No. 19-1557

United States Court of Appeals for the Federal Circuit

MCRO, INC., dba PLANET BLUE,

Plaintiff-Appellant,

v.

BANDAI NAMCO GAMES AMERICA INC., NAUGHTY DOG, INC., ELECTRONIC ARTS, INC., DISNEY INTERACTIVE STUDIOS, INC., SQUARE ENIX, INC., TREYARCH CORPORATION, SONY COMPUTER ENTERTAINMENT AMERICA LLC, SUCKER PUNCH PRODUCTIONS, LLC, INFINITY WARD, INC., LUCASARTS, A DIVISION OF LUCASFILM ENTERTAINMENT COMPANY LTD., ACTIVISION PUBLISHING, INC., BLIZZARD ENTERTAINMENT, INC.,

Defendants-Appellees.

Appeal from the United States District Court for the Central District of California in Nos. 2:12-cv-10322-GW-FFM, 2:12-cv-10329-GW-FFM, 2:12-cv-10333-GW-FFM, 2:12-cv-10335-GW-FFM, 2:12-cv-10338-GW-FFM, 2:14-cv-00332-GW-FFM, 2:14-cv-00336-GW-FFM, 2:14-cv-00352-GW-FFM, 2:14-cv-00358-GW-FFM, and 2:14-cv-00383-GW-FFM, Honorable George H. Wu, United States District Court Judge

PLAINTIFF-APPELLANT MCRO, INC.'S OPENING BRIEF

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MAY 31, 2019

CERTIFICATE OF INTEREST

Counsel for Plaintiff-Appellant certifies the following:

1. The full name of every party represented by me is:

   McRo, Inc., dba Planet Blue

2. The name of the real party in interest (Please only include any real party in interest NOT identified in Question 3. below) represented by me is:

   None.

3. All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party represented by me are:

   None.

4. The names of all law firms and the partners or associates that appeared for the party now represented by me in the trial court or agency or are expected to appear in this court (and who have not or will not enter an appearance in this case) are:

   Mishcon de Reya New York LLP: Eric P. Berger, Vincent Filardo Jr., Lana Milojevic (formerly of Mishcon de Reya New York LLP)

   Russ August & Kabat, Marc A. Fenster, Irene Y. Lee, Paul A. Kroeger

5. The title and number of any case known to counsel to be pending in this or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal. See Fed. Cir. R. 47(a)(5) and 47.5(b). (The parties should attach continuation pages as necessary).

   None.

May 31, 2019

/s/ Robert A. Whitman
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STATEMENT OF RELATED CASES

On September 13, 2016, this Court unanimously reversed the district court's finding that the claims of U.S. Patent Nos. 6,611,278 (the "'278 Patent") and 6,307,576 (the "'576 Patent") were directed to an unpatentable abstract idea and remanded for further proceedings. *See McRo, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299 (Fed. Cir. 2016) (Lead Consolidated Appeal No. 15-1080) (Reyna, Taranto, and Stoll, JJ.) (Decided September 13, 2016).

No other case known to counsel will directly affect or be directly affected by this appeal.

JURISDICTIONAL STATEMENT

The district court had jurisdiction over this patent-infringement action under 28 U.S.C. §§ 1331, 1338(a).

This appeal follows a final judgment, entered on January 9, 2019, of non-infringement and invalidity disposing of all asserted claims and counterclaims in the underlying district court case. Appx0001-0004. Appellant timely filed a notice of appeal on February 7, 2019. Appx8071. This Court has jurisdiction under 28 U.S.C. §§ 1291 and 1295(a)(1).

STATEMENT OF ISSUES PRESENTED FOR REVIEW

(1) Did the district court err in construing the claim term "morph weight set" to require "a set of vectors" wherein each individual vector must be "a direction and magnitude in three-dimensional space"?

(2) Did the district court err in granting summary judgment that all asserted claims of the '278 Patent are invalid for lack of enablement under 35 U.S.C. § 112?

(3) Should this action be assigned to a new judge upon remand?

STATEMENT OF THE CASE

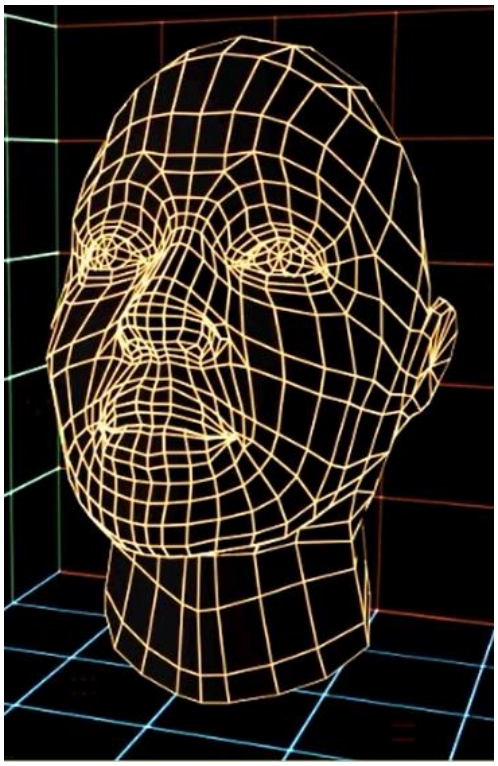
Maury Rosenfeld, the inventor of the patent-in-suit, is an Emmy-winning animator and the founder of McRO, Inc., dba Planet Blue ("Planet Blue"), a visual-effects company. The '278 Patent is directed to the field of 3-D computer animation. It teaches methods, embodied in computer software, for automatically manipulating the facial features of a computer-generated character to make a video of the character speaking pre-recorded dialogue. Mr. Rosenfeld's patented method has been hailed as "revolutionary." Appx8236. Before this litigation, many of the named Appellees (video game makers) hired Planet Blue to work on computer animation projects for them. Appx8218-8234. At some point, Appellees began using the patented techniques without a license from Planet Blue, leading to this litigation.

The district court initially held the patent invalid because it was directed to "abstract ideas" that are not patent-eligible under 35 U.S.C. § 101, but this Court reversed. *McRo, Inc. v. Bandai Namco Games Am., Inc.*, 837 F.3d 1299, 1302-03 (Fed. Cir. 2016). The case now returns to this Court following the district court's grant of summary judgment of non-infringement and non-enablement.

I. THE '278 PATENT

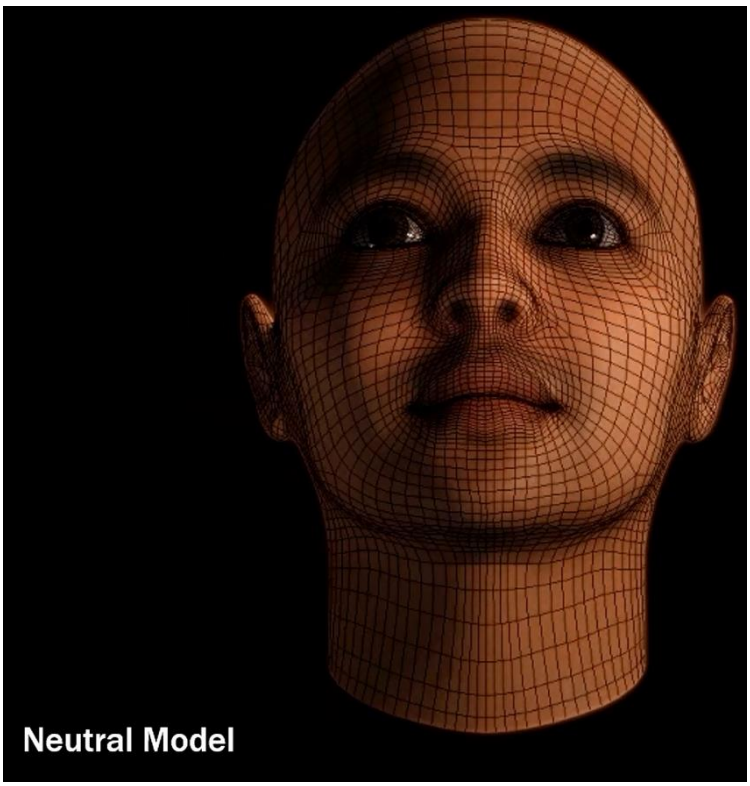
Planet Blue submits herewith a video tutorial prepared for the district court in the claim construction proceedings. Appx0808. This informative video covers background principles of computer-generated animation and the operation of the invention.

Computer-generated animation begins with an artist creating a visual depiction of a character. The starting point is the "neutral model" of that character—that is, a reference model that depicts the character's face as it looks with a neutral expression. Appx0061, 1:49-53; Appx0064, 7:49-50; Appx0808, 1:24. The foundation of the neutral model is called a "mesh" (shown below).



Appx0808, 1:17. The mesh contains various "vertices." Vertices are points in three-dimensional space that outline the model. Appx0808, 0:56. For example, one vertex may correspond with the left corner of the mouth, another with the tip of the nose, another with the center of the forehead, etc. *See* Appx0061, 1:50-58.

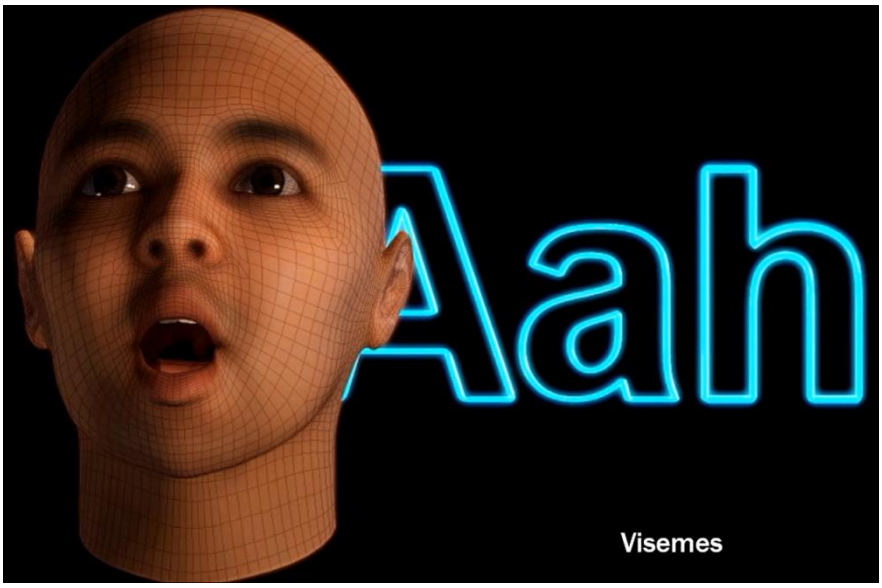
After the character's mesh has been created, the animator can add details such as skin, lips, and shading to create a more life-like image that completes the model.

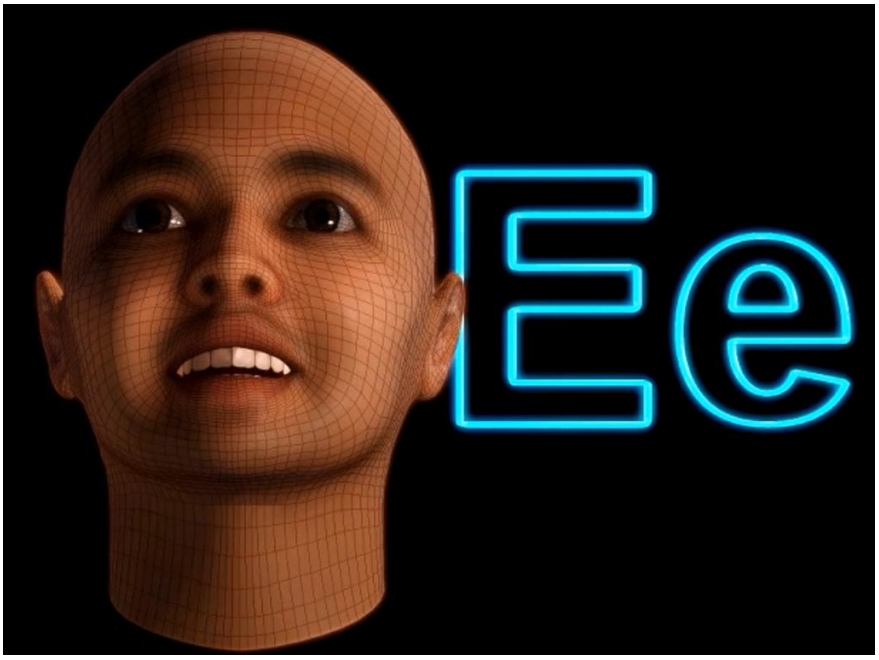


Appx0808, 1:39, 7:19.

The '278 Patent teaches a method of depicting speech in computer animation. Two non-computer-specific terms concerning speech are important to understanding that process: "phonemes" and "visemes" (the latter are sometimes called "visual phonemes"). Phonemes correspond to a single sound, the smallest unit of speech.

Appx0061, 1:37-38. Examples of phonemes would be "th," "aah," "ee," and "oh" sounds. Standardized phonetic "alphabets" list the phonemes. Appx0061, 1:39-42. Visemes are visual representations of phonemes; in simple terms, a viseme is a visual representation of what a face looks like when speaking a certain phoneme. Appx0808, 4:31. Because the face looks the same when making certain sounds, such as "F" and "V" sounds, the same viseme can sometimes be used for multiple phonemes. *Id.*, 5:04; *see* Appx0062, 3:61-64. The images below are examples of visemes showing a model speaking the "Aah" and "Ee" phonemes:





Another important concept in the field of the invention is that of a "morph target." A morph target is created by manipulating the geometry of the neutral model (as opposed to creating a new model of the character from scratch). A viseme may be a single morph target or a blended combination of multiple morph targets. As the patent specification explains, typically a morph target has the same number of vertices as the neutral model, and each vertex on the morph target corresponds to a vertex on the neutral model. Appx0061, 1:54-59 (explaining one to one correspondence is the "typical case"). In that "typical case," a vertex may represent the left corner of the mouth on the neutral model and on each morph target. Depending on the facial expression desired, the position of that vertex may vary in three-dimensional space among the different morph targets. *Id.* A morph target is represented numerically by a "delta set." Appx0061, 1:60-64. The delta set for a morph target is the set of

vectors that reflects the changes in position of each vertex on the morph target from each vertex on the neutral model. *Id.* There are many different ways vectors, individually, or a set of vectors, can be stored, encoded and used. Appx6732-6733, 109:7-110:5; Appx2291-2292, ¶16. One delta set corresponds to each morph target. Appx0061, 1:64-65.

Once a morph target has been defined, an animator is able to transform a neutral model only part of the way toward that morph target through the use of "morph weights." Appx0061, 2:14-2:26. In visual terms, a morph weight might be thought of as how fully the facial shape represented by the morph target is expressed. For example, if a morph weight of 1 is assigned to the morph target for the "oh" viseme, the model would be modified to look exactly like the "oh" viseme. Appx0061, 2:14-20. But if a morph weight of 0.5 is assigned to the "oh" viseme, the model's geometry would be modified to be halfway between the neutral model and the "oh" viseme. Appx0061, 2:16-24. It is also possible to blend different morph targets to create a desired model that depicts certain characteristics of each. Appx0061, 2:25-27. The desired model can be represented, for example, in a relatively simple numerical form as a "morph weight set." Appx0062, 4:32-45; Appx0808, 11:55-12:00.

The patented invention builds upon certain fundamental principles and techniques of computer-generated animation found in the prior art. For example, it involves the creation of a time-aligned phonetic transcription of the recorded dialog—

i.e., the speech that the animation is supposed to visually depict. *See* Appx0061, 1:35-37. It also requires an artist to create a neutral model of the character to be animated, along with a library of different morph targets for that model, such as visemes and other facial expressions. *See* Appx0061, 1:49-53; Appx0064, 7:40-48; Appx0808, 7:09, 7:35.

The specification does not purport to develop or improve a new system for creating models or morph targets. *Id.* Instead, what sets the invention apart is that the animation software is programmed with rules that evaluate the time-aligned transcription and, depending on the sequence of the phonemes and the pace of the speech, determine the appropriate morph weight set—*i.e.*, determine how much to express or blend the various models in the library of morph targets. *Id.*; *see McRo,* 837 F.3d at 1307.

The rules perform two main functions. The rules establish what morph weight set should be applied—and thus, what facial expressions the character model should make—when a particular subsequence of phonemes is encountered in a time-aligned transcript. Appx0062, 4:52-57. Additionally, the rules set the appropriate time parameters of transitions from one morph weight set to the next—from one facial expression to the next—again depending on the particular phoneme sub-sequences encountered in the transcript. Appx0062, 4:54-57; Appx0063, 6:48-56.

The patent teaches that the rules can be categorized as default rules, secondary rules, and post-processing rules. Appx0063, 5:5-8. The default correspondence rules

may be basic morph weight sets that apply to the visemes. Appx0063, 6:43-48. For example, if the software encounters an "h" as in "house" in the phonetic transcript of the dialog, the default rule would specify using the morph weight set corresponding to that viseme. Appx0064, 7:57-60.

Other rules are used in special cases with more complex criteria. For instance, a secondary rule might be invoked based on coarticulation, *i.e.*, a phoneme's context (such as what phonemes precede and follow it), or its duration, or the duration of adjacent phonemes. Appx0063, 5:26-34. The implementation of a coarticulation rule might specify a particular morph weight set where the "l" viseme is suppressed because it closely follows a closed-mouth viseme such as "b." *See* Appx0064, 8:25-28 (discussing different examples of rules based on phoneme sequence). Post-processing rules may further manipulate the morph weight sets after the default and secondary rules have been applied. Appx0063, 5:34-41; Appx0064, 7:16-32. A post-processing rule, for example, might add a small amount of random noise to the morph weight set to introduce more variety into the character's expressions. Appx0065, 9:44-46. Another might alter the transition target by a certain percentage whenever a phoneme's duration is shorter than a specified period of time. Appx0065, 8:37-39.

As explained above, the '278 Patent provides extensive examples of rules and rule sets or rule schemes. *See* Appx0064-0065, 7:55-10:62. But the patent does not purport to list all possible rules to define appropriate morph weight sets and transition times for each. That is because the proper morph weight sets and transition times to

be applied at any given moment are a matter for the artist's judgment, in the context of a particular animation project; there is no single scientifically or mathematically "correct" set of rules. For example, the contents of a morph weight set will vary depending on how many morph targets the artist has created for that model; it might contain only four values, or it might contain twenty. Mouth shapes and facial expressions will also vary depending on the character the artist has created—the same phoneme sequence may look very different when spoken by a cowboy with a Texas drawl, a talking dog, or a swamp monster. Thus, as the patent explains, "[t]he rules of the present invention are extensible and freeform in the sense that they may be created as desired and adapted to a wide variety of animation characters, situations, and products." Appx0065, 9:28-31.

Once the models have been created and the rules have been established, the other steps of the method can be performed automatically by the computer software. Ultimately, using the specified rules, a stream of morph weight sets is generated, Appx0066, 11:53-55, and the stream is applied to manipulate the neutral model to automatically move the animated character's mouth and change its facial expression to match the recorded dialog. Appx0063, 6:15-21; Appx0065, 9:22-27.

Claim 1 of the '278 Patent is representative of the asserted claims for purposes of this appeal. It recites:

> A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:

> obtaining a first set of rules that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence;
>
> obtaining a plurality of sub-sequences of timed phonemes corresponding to a desired audio sequence for said three-dimensional characters;
>
> generating an output morph weight set stream by applying said first set of rules to each sub-sequence of said plurality of sub-sequences of timed phonemes; and
>
> applying said output morph weight set stream to an input sequence of animated characters to generate an output sequence of animation characters with lip and facial expression synchronized to said audio sequence.

Appx0066, 11:42-59.

II. PROCEDURAL HISTORY

In November and December 2012, Planet Blue commenced actions in district court under 35 U.S.C. § 271, alleging that Appellees, various video-game studios, used animation techniques that infringed the '278 Patent. Planet Blue also asserted the '576 Patent whose claims are no longer at issue. Appx8070. All Appellees answered and denied infringement. All Appellees, except Square Enix, Inc., filed counterclaims for non-infringement and invalidity of the '278 Patent. Appx0004.

A. District Court's Construction of "Morph Weight Set"

In 2014, the district court construed "morph weight set" as "a set of values, one for each delta set, that, when applied, transform the neutral model to some desired state, wherein each delta set is the set of vectors from each vertex on the neutral (reference) model to each vertex on a model of another mouth position."

Appx0901-0902. In doing so, the court recognized that the specification expressly defines "morph weight set" as "a set of values, one for each delta set, that, when applied as described, transform the neutral mode[l] to some desired state." *Id.* The court then combined that express definition of "morph weight set" with the specification's express definition of "delta set" and the parties' shared understanding of how the specification describes "morph targets" (*i.e.*, as "models of other mouth positions") to arrive at its construction. *Id.* Appellees recognized that construction "fairly informs the jury of the express definitions given by the patents-in-suit for 'morph weight set,' and its constituent elements 'delta set' and 'morph target.'" Appx0751.

B. The District Court Dismisses Under 35 U.S.C. § 101 and This Court Reverses

Following claim construction, the district court granted Appellees judgment on the pleadings, holding the patents covered abstract ideas that are not patent-eligible under 35 U.S.C. § 101. In the district court's view, the claims were broad enough to "cover all" rules for "setting morph weights and transitions between phonemes." *McRo*, 837 F.3d at 1309.

This Court reversed. *Id.* at 1302-03. The Court began by addressing claim construction issues. No one challenged the district court's construction of "morph weight set." Rather, the sole claim term this Court addressed was the term "first set of rules." *Id.* at 1311. At that time, the parties had disputed "whether the 'first set of

rules' must evaluate sequential phonemes or can evaluate individual phonemes …." *Id.* Agreeing with Planet Blue, this Court found the dispute resolved on the "face of the claims themselves" which established that "[t]his limitation could not be satisfied by rules that only evaluate individual phonemes." *Id.*

The Court then held that the claims were not directed to an abstract idea. *Id.* at 1311-16. Disagreeing with the district court's reading of the claims, this Court emphasized that "the claims are limited to rules with specific characteristics": "[T]he claims themselves set out meaningful requirements for the first set of rules: they 'define[ ] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence.'" *Id.* at 1313. As a result, the Court explained, the "specific structure of the claimed rules would prevent broad preemption of all rules-based means of automating lip synchronization." *Id.* at 1315. "The claim uses the limited rules in a process specifically designed to achieve an improved technological result in conventional industry practice." *Id.* at 1316.

C. District Court's Re-Construction of "Morph Weight Set" and Appellees' Motions for Summary Judgment of Non-Infringement

On remand, in 2017, Appellees filed a first summary judgment motion of non-infringement. Appx1190. Appellees argued that the accused systems do not use "morph weight sets" in creating lip-sync animation for the accused video games. Appx1196-1198.

In response, Planet Blue alleged that Appellees' infringed based on their use of the "bones animation" technique in conjunction with other software products. Appx7519. In bones animation, a neutral model and the model of another mouth position are created. *See* Appx2298-2299, ¶¶36-38. The movement of each vertex on a facial model from a neutral position to another mouth position is represented and stored as a set of vectors. *See* Appx2298-2299, ¶¶36-37. Bones animation, however, does not store each vector as a simple 3-D vector with magnitude—the type of simple, x, y, z vector that might be encountered in a high-school geometry lesson on Cartesian coordinates. Appx2291-2292, ¶16. Rather, in bones animation, each vertex's movement is defined by control objects (commonly referred to as "bones") associated with that vertex. Appx2292-2294, ¶¶18-24; Appx2298-2299, ¶¶35-38. A single control object can attach to multiple vertices. *Id.* The collection of control objects represents the movement of each vertex on a facial model from a neutral position to another mouth position. *Id.* These control objects, or bones, are each encoded as transform vectors. *Id.* At heart, bones animation represents a more concise way to utilize a set of vectors to define the movement of the vertices in the facial model than a set of simple 3-D vectors with magnitudes for each vertex. *Id.*

In moving for summary judgment, Appellees argued that bones animation cannot infringe because bones animation does not perform animation using vectors of vertices on the facial model. Appx1196, 2:10-15. In response, Planet Blue argued that one of ordinary skill in the art would recognize that bones animation uses vectors

to define the movement of the vertices between the neutral position and another mouth position. Appx2128-2130.

The district court issued a tentative ruling that *sua sponte* re-construed and limited its prior construction of "morph weight set" by requiring that only vectors in three dimensions with magnitude, *i.e.*, a simple x, y, z vector, could be utilized with morph weight sets. Appx2784-2786. The district court did not enter its tentative ruling. Instead, it allowed the parties to complete discovery. Appx2786; Appx0014, n.9.

After discovery, Appellees again moved for summary judgment of non-infringement, invoking the district court's proposed *sua sponte* re-construction of "morph weight set" from its tentative ruling. Appx4058-4060. In response, Planet Blue argued that the construction—proposed for the first time by the district court in its tentative ruling—was wrong because it departed from the specification's express definitions, read limitations into the claims from exemplary embodiments, and was inconsistent with all expert testimony. Appx6137-6142.

The district court, however, adopted its re-construction of "morph weight set." Under the district court's re-construction, Planet Blue was required to prove that each "vector" in the "set of vectors" that comprises a "delta set" must do more than define the movement of a vertex between the neutral and desired facial model. Appx0020-0021 ("The Court clarifies that the term 'vector' in the context of the claim term 'morph weight set[s]' refers to a vector with direction and magnitude in three-

dimensional space."). Now, each vector must represent the movement as a simple, single 3-D vector with magnitude.

The district court granted Appellees' motion because there was no dispute that Appellees did not infringe under the district court's new construction. Appx0013 (finding Appellees' motion hinged "entirely on claim construction.").

D. Appellees' Motion for Summary Judgment of Non-Enablement

Before entering its order granting Appellees' summary judgment of non-infringement, the district court ordered Appellees to file a summary judgment motion concerning enablement. *See* Appx0008. The district court noted that it had previously pressed Appellees for arguments concerning enablement and Appellees had ignored its request. *Id.* The district court stated that it would not enter an order finding non-infringement until it received briefing on enablement. *Id.* Accordingly, Appellees filed a summary judgment motion arguing the '278 Patent claims were not enabled. Appx0185.

The district court granted the motion, holding the '278 Patent claims not enabled. Appx0026. The district court's finding was based on the "first set of rules" limitation. It found the '278 Patent failed to enable two rule sets as a matter of law: 1) rules pertaining to an alleged prior art BALDI system;[1] and 2) rules pertaining to the accused bones animation. Appx0042-Appx0047. The district court further found

[1] BALDI as used herein refers to an alleged prior art commercial software system. *See* Appx4922, ¶¶132-134.

that no factual disputes existed regarding each of the *Wands* factors, an eight factor test that this Court has held to be a useful tool in the enablement context. Appx0047-0052 (citing *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988)).

SUMMARY OF THE ARGUMENT

The district court's non-infringement ruling rests on an erroneous construction of the term "morph weight set." The district court's construction requires a "morph weight set" to have a particular set of vectors wherein each vector is a simple three-dimensional vector with magnitude. The specification expressly defines the term "morph weight set," but that definition does not require vectors to be represented or stored in computer software in any particular way. Nothing in the '278 Patent requires every vector to be a "vector with direction and magnitude in three-dimensional space." Appx0021.

Testimony from persons skilled in the art confirms the district court's construction is erroneous. As experts explained, in the context of the inventions, the movement of vertices between facial models, as represented by vectors, are what matters; not whether each individual vector is itself represented as a "direction and magnitude in three-dimensional space." Vectors can be stored in many different ways. The district court disregarded that evidence on summary judgment.

The district court also erred in finding the '278 Patent not enabled. Enablement is a highly fact-dependent question, often turning on the eight so-called *Wands* factors. Planet Blue presented evidence on each of those eight factors from

which a reasonable jury could find that Appellees failed to prove non-enablement by clear and convincing evidence. The district court ignored much of that evidence or resolved factual disputes against Planet Blue, the non-moving party, on summary judgment. That was improper. *Vasudevan Software, Inc. v. MicroStrategy, Inc.*, 782 F.3d 671, 684 (Fed. Cir. 2015) (reversing summary judgment of non-enablement based on factual disputes concerning "several of the *Wands* factors").

Lastly, Planet Blue respectfully requests a new judge on remand. After this Court reversed on § 101 grounds, the district court injected itself into the case in a highly unusual manner. The district court *sua sponte* determined that the term "morph weight set" needed to be re-construed despite Appellees' concession that the original construction fairly informed the jury of the meaning of the term. The district court advised Appellees to raise a defense of non-enablement during discovery; permitted Appellees to add that defense after the close of fact discovery; ordered Appellees to file a summary judgment motion concerning enablement (despite Appellees' election not to do so); and ruled for Appellees despite sharply disputed evidence.

ARGUMENT

I. STANDARD OF REVIEW

Summary judgment decisions are reviewed according to the law of the regional circuit, here the Ninth Circuit, which reviews them *de novo*. *Vasudevan*, 782 F.3d at 676. "In the Ninth Circuit, summary judgment is appropriate when, even 'draw[ing] all reasonable inferences in favor of the non-moving party,' there is no 'genuine issue

of material fact.'" *Id.* (quoting *Comite de Jornaleros de Redondo Beach v. City of Redondo Beach*, 657 F.3d 936, 942 (9th Cir. 2011)). "As a general rule, summary judgment is inappropriate where an expert's testimony supports the nonmoving party's case." *Provenz v. Miller*, 102 F.3d 1478, 1490 (9th Cir. 1996).

Whether the district court properly construed "morph weight set" is a question of law. *See AIA Engineering Ltd. v. Magotteaux Int'l S/A*, 657 F.3d 1264, 1271 (Fed. Cir. 2011). The district court's interpretation of intrinsic evidence, including the patent's specification, is reviewed without deference. *CardSoft, LLC v. VeriFone, Inc.*, 807 F.3d 1346, 1349-50 (Fed. Cir. 2015). Any underlying factual disputes over extrinsic evidence, such as conflicting expert testimony, are reviewed for clear error, but only if "the district court … actually made a factual finding." *Id.*

Enablement is a question of law subject to *de novo* review. *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1334 (Fed. Cir. 2003).

II. SUMMARY JUDGMENT OF NON-INFRINGEMENT SHOULD BE REVERSED

The district court's judgment of non-infringement rests on a construction of "morph weight set" that cannot be reconciled with how the '278 Patent explicitly defines the term. *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009). The patent expressly defines the term "morph weight set" to mean "a set of values, one for each delta set, that, when applied as described, transform the neutral mode[l] to some desired state such as speaking the 'oo' sound or the 'th' sound." Appx0061, 2:14-20. All parties below recognized this as a lexicographical

definition. *See* Appx0749-0750; Appx0697-0698. It was also undisputed that the '278 Patent expressly defines what a "delta set" is: "The deltas of each vertex on each morph target relative to the neutral are computed as a vector from each vertex n on the reference to each vertex n on each morph target." *See* Appx0061, 1:60-64; Appx0749-0750; Appx0697-0698.

Reading the '278 Patent's express definitions, a person of ordinary skill in the art would understand that a "morph weigh set" is "a set of values, one for each delta set, that, when applied, transform the neutral model to some desired state, wherein each delta set is the set of vectors from each vertex on the neutral (reference) model to each vertex on a model of another mouth position." That construction was originally adopted by the district court prior to the first appeal. Appx0901-0902. This Court should adopt the same construction. As Appellees previously recognized, that "construction fairly informs the jury of the express definitions given by the patents-in-suit for 'morph weight set,' and its constituent elements 'delta set' and 'morph target.'" Appx0750-0751.

A. The '278 Patent Defines the Claim Term "Morph Weight Set"

Following this Court's reversal of the district court's §101 decision, the district court layered additional requirements into the specification's express definitions. This was error.

The district court declared that a "simple reading" of the definition of the term "delta set" requires vectors to have "3-D magnitude and direction computed by pure

subtraction/addition between the neutral and target models, with one vector corresponding to each set of two vertices." Appx0016-0017. But the terms "3-D magnitude," "direction," "pure subtraction/addition" appear nowhere in the definition of "delta set." The district court read those limitations into the patent's express definition of "delta set."

The district court's approach defies foundational claim construction principles. When a specification provides an express definition, that definition governs the claim construction process. Indeed, this Court routinely rejects attempts to depart from express definitions contained in the intrinsic evidence. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) ("the inventor's lexicography governs"); *Martek*, 579 F.3d at 1380 ("'When a patentee explicitly defines a claim term in the patent specification, the patentee's definition controls.'"); *Honeywell Int'l, Inc. v. Universal Avionics Sys. Corp.*, 493 F.3d 1358, 1361 (Fed. Cir. 2007) ("When a patentee defines a claim term, the patentee's definition governs, even if it is contrary to the conventional meaning of the term."); *Braintree Laboratories, Inc. v. Novel Laboratories, Inc.*, 749 F.3d 1349, 1355-56 (Fed. Cir. 2014) ("Under our precedent, the patentee's lexicography must govern the claim construction analysis.").

In *Martek*, for example, this Court reversed a district court for trying to narrow an express definition in the specification. There, the patentee had "explicitly defined the term 'animal' in the '244 patent: 'The term 'animal' means any organism belonging to the kingdom Animalia.'" *Martek*, 579 F.3d at 1380. That definition was broad

enough to include humans. *Id.* Invoking other parts of the specification, however, the district court construed the expressly defined term "animal" to exclude humans. *Id.* That "was error." *Id.* This Court explained that, in the absence of "words or expressions that manifestly exclude coverage of humans," it was "improper to override the patentee's express definition of 'animal' to limit the scope of the claims." *Id.* at 1381.

The same principle applies here. The expressly defined terms "morph weight set" and "delta sets" do not require vectors to have particular characteristics. There are no "words or expressions" of manifest exclusion limiting the term "vector" to a vector having 3-D direction and magnitude. But the district court construed the word "vector" narrowly and limited it to a specific type of vector, even though such limiting language was not part of the express definitions in the specification. That, too, "was error." *Id.* at 1380; *see Braintree*, 749 F.3d at 1355-56 (reversing district court and finding express definition controls even where such definition may exclude the preferred embodiment).

Put simply, this Court should hold that the '278 Patent's express definitions govern.

B. The '278 Patent Specification Does Not Require Delta Sets to Be Comprised of 3-Dimensional Vectors with Magnitude

The district court's decision did not merely violate a fundamental canon of claim construction by reading additional limitations into the patent's express

definitions. It also misconstrued the specification language it invoked to narrow the claim terms—not once, but twice.

1. The Definition of Delta Set Does Not Limit Vectors to Single 3-Dimensional Vectors with Magnitude

The district court erred by construing the definition of "a" within the "delta set" definition as if it meant "a single" or "only one." The '278 Patent explains that, for a "delta set," the "[t]he deltas of each vertex on each morph target relative to the neutral are computed as ***a vector*** from each vertex n on the reference model to each vertex n on each morph target." Appx0061, 1:60-63 (emphasis added). Seizing on the phrase "a vector," the district court declared that a "simple reading" of the definition required "***one vector*** corresponding to each set of two vertices" to define the difference between a vertex on a neutral model and a target model. Appx0016-0017 (emphasis added). That conclusion, in turn, undergirded the district court's further decision to require vectors to have a 3-D direction and magnitude: The district court declared it "important[]" that "the specification refers to the deltas of each vertex on each morph target as being computed as ***a single vector***." Appx0015 (emphasis added).

The district court's "simple" reading of the "delta set" definition violates settled canons of claim construction. The definition of "delta set" does ***not*** describe "the deltas of each vertex on each morph target" as consisting of "a single vector" or "one vector." Instead, the specification states that "[t]he deltas of each vertex on each

morph target relative to the neutral are computed as ***a vector*** from each vertex n on the reference model to each vertex n on each morph target." Appx0061, 1:60-63 (emphasis added). In patent parlance, it is a well settled rule that the article "a" means one or more and not "a single." *See KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000) ("[T]he article 'a' receives a singular interpretation only in rare circumstances when the patentee evinces a clear intent to so limit the article."); *Baldwin Graphic Systems, Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342–43 (Fed. Cir. 2008) ("That 'a' or 'an' can mean 'one or more' is best described as a rule, rather than merely as a presumption or even a convention."). If the inventor had meant to require a single or one vector, the patent would not have said "a vector"—it would have said "a single vector" or "one vector." Consistent with patent parlance, when the inventor meant "one" or a "single" item, the patent says so expressly. Indeed, two sentences after using the phrase "a vector," the specification explains that "[t]here is ***one*** delta set" for each morph target. Appx0061, 1:63-64 (emphasis added).

The district court's "simple" reading of the definition of "delta set" further contradicts expert testimony (from Appellees' technical witness) regarding how one of ordinary skill in the art would understand the specification's definition of "delta set." During his deposition, Dr. Dobkin, Appellees' expert, was questioned about the definition of "delta set" in the '278 Patent. He testified that the patent specification explains that "vectors are computed" and that the patent's definition does not further limit the term "vector." Appx6732, 107:17-109:6. That acknowledgement reflects

that the patent's express definition does not require vectors to have 3-D magnitude and direction.

Dr. Dobkin, moreover, conceded that the definition of "delta set" does not say "how [vectors] have to be stored," because there are a number of ways to store vectors. *Id.* at 107:17-109:12. That is significant: If a computer can store a vector in many ways—*i.e.*, in ways other than as a direction and magnitude—vectors do not have to be encoded as 3-D vectors with magnitude. Indeed, the bones animation technique merely represents a more efficient way to encode 3-D vectors with magnitude. Appx2291-2292, ¶16. Dr. Dobkin's opinions cannot simply be dismissed as "not relevant." Appx0020.

Thus, contrary to the district court's finding, under the express definition of delta set, the movement of each vertex on the reference model to each vertex on the morph target is computed as one or more vectors. The vertex movement can be computed as any type of vector. Indeed, if multiple vectors (collectively) represented the movement of a single vertex, than each individual vector would not represent the movement of that vertex from a reference model to a target model as a 3-D direction with magnitude as required by the district court's re-construction. Similarly, if a vertex is moved to a target vertex via an intervening vertex, then an individual vector of direction and magnitude would not suffice. As such, the specification explains that precise vertex to vertex correspondence is not required. Appx0061, 1:54-59.

2. Remaining Portions of the Specification Do Not Limit Vectors to Single 3-Dimensional Vectors with Magnitude

Other parts of the specification contradict the district court's decision to require each vector in a "delta set" to have a 3-D direction and magnitude. The district court invoked a formula for computing vectors in the specification to conclude that, for each set of vertices, there must be a "single vector" whose direction can be "obtained through simple subtraction." Appx0015. But the court confused a description of an exemplary embodiment with the claims.

The specification explains that "delta sets" can be used to define the movement of vertices from a neutral model to another mouth position. The specification explains that, in the "typical case," a "logical correspondence" will exist between each vertex on the neutral model and each vertex on the second model. Appx0061, 1:54-59 ("[E]ach vertex on each model logically corresponds to a vertex on each other model … although this is the typical case, such rigid correspondence may not be necessary."). Thus, if a neutral model had 16 vertices, a morph target would have 16 corresponding vertices. But the patent expressly teaches that such "rigid correspondence" between vertices is not necessary. *Id.* As such, the same number of vertices do not have to exist on each model.

The specification discloses a formula that could be used for calculating the movement of each vertex when rigid correspondence between vertices exists, *i.e.*, in the typical case. Appx0061, 1:54-59. The specification states that the formula can be

used to calculate a vector when "each vertex N on the neutral" has a corresponding vertex on the other model. *Id.* at 1:65-2:3. The result of the formula is a calculation of the location of a vertex from its corresponding vertex. *Id.* at 2:5-2:10 ("For example, |result| is the corresponding resulting vertex to vertex v in the neutral model …."). Yet, rigid correspondence between vertices is the "typical case" and not required. *Id.* at 1:54-59. As such, the district court erred by finding the formula limiting. *See* Appx0017 (district court finding specification "provides the appropriate formula for computing a desired facial expression" because the formula is not held out as exemplary).

The express distinction between typical and non-typical cases cannot be reconciled with the district court's construction. Knowing that vertices do not necessarily have rigid correspondence, a person of ordinary skill in the art would never narrowly understand the term vector to require only 3-D vectors with a magnitude, *i.e.*, computable through "simple subtraction." A person of skill in the art would not import a high-school-geometry understanding of vectors into the field of computer animation.

Further, the district court erred by interpreting the background of the invention and all statements contained therein as if they were limiting unless the specification expressly indicated that they were non-limiting. Appx0017. That analysis turns claim construction jurisprudence on its head. "It is improper to read limitations from a preferred embodiment described in the specification—even if it is the only

embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited." *GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309-1310 (Fed. Cir. 2014) (citations omitted). "[A]bsent a clear disavowal or alternative lexicography by a patentee, he or she is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning." *Wasica Finance GmbH v. Continental Automotive Sys., Inc.*, 853 F.3d 1272, 1281-82, (Fed. Cir. 2017) (citations omitted); *see also 3M Innovative Properties Co. v. Tredegar Corp.*, 725 F.3d 1315, 1329-30 (Fed. Cir. 2013). The district court, however, identified no such clear indication here. Instead, the district court found the formula limiting because the specification "does not hold [the formula] out as exemplary." Appx0017-0018. That finding was wrong both as a factual matter (as explained above, the formula may only be applied in the "typical case") and as a legal matter (failing to describe something as "exemplary" is not a disclaimer).

The district court criticized Planet Blue for failing to submit evidence that the exemplary formula could be used to calculate, for example, the transform vectors utilized for bones animation. Appx0018.[2] That ignores that the exemplary formula is not a claim limitation. Besides, a court should not construe claims with a view toward either "capturing or excluding" an accused product. *See Vita-Mix Corp. v. Basic*

[2] Appellees did not argue in their moving papers that the disclosed formula could not be used to calculate transform vectors. Appx4064-4070, Appx7302-7305. Instead, there was no dispute that the transform vectors used in bones compute the new positions of each vertex from the old positions of each vertex. Appx2293, ¶23.

Holding, Inc., 581 F.3d 1317, 1324 (Fed. Cir. 2009). "It is well settled that claims may not be construed by reference to the accused device." *NeoMagic Corp. v. Trident Microsystems, Inc.*, 287 F.3d 1062, 1074 (Fed. Cir. 2002). Yet, that is exactly what happened here. The district court required proof that the accused transform vectors would operate in the disclosed, but unclaimed, formula for a "typical case," before construing the term vector to exclude bone transform vectors.

C. The Ordinary Meaning of Vector Is Not Limited to a 3-Dimensional Vector with Magnitude

The undisputed extrinsic evidence teaches that the ordinary meaning of vector would be understood by one of skill in the art as an ordered list of numbers that can be used to move vertices (among other functions). As such, based on the specification's express definition of "delta set," vectors in the context of the specification are ordered lists of numbers that represent the movement of the vertices from the neutral model to the vertices of another mouth position.

Only Planet Blue submitted a declaration from a person of ordinary skill in the art concerning the ordinary meaning of vector to the district court. Appx2289, ¶10. Planet Blue's expert, Dr. Gleicher, explained:

> The term "vector" in mathematics, computer science and computer graphics is a general concept that roughly means an ordered list of numbers. My understanding of this term is consistent with one of the

> seminal texts on computer graphics, Real Time Rendering[3] …, which defines a "vector" as "an ordered list of real numbers."

Id. (citing Appx2068-2069). Real Time Rendering is "one of the seminal texts on computer graphics," Appx2289, ¶10, and its definition of "vector" is consistent with Dr. Gleicher's. Appx2068-2069.

Dr. Gleicher further explained that one of ordinary skill in the art would understand that vectors have varying levels of complexity. For example, a simple vector representing the movement of a vertex from one position to another position may be represented as three numbers (a magnitude in each of the x direction, the y direction and the z direction), known as a "3-vector." Appx2289, ¶11. A vector associated with movement from one vertex to a second vertex via a third vertex might be a "6-vector," *e.g.*, two simple vectors described by six values. *Id.* The vectors associated with changes of vertex positions in bones animation are known as "10-vectors" because they contain ten different values. *Id.*

The district court, however, dismissed Dr. Gleicher's testimony and Real Time Rendering's definition stating they were "not necessarily tied to the understanding … at the time of the invention." Appx0020. But the court cited no evidence that the term "vector" in the relevant field had changed between the patent's filing and Real Time Rendering's publication in 2008. Nor did Dr. Gleicher's opinion suggest that the meaning of vectors—a basic computer animation concept—might be different at

[3] Akenine-Moller, T., Haines, E., Hoffman, N., Real-Time Rendering (3rd Edition, CRC Press Taylor & Francis Group, 2008). Appx2029-2030.

any other point in time. Indeed, prior art references also recognize that vectors are an ordered list of numbers. *See* Appx3793-3794, Table 5-3.

Testimony from Appellees' expert, Dr. Dobkin, confirms that vectors can take many forms other than a magnitude and direction in three-dimensional space. Dr. Dobkin repeatedly recognized that vectors would be understood to be an ordered list of numbers and would not be limited to 3-D vectors with magnitude. For example, Dr. Dobkin explained that "a bone is represented by a 10-vector, which records the rotation scaling in the transformation." Appx6717, 46:11-23. He further testified how the "10 vector" associated with a bone transform contains three numbers "for translation, three for scale, and four for rotation," resulting in a total of ten numbers in the vector (a "10 vector"). *Id.* These were not isolated concessions; Dr. Dobkin repeatedly recognized that bones transforms are vectors. *Id.* at 47:23-49:2 (recognizing that bones animation uses vectors); Appx6719-6720, 57:22-58:25 (same); Appx6726, 85:8-21 (same). Dr. Gleicher agreed. Appx2298-2299, ¶¶36-37 (explaining in detail why one a skilled artisan would recognize "bones" animation to utilize "vectors," in general, and 10-vectors, in particular). As detailed above, the district court chose to focus extensively on the accused bones animation technology in construing the claim term "morph weight set," yet the court failed to address Dr. Dobkin's repeated concessions that bones animation uses vectors generally, and a 10-vector in particular.

In lieu of testimony concerning the use of the term vector by one of skill in the art, the district court invoked Dr. Gleicher's testimony that bones was not an "attractive approach for facial animation." Appx0019. Based on this testimony, the district court found that the patented invention could not encompass the accused "complex, non-three-dimensional" delta vectors. *Id.* But the attractiveness of bones animation has nothing to do with a person skilled in the art's understanding of vector. Besides, Dr. Gleicher did not opine that bones animation was impossible or even exceedingly difficult; he said it was "not attractive." The district court erred by latching onto (and distorting) a statement which does not mention vectors, vertices or anything of the like. Instead, the statement merely generally describes the accused technology. *See Vita-Mix*, 581 F.3d at 1324; *NeoMagic*, 287 F.3d at 1074.

The district court's disregard of testimony and extrinsic evidence about how a skilled person would have understood vectors is another reason for reversal.

D. The District Court's Erroneous Construction Requires Reversal

The district court's erroneous construction was far from harmless. As explained above, bones animation uses vectors to define the movement of each vertex from a base-model to a desired model.

In bones animation, displacement for each vertex in a facial model is defined by the set of vectors associated with three basic bone transforms: translation (change in position), scale (change in size) and rotation (change in orientation). *See* Appx2292-2299, ¶¶18, 23-25, 36-37; Appx4649-4651, ¶¶2.6-2.12; Appx6717, 46:11-49:2. The

collection of these vectors defines the movement of each vertex from the neutral model to the model of another mouth position. *Id.* As such, bone animation uses a set of vectors that meet the original claim construction of the district court, which is the construction Planet Blue requests this Court to adopt. *See* Appx2292-2299, ¶¶18, 23-25, 36-37; Appx4649-4651, ¶¶2.6-2.12.

As recognized by the district court, Appellees' non-infringement summary judgment motion hinged "entirely on claim construction." Appx0013. Under the proper construction, the district court could not have granted summary judgment of non-infringement. At a minimum, there are questions of fact concerning whether bones animation employs "morph weight sets." The district court's non-infringement ruling should be reversed.

III. SUMMARY JUDGMENT OF NON-ENABLEMENT SHOULD BE REVERSED

The district court also erred in granting summary judgment of non-enablement. Enablement is a question of law based on underlying fact questions regarding undue experimentation. *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 617 F.3d 1296, 1305 (Fed. Cir. 2010). A claim is enabled when a person of ordinary skill in the art, after reading the specification, could practice the claimed invention without undue experimentation. *Wands*, 858 F.2d at 736-37.

"Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." *Id.* at 737. In considering whether the level of experimentation at

issue is "undue," courts consider the factors listed in *Wands*: "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability of the art, and (8) the breadth of the claims." *Id.*; *see Vasudevan*, 782 F.3d at 684.

A reasonable jury could find that Appellees failed to meet their burden of proving by clear and convincing evidence that the claims of the '278 Patent are not enabled. The district court found otherwise by improperly requiring the claims to enable rules sets pertaining to the prior art BALDI system and the accused commercial embodiments' use of bones animation. The BALDI system, however, does not use the claimed rule set. And, as explained below, the claims need not enable the accused methods. In addition, in reaching its conclusions concerning enablement of BALDI and the accused systems, the district court relied exclusively on irrelevant and disputed expert opinions directed to the disclosure in the '278 Patent, *i.e.*, the written description requirement, which do not mention experimentation.

Further, each *Wands* factor counsels against a finding of non-enablement. When genuine disputes exist regarding the *Wands* factors, a finding of non-enablement on summary judgment is improper. *Vasudevan*, 782 F.3d at 684 (reversing summary judgment of non-enablement based on factual disputes concerning "several of the *Wands* factors"). Genuine factual disputes exist with respect to each *Wands*

factor. The district court's findings with respect to the *Wands* factors invaded the province of the jury. Reversal is warranted.

A. The District Court Erred in Granting Judgment Based on an Alleged Failure to Enable Prior Art and the Accused Method

Even before addressing the *Wands* factor, the district court ruled that the claims failed to enable certain rule sets as a matter of law. Appx0041-0047. The district court stated that Appellees submitted specific evidence of rule sets that would be covered by the "first set of rules" limitation and that were not disclosed in the '278 Patent and not enabled. Appx0047. Those rules sets pertain to: 1) the BALDI system and 2) the accused bones animation technology. Appx0041-0043. To support its conclusion, the district court relied on five paragraphs from the report of Appellees' expert, Dr. Wyvill. *See* Appx0042-0047 (relying on Appx5891-5893, ¶¶370-74). But the cited paragraphs do not mention experimentation at all—the key concept in enablement—and are disputed.

The first paragraph of Dr. Wyvill's report invoked by the district court states that the "specification fails to disclose a representative number of species to demonstrate that applicant possessed the full scope of the genus." Appx5891, ¶370. But that statement concerns written description—not enablement. It does not mention experimentation. Nor does it reference any allegedly non-enabled rule set. Further, Dr. Gleicher disputed Dr. Wyvill's opinion. *See* Appx4943, ¶201 (explaining why one of skill in the art would find a representative number of rule sets disclosed).

The district court relied on a second paragraph of Dr. Wyvill, the only paragraph that even mentioned BALDI. That paragraph states: the "BALDI system [an alleged prior art system] provides a good example of a system that uses 'rules' that are far more complex than anything ***the patent describes*** …." Appx5891-5892, ¶371 (emphasis added). But the BALDI system does not use the claimed rule set. Indeed, Appellees' expert conceded that BALDI does not utilize "morph weight sets" due to its lack of delta sets. Appx5839-5840, ¶237 ("The parameter target values corresponding to each phoneme do not represent delta sets as construed by the Court."). Dr. Gleicher agreed with Dr. Wyvill, explaining: "BALDI defines 'rules' in terms of … anatomical parameters … teaching away from the idea of defining rules in terms of Morph Weight values …." Appx4924, ¶140. Dr. Gleicher further explained in detail why BALDI does not use rules that define morph weight sets. *See* Appx4924-4926, ¶¶139-145. A patent is not required to enable what is outside its claims.

Further, the evidence relied on by the district court does not compel the conclusion that undue experimentation would be required to practice the BALDI rule set. The cited paragraph concerning BALDI does not mention experimentation—the touchstone of the enablement inquiry. *See* Appx5891-5892, ¶371 (opining that BALDI is "far beyond anything the '278 patent describes"). On the issue of experimentation, Dr. Wyvill explained that it "would have been a trivial matter for anyone with the most rudimentary experience with computer graphics" to modify the

BALDI rule set such that they could be used with the rule scheme taught by the '278 Patent. Appx5840, ¶238; *see also* Appx5840, ¶237. At a minimum, a reasonable jury would not be required to find that a claimed implementation of BALDI's rule set would require excess experimentation as the district court found.

The remaining paragraphs of Dr. Wyvill's report relied on by the district court fail for similar reasons. The third paragraph states that a skilled artisan reading the specification would not have "understood Mr. Rosenfeld ***to have been in possession*** of anything approaching" the accused technology. Appx5892, ¶372 (emphasis added). Similarly, the last two paragraphs of Dr. Wyvill's report concern bones animation generally, *id.* Appx5892-5893, ¶373, and whether the specification "suggests that the inventor ***had possession*** of the species of rule sets that defines a morph weight set stream as a function of phoneme sequence and time for bone animation," Appx5893, ¶374 (emphasis added). In short, each of those paragraphs concerns whether the inventor ***had possession*** of a rule set encompassing the accused bones animation—not whether the "first set of rules" limitation is enabled.

By invoking Dr. Wyvill's report, the district court focused on the wrong legal question. "The dispositive question of enablement does not turn on whether the accused product is enabled." *Durel Corp. v. Osram Sylvania Inc.*, 256 F.3d 1298, 1306 (Fed. Cir. 2001); *see also Amgen*, 314 F.3d at 1335 ("[T]he law makes clear that the specification need teach only one mode of making and using a claimed composition. This conclusion again makes the specification's failure to disclose [the accused

technology] legally irrelevant.”). But the district court made the accused technology its focus—even though it had elsewhere held the claims did not cover that technology. The district court recognized this contradiction in its enablement decision, yet found against Planet Blue anyway. Appx0042 (finding accused rules pertaining to bones animation relevant because Planet Blue “previously argued” they were covered by the claims).

The district court compounded its error by relying on opinions not directed to experimentation. The district court’s failure to identify any evidence related to the amount of experimentation that would be necessary to develop a rule set pertaining to bones animation—much less evidence that a person of skill would have to engage in excessive experimentation—also requires reversal. *See Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1321 (Fed. Cir. 2003) (recognizing that accused infringer’s failure to offer evidence on the amount of experimentation precluded a finding of no enablement).

Of course, merely identifying a rule set that hypothetically might require excess experimentation is not enough to establish non-enablement as a matter of law. Indeed, there was ample evidence from which a reasonable jury applying the *Wands* factors could conclude that the claimed invention would not require excess experimentation.

B. The *Wands* Factors Evidence That the Claims Are Enabled

1. The Nature of the Invention, the State of the Prior Art and the Skill of Those in the Art (*Wands* Factors 4-6)

A reasonable jury would likely find that the nature of the invention, the state of the prior art, and the skill of those in the art all strongly counsel against a finding of non-enablement. The district court declared these three *Wands* factors irrelevant; yet properly viewed, these factors frame the enablement inquiry in this case.

With respect to the nature of the invention, the claimed invention relates to the field of computer animation. The nature of the invention provides important context for a finder of fact to consider and weigh the evidence concerning experimentation.

As both parties' experts explained, computer animation was a well-developed field at the time of the invention, not an unpredictable area. *See* Appx4946-4947, ¶¶208–209 (recognizing well developed nature of computer animation); Appx5842, ¶244 (opining that the nature of the invention was not in an art that had unexpected results). Prior to the invention, animators utilized morph weight sets for animation by manually setting keyframes for each frame of animation. Appx0061, 1:47–2:13. The specification describes this as an incredibly time consuming process. *Id.* at 2:27-34. Indeed, in 1998, a hand animator would only be able to produce between 5 and 10 seconds of animation in a single day or at most about 33 minutes of animation in a single year—assuming a 200 day work year. Appx8150-8151, ¶¶326–327. A

reasonable jury could certainly find that the labor intensive aspect of the field of the invention strongly counsels against a finding of non-enablement. The district court erred in determining this factor irrelevant as a matter of law.

With respect to the state of the prior art, this factor similarly counsels against a finding of non-enablement. Both parties' experts concur that the state of the prior art was well developed by 1998. Appx4946-4947, ¶¶207–208; Appx5772, ¶77. Although no prior art reference taught the claimed rules that define a morph weight set stream as a function of phoneme sequence and timing, rules regarding coarticulation as a linguistic matter were known. Appx4893-4894, ¶¶46-47 (opining that complicated muscle-based systems were utilized with certain rules that did not define "morph weight set streams"), Appx4945, ¶205 (recognizing that coarticulation rules were known). Coarticulation rules are linguistic observances about the manner in which certain phonemes affect surrounding phonemes. For example, as taught in the '278 Patent, when a mouth expresses the "'l' in 'hello'" it is shaped wider than when the mouth expresses the "'l' in 'burly' due to proximity to an 'eh' as opposed to an 'r'." Appx0065, 10:22-26. The patent does not claim "coarticulation" rules. But the specification explains that a claimed rule could specify "morph weight set as [a] transition target" to account for the observed coarticulation effect. *Id.* One of skill in the art would have little difficulty applying this teaching to account for other, non-disclosed, coarticulation rules. Appx4943-4046, ¶¶203–206. The academic community had spent years developing and publishing coarticulation rules, and

numerous prior art references disclose such rules as a general matter. Appx4908, ¶381. There was no need to disclose additional coarticulation rules in the specification. *See Falkner v. Inglis*, 448 F.3d 1357, 1365 (Fed. Cir. 2006) ("[A] patent … preferably omits, what is well known in the art.").

In sum, a reasonable jury could find that the state of the prior art counsels against a finding of non-enablement.

With respect to the knowledge of one of skill in the art, a reasonable jury could find that the coarticulation rules of the prior art could be modified without undue experimentation as taught by the '278 Patent, *i.e.*, such that they define morph weight streams as a function of phoneme sequence and timing. Appx4943-4946, ¶¶203–206; Appx5813, ¶173; Appx5840, ¶238; Appx7780-82, 104:5–107:4. For example, Dr. Gleicher opined that coarticulation rules disclosed in the literature could be modified based on the rule scheme taught in the '278 Patent. Dr. Gleicher explained:

> The '278 does not waste time listing the sets of coarticulation rules that were known in the literature (such as from Pelachaud[4] or [Cohen][5]). Instead, it instructs one of skill in the art in how to transfer this knowledge into a production compatible system. It does this through teachings such as a rule schema that is sufficient for capturing these coarticulation effects as well as artistic effects in a controllable manner.

[4] Catherine Pelachaud, "Communication and Coarticulation in Facial Animation," PhD thesis, Univ. of Pennsylvania, PA 1991.

[5] Cohen M., Massaro D., "Modeling Coarticulation in Synthetic Visual Speech," Models and Techniques in Computer Animation, Springer Verlag, Tokyo, 1993, pp. 139-156.

Appx4945, ¶205 (emphasis added). At his deposition, Dr. Gleicher further explained:

> [L]ooking at the patent, the patent suggests that I could reimagine Pelachaud's rules in the form that the patent imagined. Given that motivation and those examples that it gives, I believe that it -- that the kinds of rules that she created could be transformed into a kind of system that would ultimately produce morph weight set streams, as required in the patent.

Appx7785, 651:10–22. He further explained why it would not be exceedingly difficult to modify prior art coarticulation rules, such as those taught in Pelachaud, such that they applied to morph weight set streams. *See* Appx4899-4899, ¶¶60-63 (explaining why the use of morph weight sets and rules that define them would have been easier to create and implement than rules pertaining to musculature as taught by Pelachaud).

Appellees' expert agreed with Dr. Gleicher. Dr. Wyvill opined that it would be "trivial" for one of skill in the art to take the coarticulation rules from Pelachaud and modify them such that they define "morph weight set streams" as taught by the '278 Patent instead of Pelachaud's action units (AUs).[6] Appx5813, ¶173 ("One of skill in the art in 1996 ***would have known that it was trivial*** to apply the algorithms described in Pelachaud to blend AUs defined as delta sets operating on the base vertices of the facial mesh.") (emphasis added). Further, Dr. Wyvill similarly conceded that it would have been "trivial" to modify the BALDI system such that the

[6] Pelachaud's "rules" do not define morph weight sets and are not covered by the claims. Appx4901-4902, ¶¶66-71.

alleged coarticulation rules disclosed there were applied to "morph weight sets." Appx5840, ¶238.

Mr. Rosenfeld, the inventor of the '278 Patent, similarly explained that creating claimed rule sets would not be unduly time consuming. He testified that one of skill in the art would have little difficulty understanding the rule schemes taught in the '278 Patent or creating additional rules based on those rule schemes. *See* Appx7780-7782, 104:5–107:4. Dr. Wyvill, Dr. Gleicher and Mr. Rosenfeld all agree that, based on the '278 Patent's teachings, known coarticulation rules could be modified without undue experimentation to practice the claimed invention. A reasonable jury could credit that testimony.

Similarly, with respect to facial models, the '278 Patent teaches that the creation of facial models was also known in the prior art. Appx0061, 1:47–2:13. The time required to create such facial models depends on the artist's preferences and is not an inventive aspect of the '278 Patent. Appx4945-4946, ¶206 (recognizing that the creation of "good facial models" was known in the art); *see* Appx3176, 239:20–240:24 (recognizing, as taught in the '278 Patent, one of skill in the art would be able to create quality facial models based on the prior art).

The district court wrongly rejected the evidence concerning these *Wands* factors as irrelevant. The district court found the "first set of rules" limitation was the "novel aspect" of the invention and therefore Planet Blue could not rely on prior art for any aspect of enablement. Appx0046. The case law cited by the district court does not

support its conclusion. In *Automotive Technologies International, Inc. v. BMW of North America, Inc.*, there was no dispute that "electronic sensors," the novel aspect of the invention, were ***unknown in the art***. 501 F.3d 1274, 1283-84 (Fed. Cir. 2007). There were no examples of electronic sensors identified or disclosed in the specification and the inventor had not been able to develop "electronic sensors" for use in the invention. *Id.* In view of those undisputed facts, the Federal Circuit stated: "it was especially important for the specification to discuss how an electronic sensor would operate to detect side impacts and to provide details of its construction." *Id.* at 1284.

Here, the specification provides examples of how to implement certain claimed rule sets, explains how coarticulation rules would operate in the context of the invention, and one of skill in the art would have been able to modify other well-known coarticulation rules such that they could be employed in the claimed invention without excess experimentation based on these teachings. Appx4943-4946 ¶¶203–206. Accordingly, *Automotive Technologies* is inapposite.

Similarly, *Genentech, Inc. v. Novo Nordisk A/S* provides no support for the district court's opinion. 108 F.3d 1361, 1367-1368 (Fed. Cir. 1997). The *Genentech* Court held that where "the claimed invention is the application of an unpredictable technology in the early stages of development, an enabling description in the specification must provide those skilled in the art with a specific and useful teaching" enabling one to practice the claimed invention. *Id.* Here, computer animation was not an

unpredictable technology and the specification provides a useful teaching with specific example rule sets that can be practiced without excess experimentation. *See* Appx4943, ¶202 (opining on predictable nature of claimed rules); Appx5884, ¶353 (same); *see infra*, Arg.III.B.4 (addressing examples), Arg.III.B.5 (addressing predictability of art). Indeed, the dispute here does not concern whether the embodiments described are enabled, but whether some ill-defined and complicated rule sets are enabled.

In sweeping all these factors away, the district court legally erred and failed to give Planet Blue the reasonable inferences required on summary judgment.

2. Quantity of Experimentation Necessary (*Wands* Factor 1)

The quantity of experimentation necessary to practice the invention strongly supports a finding that the claims are enabled. The district court wrongly found no factual disputes concerning this factor. *See* Appx0047-0049.

In order to reach that conclusion, the district court relied primarily on Dr. Wyvill's largely irrelevant (and disputed) opinions concerning written description support, discussed above. The district court further relied on two additional paragraphs of Dr. Wyvill's report as "support[ing]" a finding of "undue experimentation." *See* Appx0013 (relying on Appx5893-5894, ¶¶378-379).

As a threshold matter, Dr. Wyvill's opinions in those paragraphs are directed to developing a system with an unspecified rule set that outputs an unknown quantity of "high quality" or "realistic" animation. Appx5894, ¶379 ("[I]t would have required an

incredible amount of effort and experimentation to develop a working system that produced high-quality animation."), Appx5893, ¶378 ("[T]he specification leaves to others the hard work of developing rules that could actually produce realistic animation."). Dr. Wyvill fundamentally misunderstood the enablement inquiry.

The claims themselves do not require animation to meet some unspecified standard of being "high quality" or "realistic." *See CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1338 (Fed. Cir. 2003) ("Enablement does not require an inventor to meet lofty standards for success in the commercial marketplace. Title 35 does not require that a patent disclosure enable one of ordinary skill in the art to make and use a perfected, commercially viable embodiment absent a claim limitation to that effect."); *Vasudevan*, 782 F.3d at 684 ("[T]he time it took to make a commercial-grade embodiment is not, itself, determinative of non-enablement."). All that the claims require is the use of a "first set of rules" to create lip-synchronized animated characters.

Requiring the resulting animation to be "high quality" or "realistic" cannot be reconciled with the claim language. In *CFMT*, the district court found certain claims not enabled because undue experimentation was required to "clean" silicon wafers in a satisfactory manner. *CFMT*, 349 F.3d at 1338. This Court vacated that finding:

> The claims of the '532 and '123 patents state no standard of cleaning. Absent some standard for cleanliness in the claims, this court proceeds to examine the record for a showing that the disclosures of the CFMT patents would enable a person of skill in the art to make and use a

> system or apparatus to achieve any level of contaminant removal without undue experimentation.

Id. Here, the claims are not directed to some subjective standard of "high quality" animation. Instead, they are expressly directed to the creation of "lip synchroniz[ed]" "animation" of "three-dimensional characters." Under *CFMT*, the appropriate inquiry is whether "any level of" animation can be produced using the claimed method without undue experimentation.

Dr. Wyvill's opinions concerning the "experimentation time" necessary to achieve a non-specific, subjective "high quality" of animation depends on the artistic abilities and artistic intentions of the facial modeler/animator. Appx5893-5895, ¶¶378-380. Like any artistic endeavor, facial modeling could take as much, or as little, time as the circumstances allow. *See* Appx7781-7782, 109:1–111:2; Appx4946-4947, ¶208. A reasonable jury could conclude that time spent fine-tuning animation for artistic purposes, to produce "high quality" animation, is the type of routine experimentation that does not render the claims non-enabled. *See Cephalon, Inc. v. Watson Pharm., Inc.*, 707 F.3d 1330, 1336-40 (Fed. Cir. 2013) (reversing judgment of non-enablement and stating that "extensive experimentation does not necessarily render the experiments unduly extensive where the experiments involve repetition of known or commonly used techniques" and therefore "the focus is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of

guidance.") Indeed, as discussed above, animators using prior-art methods spent far greater amounts of time to produce realistic animation.

Ultimately, both experts agreed that artistic concerns—not the claimed rules—were responsible for the effort required. Dr. Gleicher explained that the vast amount of "effort and experimentation" with respect to practicing the claimed invention would be from the routine fine tuning of the facial models to an artist's liking, *i.e.,* not from creating or obtaining the claimed rule sets. Appx4946, ¶207. When asked at his deposition why he believed extensive experimentation was required for the claimed rules, Dr. Wyvill explained that there is "nothing in [the specification] that tells you how to build the models." *See* Appx3176, 238:8–22. That answer proves the point. Building the models has nothing to do with obtaining the "first set of rules" (rules for defining the "morph weight set stream" as a function of phoneme sequence and timing). As the specification explains, the creation of models was known in the art. Appx0061, 1:47–2:13; Appx0064, 7:33-38. And, ultimately, Dr. Wyvill agreed that one of skill in the art would have been able to build quality models "without excess experimentation," and modify known coarticulation rules for application to such models. Appx3176, 239:20–240:24. The district court failed to address these express concessions concerning the critical issue of experimentation.

Dr. Wyvill also committed a second fundamental error in reaching the opinion on which the district court relied. He assumed the claimed rule set required a rule for "all visual phoneme groups," even those not in a time-aligned transcript. Appx5894,

¶379. The claims, however, require only rules that are applied to the phoneme sub-sequences in a transcript. Appx0066, 11:53-55 ("applying said first set of rules to each sub-sequence of said plurality of sub-sequences of timed phonemes"). For example, as taught in the specification, animating the word "hello" requires as few as four rules. Appx0064, 7:55–8:55. As Dr. Wyvill wrongly believed the claims required a rule for every visual phoneme group, Dr. Wyvill's opinions do not dispute that a phrase of any reasonable length, *i.e.*, 10 words, 20 words, 30 words, could be animated with any claimed rule set based on the teachings of the '278 Patent without excess experimentation. And, in any event, Mr. Rosenfeld explained that it would "not take very long" to create a set of rules for every word in the English language and the length of time is largely dependent on how "ornate" the programmer wanted to make the rule set. *See* Appx7781-7782, 109:1–111:2. The district court should not have ignored that evidence on summary judgment.

Moreover, Planet Blue's expert disagreed with Appellees' expert concerning "undue experimentation" and offered detailed opinions concerning the same. Dr. Gleicher identified the numerous rules disclosed in the specification and explained that one of skill in the art would understand the rule scheme and the numerous rule types as exemplary. Appx4944-4945, ¶204 (disagreeing with Appellees' position that "no real insight" is provided based on the rule scheme disclosed and the numerous rule types described in the specification). That opinion is consistent with the specification, which explains that the rules and rule schemes taught should be

understood as exemplary. *See* Appx0065, 9:23-26 ("The rules of the present invention are extensible and freeform in the sense that they may be created as desired and adapted to a wide variety of animation characters, situations, and products."), *id.* at 10:46-47 ("As is readily apparent a wide variety of other rules can be created to add individuality to the different characters."), Appx0064, 7:1-4, 7:53-57. Dr. Gleicher explained how the numerous disclosed rules would "guide a practitioner," Appx4945, ¶205, and that the specification "helps with the aspects it intends to, and leaves other aspects of the process (such as creating good facial models) to its users," Appx4945-4946, ¶206. Dr. Gleicher concluded: "[b]ased on the descriptions in the specification, the state of the art and the level of knowledge of one of skill in the art, one of skill in the art would have been able to create a first set of rules without excess experimentation." Appx4944-4945, ¶204; *see* Appx4946-4947, ¶208 ("it is my opinion that one of ordinary skill in the art would not have needed to expend 'an incredible amount of effort and experimentation to develop a working system that produced high quality animation' and certainly would not have needed 'undue experimentation.'"). The district court simply disregarded these opinions.

In sum, there are substantial questions of fact regarding the amount of experimentation necessary to practice the "first set of rules" limitation, and a reasonable jury could have found that this factor supports a finding of enablement. *See Transocean*, 617 F.3d at 1306–07 (holding that factual dispute regarding undue experimentation precluded summary judgment).

3. Guidance Presented (*Wands* Factor 2)

A reasonable jury could find that the amount of guidance presented in the '278 Patent supports a finding of enablement.

As Dr. Gleicher explained, more than twenty portions of the specification disclose "common rule types and how they can be embellished with artistic effects." Appx4944-4945, ¶204. He relies on the specification's teaching:

> [R]ules for the phoneme "m" (*id.* at 9:35-39); rules for when an "l" phoneme is preceded by an "r" phoneme (*id.* at 10:15-28); rules for "grouping phonemes that are in the same visual phoneme group" (*id.* at 4:61-5:4); rules for transitioning between phonemes based on durations of other phonemes (*id.* at 8:15-19); rules for transitioning to or from a silence (*id.* at 8:29-35); rules for phonemes with short durations (*id.* at 8:37-39, 10:51-60); rules for phonemes of long durations (*id.* at 8:22-24, 10:29-51); 51); rules for using an "eh" phoneme during a "snide laugh" sequence (id. at 7:46, 8:25-28); rules for adding random noise for a more natural look (id. at 9:44-67); rules for cycling mouth position (id.); and rules for emotions (emotemes) (id. at 10:63-11:11).

Id. (*citing* '278 Patent).

Based on these numerous teachings, Dr. Gleicher opined that one of skill in the art would be able to employ other rules concerning coarticulation effects without undue experimentation. Appx4943, ¶202 (identifying structural characteristics of rule scheme); Appx4944-4945, ¶¶204–205 (opining on specification's teaching of scheme). His testimony is consistent with the claims, which require rules with a particular structural scheme: they must define morph weight set streams as a function of phoneme sequence and timing and they must be applicable to sub-sequences of phonemes. *See McRo*, 837 F.3d at 1313. A reasonable jury could find that the

direction and guidance in the specification supports the conclusion that the claims are enabled.

The district court found that the examples weighed against enablement because the disclosed rules are provided in the context of "if … then … else" logic. Appx0049. Yet, the district court offered no explanation concerning why "if … then … else" logic was relevant to anything, let alone why it would matter to a skilled artisan or a reasonable jury. *Id.* Appellees' expert did not opine that the logical format of the rules disclosed had anything to do with experimentation; and his opinions concerning enablement do not even mention the "if … then … else" construct central to the district court's analysis. *See* Appx5893-5896, ¶¶376-382. The district court, likewise, failed to identify evidence of any other type of rule set that could be used with the claimed invention, let alone evidence of the experimentation required to implement such an imaginary rule set. Planet Blue was entitled to receive all "reasonable inferences" in its favor; the district court, however, invoked rationales from thin air, and did the opposite.

4. Working Example (*Wands* Factor 3)

Another *Wands* factor concerns whether working examples are disclosed in the specification. Here, the specification teaches, among other rules, a rule set that is applicable to animate a character speaking the word "hello" and provides examples of how the animation could be modified based on the pace of speech and phoneme sequences. Appx0064, 7:55–8:55; Appx4943-4946, ¶¶ 202–204. Appellees conceded

that a working example was provided in the specification, Appx0473, 9:14-18, and the district court found that a working example was disclosed, Appx0049. Yet, the district court wrongly found that a reasonable jury could not find the presence of a working example supported enablement because the working example was expressed in an "if … then … else" construct. *See* Appx0049-0050 (finding this factor weighs in favor of finding claim not enabled). Yet, as mentioned above, the logical construct is irrelevant, and the presence of a working example, by definition, supports enablement. And, here, the specification provides not only a working example but a detailed description concerning how that example may be modified. *See* Appx4944-4945, ¶204 (identifying rule sets).

5. Predictability of the Art (*Wands* Factor 7)

The predictability of the art also counsels against non-enablement. A finder of fact could reasonably conclude that the disclosure of a single species in the predictable computer science arts is sufficient for purposes of enablement. Ordinarily, "[i]f an invention pertains to an art where the results are predictable … a broad claim can be enabled by disclosure of a single embodiment … and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed." *Epistar Corp. v. Int'l Trade Comm'n*, 566 F.3d 1321, 1336 (Fed. Cir. 2009) (*quoting Spectra–Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1534 (Fed. Cir. 1987)); *see also In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991) (observing that electrical elements are predictable and noting that the required level of disclosure for such

inventions is less than for unpredictable arts). Dr. Gleicher opined that computer animation is a predictable field and the creation of rules for defining morph weight set streams would operate predictably. Appx4943, ¶202 (opining on predictable nature of claimed rules). Dr. Wyvill similarly opined that taking the coarticulation rules from the prior art and using them in a system that employed rules for defining morph weight sets would have "predictable results." Appx5884, ¶353 (opining that "invention comprises no more than the combination of familiar elements according to known methods to yield predictable results"). That predictability strengthens the inference that the disclosed working example (and other rules) in the specification enables the claimed invention. *See Epistar*, 566 F.3d at 1336 (recognizing that in the predictable arts a single disclosed example can satisfy the enablement requirement).

The district court found that this factor favors non-enablement by crediting Appellees' evidence and disregarding all other evidence. Dr. Wyvill opined that it "would have been difficult to predict" the results of experiments with new sets of rules, particularly for some unidentified "more complicated sets of rules." Appx5894-5895, ¶380. But that opinion was disputed by Dr. Gleicher, Appx4943, ¶202, and inconsistent with other statements from Dr. Wyvill, Appx5884, ¶353 (opining that the invention uses "known methods to yield predictable results"). The district court could not have resolved that dispute on summary judgment.

In addressing this factor, the district court further found that Planet Blue "has not provided substantial evidence to show how complex rule sets from prior art

systems could be transferred consistent with the requirements of the claims." Appx0051. However, Appellees' expert, Planet Blue's expert, and Mr. Rosenfeld all agree that one of skill in the art would be able to utilize prior art coarticulation rules and implement them with the rule scheme taught in the '278 Patent without excess experimentation. *See supra*, Arg.III.B.2 (discussing transfer of coarticulation rules). With respect to "complicated rule sets," neither the district court nor Dr. Wyvill identified any "complicated set of rules" that would be "difficult to predict." Moreover, the claims do not require complicated sets of rules. *See CFMT*, 349 F.3d at 1338 (recognizing that where no standard of "cleaning" is required in claims then enablement turns on whether "any" level of cleaning is enabled). Thus, it was error for the district court to find that unidentified complicated rule sets would be difficult to predict as a matter of law.

6. The Breadth of the Claims (*Wands* Factor 8)

As this Court previously held the claims are "limited to rules with specific characteristics." *McRo*, 837 F.3d at 1313. The Court explained the claims "themselves set out meaningful requirements for the first set of rules: they 'define[] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence.'" *Id.* The Court further explained the claims require "applying said first set of rules to each sub-sequence … of timed phonemes." *Id.* Indeed, as found by this Court, "the specific, claimed features of these rules allow for the

improvement realized by the invention." *Id.* Yet, on remand, the district court purported not to "understand the exact bounds of what is claimed." Appx0041-0042.

Consistent with this Court's opinion, Dr. Gleicher opined that one of skill in the art would readily recognize that the claimed rules have specific characteristics that render them easily understandable, *i.e.*, not unbounded as Appellees argued below. Appx4943, ¶202. Given Dr. Gleicher's testimony and the claim language, a reasonable jury could find the claims tailored to the invention described in the specification. The district court found otherwise, Appx0051, but failed to credit the evidence supporting Planet Blue or explain why a reasonable jury could not find in Planet Blue's favor.

* * *

"Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." *Wands*, 858 F.2d at 737. As detailed above, a reasonable jury could conclude that the *Wands* factors individually and collectively support a finding of validity. At a minimum, genuine factual disputes exist regarding all *Wands* factors, thus precluding a finding of non-enablement on summary judgment. *See Vasudevan*, 782 F.3d at 684 (recognizing where "there are genuine issues of material fact relating to several of the *Wands* factors" summary judgment of non-enablement is improper).

IV. Reassignment upon Remand Is Warranted

"Remand to a different trial judge is appropriate under a demonstration of personal bias or in unusual circumstances.'" *Smith v. Mulvaney*, 827 F.2d 558, 562 (9th Cir. 1987) (citations omitted). Courts must consider the following when determining whether "unusual circumstances" exist: "(1) whether the original judge would reasonably be expected upon remand to have substantial difficulty in putting out of his or her mind previously-expressed views or findings determined to be erroneous or based on evidence that must be rejected, (2) whether reassignment is advisable to preserve the appearance of justice, and (3) whether reassignment would entail waste and duplication out of proportion to any gain in preserving the appearance of fairness." *Id.* at 563 (citations omitted). "The first two factors are considered to be of equal importance; moreover, a finding of either one would support remand to a different judge." *State of California v. Montrose Chem. Corp. of California*, 104 F.3d 1507, 1521 (9th Cir. 1997) (citation omitted).

Here, reassignment upon remand is warranted. This is Planet Blue's second appeal to this Court and, following the first remand, the district court disposed of Planet Blue's claims in a manner neither argued nor proposed by Appellees. First, the district court re-construed the term "morph weight set" despite the express definitions in the specification and Appellees' concession that the operative construction at the time "fairly informs the jury of the express definitions given by the patents-in-suit." Appx0751. Appellees infringe under the district court's original

construction. Upon remand, the district court *sua sponte* re-construed "morph weight set" narrowly, with the accused methods in mind, based on an interpretation of the specification urged by neither party. Appx2784-2786; Appx0018-0021.

Turning to validity, at the time of the remand, despite years of litigation, Appellees had not raised a defense of non-enablement with respect to the "first set of rules" limitation. Nevertheless, the district court took the unusual step of encouraging Appellees to pursue an enablement defense. Appx2789-2790 (raising issue of enablement and advocating that defense to Appellees). Later, after fact discovery closed, the district court allowed Appellees to amend their contentions to pursue that defense. Appx8214-8215. When Appellees failed to file a motion for summary judgment concerning enablement (despite Appellees' filing six summary judgment motions, Appx0006-0007), the district court ***ordered*** them to do so, indicating that it would not enter its order finding the claims not infringed until Appellees had done so. Appx0008. Then, the district court granted the enablement motion based, in part, on its finding that rules for bones animation, which the district court found were not encompassed by the claimed method, required excess experimentation. *See supra*, Arg.III.A.

Put simply, following the first remand, the district court demonstrated an uncommon desire to inject itself into the merits of the case. The district court's actions suggest that it would have substantial difficulty shedding its previously expressed views and erroneous findings about the case should a third go-round prove

necessary. *See Montrose Chem. Corp.*, 104 F.3d at 1521; *see also Rhoades v. Avon Products, Inc.*, 504 F.3d 1151, 1165 (9th Cir. 2007). Given the happenings following the first appeal, reassignment is advisable to preserve the appearance of justice and to ensure that Planet Blue has a fair trial. *See Montrose Chem. Corp.*, 104 F.3d at 1521; *see also TriMed, Inc. v. Stryker Corp.*, 608 F.3d 1333, 1344 (Fed. Cir. 2010).

CONCLUSION

For the foregoing reasons, Planet Blue respectfully requests that this Court: (1) reverse and vacate the judgment of non-infringement; (2) reverse and vacate the judgment of non-enablement; and (3) remand to a different district court judge for further proceedings.

Date: May 31, 2019

/s/ Robert A. Whitman

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ADDENDUM

JS-6

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

WESTERN DIVISION

MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. BANDAI NAMCO GAMES AMERICA, INC., et al., Defendants.	Lead Case No. CV 12-10322-GW(FFMx) **FINAL JUDGMENT** Judge: Honorable George H. Wu CONSOLIDATED WITH:
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. ELECTRONIC ARTS INC., Defendant.	Case No. 2:12-cv-10329-GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. ACTIVISION PUBLISHING, INC. and BLIZZARD, ENTERTAINMENT, INC., Defendants.	Case No. 2:14-cv-00336-GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. INFINITY WARD, INC., Defendant.	Case No. 2:14-cv-00352-GW (FFMx)

MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. NAUGHTY DOG, INC., Defendant.	Case No. 12-cv-10335 GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. SUCKER PUNCH PRODUCTIONS LLC, Defendant.	Case No. 14-cv-00332 GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. SONY COMPUTER ENTERTAINMENT AMERICA LLC, Defendant.	Case No. 14-cv-00383 GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. DISNEY INTERACTIVE STUDIOS, INC., Defendant.	Case No. 2:12-cv-10333-GW (FFMx)
MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. SQUARE ENIX, INC., Defendant.	Case No. 2:12-cv-10338-GW (FFMx)

MCRO, INC., D.B.A. PLANET BLUE, Plaintiff, v. LUCASARTS, A DIVISION OF LUCASFILM ENTERTAINMENT COMPANY LTD. LLC, Defendant.	Case No. 2:14-cv-00358-GW (FFMx)

FINAL JUDGMENT

For reasons stated in the Court's Order Granting Defendants' Motion for Summary Judgment of Non-Infringement of U.S. Patent No. 6,611,278 (Dkt. Nos. 755, 774), and the Court's Order Granting Defendants' Motion for Summary Judgment of Invalidity of U.S. Patent No. 6,611,278 (Dkt. No. 773),

IT IS ORDERED AND ADJUDGED that final judgment be and is entered, pursuant to Fed. R. Civ. P. 58, in favor of Defendants[1] and against Plaintiff McRo, Inc. d/b/a Planet Blue ("Plaintiff McRo") as follows:

[1] The term "Defendants" refers to all the remaining defendants in the actions consolidated with Lead Case No. 12-cv-10322, namely, Electronic Arts Inc. (Case No. 2:12-cv-10329), Naughty Dog, Inc. (Case No. 12-cv-10335); Square Enix, Inc. (Case No. 2:12-cv-10338); Activision Publishing, Inc. and Blizzard Entertainment, Inc. (Case No. 2:14-cv-00336); Infinity Ward, Inc. (Case No. 2:14-cv-00352); Sony Computer Entertainment America LLC (now Sony Interactive Entertainment LLC) (Case No. 14-cv-00383); Sucker Punch Productions LLC (Case No. 14-cv-00332); Disney Interactive Studios, Inc. (Case No. 2:12-cv-10333); and LucasArts, a division of Lucasfilm Entertainment Company Ltd. LLC (originally sued as LucasArts Entertainment Company LLC) (Case No. 14-cv-00358).

1. Final judgment of non-infringement and invalidity is hereby entered in favor of Defendants and against Plaintiff McRo on (a) all Plaintiff McRo's claims for infringement and on (b) the counterclaims for non-infringement and invalidity of U.S. Patent No. 6,611,278 of all Defendants other than Defendant Square Enix, Inc. as it has not asserted any such counterclaims. As all other claims and counterclaims have been dismissed (*see* Dkt. No. 779), Plaintiff McRo shall recover nothing.

2. Pursuant to Fed. R. Civ. P. 54, as prevailing party, Defendants are entitled to costs absent a Court order to the contrary.

3. This judgment disposes of all claims and counterclaims before the Court, and is final and appealable, though the Court retains j2urisdiction for purposes of resolving issues under Federal Rule of Civil Procedure 54.

IT IS SO ORDERED.

Dated: January 9, 2019.

Hon. George H. Wu
United States District Judge

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	CV 12-10322-GW(FFMx)	Date	July 11, 2018
Title	*McRO, Inc., v. Namco Bandai Games America, Inc., and Related Actions*		

Present: The Honorable	GEORGE H. WU, UNITED STATES DISTRICT JUDGE	
Javier Gonzalez	None Present	
Deputy Clerk	Court Reporter / Recorder	Tape No.
Attorneys Present for Plaintiffs:	Attorneys Present for Defendants:	
None Present	None Present	

PROCEEDINGS: IN CHAMBERS - COURT ORDER

Attached hereto is the Court's Amended Tentative Ruling on Scheduled Motions.

_____ : _____

Initials of Preparer JG

McRO, Inc., d.b.a. Planet Blue v. Namco Bandai Games America, Inc., Case No. CV 12-10322-GW (FFMx) (LEAD TRACK 1 CONSLIDATED CASE). Amended Tentative Ruling on Scheduled Motions:

(1) **Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity** (Docket No. 643); Plaintiff's Opposition (Docket No. 668 (public); Docket No. 686 (sealed)); Defendants' Reply (Docket No. 709); Defendants' Response to Statement of Alleged Disputes of Material Fact (Docket No. 710); Defendants' Request for Evidentiary Rulings on Specified Objections (Docket No. 711); Plaintiff's Response to Defendants' Request for Evidentiary Rulings (Docket No. 727)

(2) **Plaintiff's Motion for Summary Judgment of No Anticipation** (Docket No. 640); Defendants' Opposition (Docket No. 681); Plaintiff's Reply (Docket No. 697); Plaintiff's Response to Statement of Genuine Disputes (Docket No. 698)

(3) **Defendants' Motion for Summary Judgment or Partial Summary Judgment of Non-Infringement Under 35 U.S.C. § 271(g)** (Docket No. 638); Plaintiff's Opposition (Docket No. 675 (public); Docket No. 690 (sealed)); Defendants' Reply (Docket No. 704); Defendants' Response to Statement of Genuine Disputes (Docket No. 705); Defendant Square's Request for Evidentiary Ruling on Specified Objections (Docket No. 706-3 (public – attached to application to seal); Docket No. 732 (sealed)); Plaintiff's Response to Request for Evidentiary Rulings (Docket No. 729 (public); Docket No. 726-1 (sealed – attached to application to seal))

(4) **Defendants' Motion for Summary Judgment of No Willful Infringement** (Docket No. 634 (public notice of motion); Docket No. 655 (sealed)); Plaintiff's Opposition (Docket No. 678 (public); Docket No. 691 (sealed)); Defendants' Reply (Docket No. 712 (public); Docket No. 719 (sealed)); Defendants' Response to Statement of Genuine Disputes (Docket No. 713 (public); Docket No. 720 (sealed)); Defendants' Request for Evidentiary Ruling on Specified Objections (Docket No. 715); Plaintiff's Response to Defendants' Request for Evidentiary Rulings (Docket No. 728)

(5) **Defendant Square's Motion to Strike Portions of Gleicher Expert Report** (Docket No. 628); Plaintiff's Opposition (Docket No. 680 (public); Docket No. 693 (sealed)); Defendant's Reply (Docket No. 699)

(6) **Defendant Square's [Corrected] Motion for Summary Judgment of Non-Infringement Due to Failure of Proof** (Docket No. 632; *see also* Docket No. 629 (original Motion for Failure of Proof; still marked as pending)); Plaintiff's Opposition (Docket No. 672 (public); 688 (sealed)); Defendant's Reply (Docket No. 702); Defendant's Response to Statement of Genuine Disputes (Docket No. 703); Defendant Square's Request for Evidentiary Ruling on Specified Objections (Docket No. 706-3 (public – attached to application to seal); Docket No. 732

(sealed)); Plaintiff's Response to Request for Evidentiary Rulings (Docket No. 729 (public); Docket No. 726-1 (sealed – attached to application to seal))

(7) **Defendant Square's Motion for Summary Judgment that Plaintiff's Claims are Barred by 35 U.S.C. § 287(b)(2)** (Docket No. 635); Plaintiff's Opposition (Docket No. 670); Defendant's Reply (Docket No. 700); Defendant Square's Response to Statement of Genuine Disputes (Docket No. 706-4 (public – attached to application to seal); Docket No. 734 (sealed)); Defendant Square's Request for Evidentiary Ruling on Specified Objections (Docket No. 706-3 (public – attached to application to seal); Docket No. 732 (sealed)); Plaintiff's Response to Request for Evidentiary Rulings (Docket No. 729 (public); Docket No. 726-1 (sealed – attached to application to seal)).

I. INTRODUCTION

Plaintiff McRO, Inc., d.b.a. Planet Blue ("Plaintiff" or "Planet Blue") filed numerous patent infringement cases in this District.[1] Plaintiff alleges that the remaining Defendants[2] directly or indirectly infringe independent Claim 1 and dependent claims 4 and 13 of U.S. Patent No. 6,611,278 ("the '278 Patent"). *See* Defendants' Response to Plaintiff's Statement of Alleged Disputes of Material Fact ("Ds' Resp.") ¶¶ 13, 14, Docket No. 710. The '278 Patent relates to automatically animating the lip synchronization and facial expressions of 3-D characters.

Before the Court are seven motions:

- Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity (Docket No. 643);
- Plaintiff's Motion for Summary Judgment of No Anticipation (Docket No. 640);
- Defendants' Motion for Summary Judgment or Partial Summary Judgment of Non-Infringement Under 35 U.S.C. § 271(g) (Docket No. 638);

[1] The remaining cases are: *McRO, Inc. v. Electronics Arts, Inc.*, CV 12-10329; *McRO, Inc. v. Naughty Dog, Inc.*, CV 12-10335; *McRO, Inc. v. Square Enix, Inc.*, CV 12-10338; *McRO, Inc. v. Sucker Punch Productions, LLC*, CV 14-332; *McRO, Inc. v. Activision Blizzard Inc.*, CV 14-336; *McRO, Inc. v. Infinity Ward, Inc.*, CV 14-352; *McRO, Inc. v. LucasArts Entertainment Company LLC*, CV 14-358; *McRO, Inc. v. Sony Computer Entertainment America, LLC*, et al., CV 14-383. One other case, *McRO, Inc. v. Disney Interactive Studios, Inc.*, CV 12-10333, also remains pending but stayed pending settlement discussions. The Defendants in that case, Disney Interactive Studios, Inc. and LucasArts, a division of Lucasfilm Entertainment Company Ltd. LLC, have requested leave to join three of the pending motions and be bound by the Court's rulings on those motions, including Defendants' Motion for Summary Judgment of Non-Infringement. *See* Docket No. 733. The Court **GRANTS** Disney's and LucasArts' request.

[2] The remaining Defendants are: Electronic Arts Inc.; Naughty Dog, Inc.; Square Enix, Inc.; Activision Publishing, Inc.; Blizzard Entertainment, Inc.; Infinity Ward, Inc.; Sony Computer Entertainment America LLC (now known as Sony Interactive Entertainment America LLC); Sucker Punch Productions LLC; Disney Interactive Studios, Inc.; and LucasArts, a division of Lucasfilm Entertainment Company Ltd. LLC (collectively, "Defendants").

- Defendants' Motion for Summary Judgment of No Willful Infringement (Docket No. 634 (public notice of motion); Docket No. 655 (sealed));
- Defendant Square's Motion to Strike Portions of Gleicher Expert Report (Docket No. 628);
- Defendant Square's [Corrected] Motion for Summary Judgment of Non-Infringement Due to Failure of Proof (Docket No. 632; *see also* Docket No. 629 (original Notice of Motion for Failure of Proof)); and
- Defendant Square's Motion for Summary Judgment that Plaintiff's Claims Are Barred by 35 U.S.C. § 287(b)(2) (Docket No. 635).

All motions have been fully briefed.

In the tentative order on Defendants' previous summary judgment motion, the Court expressed concerns about whether the "first set of rules" limitation of the asserted claims meets the enablement requirements of 35 U.S.C. § 112.[3] The Court again questions why Defendants failed to challenge the patents on the basis of enablement. Even though the Court provides a tentative herein regarding some of the parties' briefed summary judgment motions, the Court will not issue a final ruling until the parties have submitted − and the Court has considered − briefing regarding the question of whether the "first set of rules" limitation of the asserted claims is enabled. The Court **ORDERS** the parties to submit a joint proposed schedule for summary judgment on the issue of enablement as to this limitation within seven (7) days of this Order.

The Court would tentatively **GRANT** Defendants' Motion for Summary Judgment of Non-Infringement. Docket No. 643. The Court would also **OVERRULE** Defendants' Objections to Plaintiff's Opposition to Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity. *See* Docket Nos. 711, 727. The Court would **DENY** all of the Defendants' other pending motions before this Court as **MOOT**.[4] The Court would **GRANT-IN-PART** Plaintiff's Motion for Summary Judgment of No Anticipation except as to two prior art references: (1) Catherine Pelachaud, "Communication and Coarticulation in Facial

[3] The Court has questions, for instance, about how the asserted claims would adequately inform a person of ordinary skill in the art to apply a phoneme to a character's face when that character is actively moving.

[4] This includes Defendants' still-pending early Motion for Summary Judgment of Non-Infringement, filed June 23, 2017. *See* Docket No. 431; *see also* Docket No. 448 (Plaintiff's *ex parte* application for leave to file a sur-reply to Defendants' early summary judgment motion); Docket No. 455 (Minutes of Hearing on early summary judgment motion and attached tentative ruling).

Animation" (1991); and (2) Antai Peng, "Speech Expression Modeling and Synthesis" (1996).

II. BACKGROUND

A. The Asserted Patent

The '278 Patent issued on August 26, 2003 to inventor Maury Rosenfeld. It is titled "Method for Automatically Animating Lip Synchronization and Facial Expression of Animated Characters."

Much of the factual background regarding the '278 Patent is explained in the Court's Final Ruling on Claim Construction (Dkt. 298) and in the Federal Circuit's opinion regarding the patent eligibility of the '278 Patent and its parent patent, U.S. Patent No. 6,307,576 ("the '576 Patent").[5] *See McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1303-07 (Fed. Cir. 2016). Briefly, the patent "relate[s] to automating part of a preexisting 3-D animation method." *Id.* at 1303; *see also* '278 Patent Abstract, *id.* at 1:35-52. The animation method relies on a "neutral model" of a character's face in conjunction with "morph targets." *Id.* at 1:48-59. A "morph target" is a character's expression as it pronounces a particular phoneme, *i.e.*, makes a certain sound. *Id.* Points "in certain places on the face" of the neutral model ("vertices") correspond to vertices on the morph targets. *McRO, Inc.*, 837 F.3d at 1303; *see also* '278 Patent 1:54-59 ("Each morph target has the same topology as the neutral model, the same number of vertices, and each vertex on each model logically corresponds to a vertex on each other model."). "The set of differences in the location of these vertices (and the corresponding point on the face) between the neutral model and the morph target form a 'delta set' of vectors representing the change in location of the vertices between the two models." *McRO, Inc.*, 837 F.3d at 1303; *see also* '278 Patent 1:60-63 ("The deltas of each vertex on each morph target relative to the neutral are computed as a vector from each vertex n on the reference to each vertex n on each morph target. These are called the delta sets."). Each morph target corresponds to a delta set "consisting of the vectors by which the vertices on that morph target differ from the neutral model." *McRO, Inc.*, 837 F.3d at 1303; *see also* '278 Patent 1:63-65.

Facial expressions are "described as a function of the amount each morph target, and its corresponding delta set, is applied to modify the character model." *McRO, Inc.*, 837 F.3d at 1304; *see also* '278 Patent 2:1-2:13. "In producing animation products, a value usually from 0 to

[5] Plaintiff originally alleged that Defendants infringed claims of the '576 Patent as well, but has dropped those allegations. Docket No. 710 ¶¶ 13, 14.

1 is assigned to each delta set by the animator and the value is called the 'morph weight.'" '278 Patent 1:65-67. The set of morph weights for all the delta sets is called a "morph weight set." *Id.* at 4:35-38. "For each morph weight set, the resulting facial expression is calculated by determining the displacement of each vertex from the neutral model as the product of the morph weights in the morph weight set and the corresponding delta sets for the morph targets." *McRO*, 837 F.3d at 1304 (citing '576 Patent 2:2-15); *see also* '278 Patent 2:4-20.

Animators previously accomplished lip synchronization using a "keyframe approach" where the artist manually set morph weights "at certain important times ('keyframes')." '278 Patent 2:29–32. "Animators knew what phoneme a character pronounced at a given time from a 'time aligned phonetic transcription' ('timed transcript')." *McRO*, 837 F.3d at 1304. The purported aim of the '278 Patent was to automate this keyframe approach. It "provide[s] a method for automatically animating lip synchronization and facial expression." '278 Patent 2:44-45. In particular, the claims require using a computer to obtain and apply a set of rules to data to ultimately "generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence." *Id.* at Claim 1.

B. Accused Products/Bone Animation

Defendants develop a wide variety of computer and video games. Plaintiff alleges that Defendants' accused games infringe the '278 Patent by using a method called "bone animation" in conjunction with one of two third-party software products, *i.e.* FaceFX and Annosoft. Docket No. 710 ¶ 27. For purposes of the parties' summary judgment dispute regarding non-infringement, the parties focus on bone animation.

Defendants do not appear to dispute Plaintiff's expert's overall description of bone animation, and for purposes of Defendants' summary judgment motion, the Court will accept the following description of bone animation from Plaintiff's expert as undisputed. According to Plaintiff's expert, bone animation systems "create[] configurations of a character's skin by moving the vertices of a base mesh." *See* Ex. F of Malloy Declaration, "Gleicher Decl.," ¶¶ 2.12. Docket No. 658-5 (sealed). Bone animation works by attaching the vertices of a character's facial model to special control objects, sometimes referred to as "bones." *Id.* at ¶ 2.7. Many vertices can be attached to a single bone. *Id.* at ¶ 2.14 ("The set of 'bones' used to control a character is typically much smaller than the number of vertices."). A particular vertex may also be attached to one or more bones "with a weight." *Id.* at ¶ 2.7. "The 'bones' serve to

control the vertices of a character, they typically are not drawn as part of the character." *Id.* at 2.11. A user manipulates the smaller number of bones, rather than the individual vertices on the face, in order to animate the facial model. *Id.* at ¶ 2.14 ("For any particular pose (e.g., frame of animation), only the configurations of the 'bones' need to be specified, reducing the workload of the artist.").

Plaintiff's expert further explains that "[e]ach 'bone' is a linear transformation (i.e., a matrix) that defines how vertices connected to it should move." *Id.* at ¶ 2.7. Bones can be represented as a 4x4 matrix. *Id.* at ¶ 2.10. Plaintiff's expert further opines that "[t]hese matrices can be represented as 'vectors' of length 16. To simplify control, 'bones' are sometimes specified or represented as simpler linear transformations such as rotations, translations, scales, or combinations of these." *Id.*

III. LEGAL STANDARD

A. Summary Judgment

Under Federal Rule of Civil Procedure ("Rule") 56, a party may move for summary judgment, identifying each claim or defense – or the part of each claim or defense – on which summary judgment is sought, and the court shall grant it when the pleadings, the discovery and disclosure materials on file, and any affidavits show that "there is no genuine issue as to any material fact and that the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(a); *see also Miranda v. City of Cornelius*, 429 F.3d 858, 860 n.1 (9th Cir. 2005). As to materiality, "[o]nly disputes over facts that might affect the outcome of the suit under the governing law will properly preclude the entry of summary judgment." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986). A dispute as to a material fact is "genuine" if there is sufficient evidence for a reasonable jury to return a verdict for the nonmoving party. *Id.*

To satisfy its burden at summary judgment, a moving party with the burden of persuasion must establish "beyond controversy every essential element of its [claim or defense]." *S. Cal. Gas Co. v. City of Santa Ana*, 336 F.3d 885, 888 (9th Cir. 2003); O'Connell & Stevenson, *Rutter Group Prac. Guide: Fed. Civ. Proc. Before Trial* ("*Federal Practice Guide*") § 14:126 (2016). By contrast, a moving party without the burden of persuasion "must either produce evidence negating an essential element of the nonmoving party's claim or defense or show that the nonmoving party does not have enough evidence of an essential element to carry its ultimate burden of persuasion at trial." *Nissan Fire & Marine Ins. Co., Ltd. v. Fritz Cos.*, Inc., 210 F.3d

1099, 1102 (9th Cir. 2000); *see also Devereaux v. Abbey,* 263 F.3d 1070, 1076 (9th Cir. 2001) (en banc) ("When the nonmoving party has the burden of proof at trial, the moving party need only point out 'that there is an absence of evidence to support the nonmoving party's case.'") (quoting *Celotex Corp. v. Catrett,* 477 U.S. 317, 325 (1986), and citing *Fairbank v. Wunderman Cato Johnson,* 212 F.3d 528, 532 (9th Cir. 2000) (holding that the *Celotex* "showing" can be made by "pointing out through argument . . . the absence of evidence to support plaintiff's claim")).

> If the party moving for summary judgment meets its initial burden of identifying for the court the portions of the materials on file that it believes demonstrate the absence of any genuine issue of material fact, the nonmoving party may not rely on the mere allegations in the pleadings in order to preclude summary judgment[, but instead] must set forth, by affidavit or as otherwise provided in Rule 56, specific facts showing that there is a genuine issue for trial.

T.W. Elec. Serv., Inc., v. Pac. Elec. Contractors Ass'n, 809 F.2d 626, 630 (9th Cir. 1987) (internal citations and quotation marks omitted) (citing, among other cases, *Celotex*, 477 U.S. at 323). "A non-movant's bald assertions or a mere scintilla of evidence in his favor are both insufficient to withstand summary judgment." *See FTC v. Stefanchik*, 559 F.3d 924, 929 (9th Cir. 2009). In addition, the evidence presented by the parties must be admissible. *See* Fed. R. Civ. P. 56(e). Conclusory, speculative testimony in affidavits and moving papers is insufficient to raise genuine issues of fact and defeat summary judgment. *See Thornhill Publ'g Co., Inc. v. GTE Corp.*, 594 F.2d 730, 738 (9th Cir. 1979). Relatedly, "[a]ny objections to declarations or other evidence must be made at or (preferably) before the hearing, and should be ruled upon by the court before ruling on the motion itself." *Federal Practice Guide* § 14:333 (citing *Hollingsworth Solderless Terminal Co. v. Turley*, 622 F.2d 1324, 1335 n.9 (9th Cir. 1980); *Sigler v. American Honda Motor Co.*, 532 F3d 469, 480 (6th Cir. 2008)). In judging evidence at the summary judgment stage, however, courts do not make credibility determinations or weigh conflicting evidence at the summary judgment stage, and must view all evidence and draw all inferences in the light most favorable to the non-moving party. *See T.W. Elec.*, 809 F.2d at 630-31 (citing *Matsushita Elec. Indus. Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574 (1986)); *Anderson*, 477 U.S. at 255 ("The evidence of the non-movant is to be believed and all justifiable inferences are to be drawn in [the non-movant's] favor.").

"If the court does not grant all the relief requested by the motion, it may enter an order

stating any material fact – including an item of damages or other relief – that is not genuinely in dispute and treating the fact as established in the case." Fed. R. Civ. P. 56(g); *see also* Federal Practice Guide § 14:352 ("A partial summary judgment may be granted on motion of either party for adjudication of particular claims or defenses.") (citing *id.* § 14:33).

B. Infringement

A determination of patent infringement requires a two-step analysis. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995). The first step is to construe the claims; *i.e.*, to determine the scope and meaning of what is allegedly infringed. *Id.* This step is a question of law. *Id.* at 970-71. The second step is to compare the properly construed claims to the accused product to determine whether each of the claim limitations is met, either literally or under the doctrine of equivalents.[6] *Id.* at 976; *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1365 (Fed. Cir. 2002); *Tex. Instruments Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1173 (Fed. Cir. 1993) (although no literal infringement of a claim, an accused device may still infringe under the doctrine of equivalents.). This determination is a question of fact. *Bai v. L & L Wings Inc.*, 160 F.3d 1350, 1353 (Fed. Cir. 1998); *Schoell v. Regal Marine Indus., Inc.*, 247 F.3d 1202, 1207 (Fed. Cir. 2001).

"Since the ultimate burden of proving infringement rests with the patentee," an accused infringer may establish that summary judgment is proper "either by providing evidence that would preclude a finding of infringement, or by showing that the evidence on file fails to establish a material issue of fact essential to the patentee's case." *Novartis Corp. v. Ben Venue Labs., Inc.*, 271 F.3d 1043, 1046 (Fed. Cir. 2001). If the moving party meets this initial criterion, the burden shifts to the party asserting infringement to provide by affidavit or as otherwise provided in Rule 56, "specific facts showing there is a genuine issue for trial." *Anderson*, 477 U.S. at 248; *accord, Novartis*, 271 F.3d at 1046. If the non-moving party fails to make a sufficient showing on an essential element of its case with respect to which it has the burden of proof, the moving party is entitled to judgment as a matter of law. *Celotex*, 477 U.S. at 325.

IV. ANALYSIS

A. Claim Construction of "Delta Set[s]" as It Relates to "Morph Weight Set[s]"

The parties' non-infringement dispute hinges entirely on a claim construction dispute.

[6] It is undisputed that "[t]here is no allegation in this case of infringement via the doctrine of equivalents – only literal infringement." *See* Ds' Resp. ¶ 85, Docket No. 710.

Namely, the parties' disagree in their interpretations of the Court's construction of the term "morph weight sets." Specifically, they dispute how a person of ordinary skill in the art at the time of the invention would interpret delta set[s] and the vectors that make up delta set[s] in the context of the claim phrase "morph weight set[s]." Plaintiff posits that "vector" is a term of art with a broader meaning. Docket No. 686 at 6, 9-10. Plaintiff specifically notes that its understanding of the term "vector" would cover any "ordered set of numbers" and is "not limited to a vector in three-dimensional space." *Id.* at 6. Plaintiff asserts, for instance, that vectors representing bones would be covered by a proper understanding of the term "vector" as it is used in the patent specification. *Id.* at 6-7. In the context of its infringement arguments, Plaintiff describes the relevant one or more bones transformations corresponding to a particular vertex on a facial model as "the set of vectors associated with three basic bone transforms: translation (change in position), scale (change in size) and rotation (change in orientation)." *Id.* at 12. Defendants, meanwhile, argue that the term "vector" as used in the context of the patent specification should be understood as a 3-vector, or a vector representing a direction in 3-dimensional space. Docket No. 709 at 13-17. Defendants rely heavily on the Court's tentative ruling on Defendants' early summary judgment motion to support their position.[7] *Id.*; *see* Docket No. 455 (Minutes for Hearing on Defendants' early summary judgment motion).

During claim construction, the Court construed the claim term "morph weight set" consistent with Plaintiff's proposal as "[a] set of values, one for each delta set, that, when applied, transform the neutral model to some desired state, wherein each delta set is the set of vectors from each vertex on the neutral (reference) model to each vertex on a model of another mouth position." Docket No. 298-1 at 9. The term "delta set" itself does not appear in the claims.[8] Instead, the same as in the Court's construction, the specification explicitly defines the

[7] The Court's tentative ruling on Defendants' early summary judgment motion has not been adopted as a final ruling. After oral argument on Defendants' early summary judgment motion, the Court asked the parties to conduct further discovery before making a final determination on the motion. After conferring further, a decision was made to wait until the normal dispositive motion deadline for Defendants to renew their motion.

[8] For reference, asserted Claim 1 of the '278 Patent recites:

> 1. A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:
>
> obtaining a first set of rules that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence;
>
> obtaining a plurality of sub-sequences of timed phonemes corresponding to a desired audio sequence for said three-dimensional characters;
>
> generating an output morph weight set stream by applying said first set of rules to each

term "morph weight set" in relation to delta sets, explaining "as used herein, a 'morph weight set' is a set of values, one for each delta set, that, when applied as described, transform the neutral mode to some desired state." '278 Patent 4:35-37.

The portion of the Court's construction relating to "delta sets" corresponds to another portion of the patent specification, which states:

> Each morph target has the same topology as the neutral model, the same number of vertices, and each vertex on each model logically corresponds to a vertex on each other model. For example, vertex #n on all models represents the left corner of the mouth, and although this is the typical case, such rigid correspondence may not be necessary.
>
> ***The deltas*** of ***each*** ***vertex on each morph target*** relative to the neutral are ***computed as a vector from each vertex n on the reference to each vertex n on each morph target***. These are called the ***delta sets***. There is one delta set for each morph target.

Id. at 1:54-64 (emphasis added). The specification is unambiguous: "deltas of ***each vertex*** on ***each morph target*** relative to the neutral ***are computed as*** a vector ***from each vertex n*** on the reference ***to each vertex n*** on each morph target." *See id.* Importantly, the specification refers to the deltas of each vertex on each morph target as being computed as a single vector. In the disclosure that follows, the specification then discloses an algorithm for creating a desired facial expression:

$$|\text{result}| = |\text{neutral}| + \sum_{x=1}^{n} |\text{delta set}_x| * \text{morph weight}_x$$

Id. at 2:6. To determine a resulting vector ("|result|") for a desired facial expression, the appropriate corresponding vector in the delta set ("|delta set_x|") is multiplied by the corresponding morph weight ("morph weight_x") and that value is then added to the value of the neutral vector ("|neutral|"). *Id.* at 11:15. If the desired facial expression involves blending multiple phonemes, the products of the delta set and morph weight corresponding to each relevant phoneme are added together before adding to the neutral.

Together, these aspects of the patent disclosure reveal the same thing: vertices exist on

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> sub-sequence of said plurality of sub-sequences of timed phonemes; and
>
> applying said output morph weight set stream to an input sequence of animated characters to generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence.

'278 Patent, Claim 1.

the models and the difference between two corresponding vertices (obtained through simple subtraction) represents the vector for those corresponding vertices in a delta set.[9]

Plaintiff disputes that the intrinsic record supports this understanding. First, Plaintiff argues that because the specification lexicographically defined the terms "morph weight set" and "delta set," but did not specifically define the term "vector," it would be improper to limit "vector" to mean vectors that are magnitudes and directions in three dimensional space. *See* Docket No. 686 at 5-6. Second, Plaintiff argues that limiting the term "vector" would essentially be departing from the lexicographic definition of "delta set" because it would be "reading in an additional requirement that a 'vector' can only be a specific type of vector, . . . where the specification does not state, suggest, or imply that specific limitation or any limitation whatsoever." *Id.* at 6. Third, Plaintiff discounts the specification's mathematical formula on the basis that it appears in the background section of the patent specification, arguing that the formula is related to a "typical case" and is not limiting. *Id.* at 7. Fourth, Plaintiff refers to a portion of the specification for the proposition that "a rigid correspondence between vertices is ***not*** necessary," further arguing that "vectors that are directions in three-dimensional space between such vertices cannot be mandatory." *Id.* at 7. Plaintiff also cites to general statements from Defendants' expert regarding the meaning of "vector" to support its position. *Id.* at 7-9 (citing Deposition of Dr. Dobkin, Ex. 21 ("Dobkin Tr."), 108:15-109:6, 109:20-110:5, Dkt. 667-29); *see also* Gleicher Decl. ¶ 2.16.

Plaintiff's first two arguments rely on an understanding of "vector" divorced from the statements in the '278 Patent. As noted, the patent specification refers to "deltas" as "***computed as a vector from each vertex n*** on the reference ***to each vertex n*** on each morph target." '278 Patent 1:60-64 (emphasis added). A simple reading of this language supports the conclusion that the specification is defining the disclosed vectors as vectors with 3-D magnitude and direction[10]

[9] The Federal Circuit likewise stated, "[t]he set of ***differences in the location*** of these vertices (and the corresponding point on the face) between the neutral model and the morph target ***form a 'delta set' of vectors representing the change in location of the vertices between the two models***." *McRO, Inc.*, 837 F.3d at 1303 (emphasis added). Plaintiff argues that the Federal Circuit's statements do not conflict with its interpretation of the invention, including its interpretation of the meaning of the term "delta set." This Court disagrees.

[10] Defendants also suggest, in a footnote, that this understanding is consistent with the first definition of "vector" in the Merriam-Webster dictionary. *See* Docket No. 709 at 14 n.3 ("The first definition of 'vector' in the Merriam-Webster dictionary reads: 'a quantity that has a magnitude and direction and that is commonly represented by a directed line segment whose length represents the magnitude and whose orientation in space represents the direction."). Defendants, however, failed to provide a citation for this statement and although it is consistent with

computed by pure subtraction/addition between the neutral and target models, with one vector corresponding to each set of two vertices.

Notably, during claim construction, the Court rejected Plaintiff's request to construe "delta set" in the context of "morph weight set" as "wherein each delta set is the ***mathematical representation*** of the difference between the neutral model and another model." Dkt. No. 298 at 9 (emphasis added). The Court found that the change was "not an innocuous 'simplification,' but rather, a significant generalization." *Id.* Although Plaintiff frames the dispute as one where the Court is impermissibly narrowing the meaning of "vector," Plaintiff is effectively urging the same impermissibly broad meaning of the term "vector," when considered in the context of the patent specification, that it argued during claim construction and that the Court rejected.

Plaintiff's attempts to discount the mathematical formula disclosed in the background section of the '278 Patent are also unpersuasive. Plaintiff refers to the formula as depicting the "typical case." In describing the formula, however, the '278 Patent states,

> In producing animation products, a value usually from 0 to 1 is assigned to each delta set by the animator and the value is called the "morph weight". From these morph weights, ***the neutral's geometry is modified as follows***: Each vertex N on the neutral has the corresponding delta set's vertex multiplied by the scalar morph weight added to it. This is repeated for each morph target, and the result summed. ***For each vertex v in the neutral model***:
>
> 5
>
> $$|\text{result}| = |\text{neutral}| + \sum_{x=1}^{n} |\text{delta set}_x| * \text{morph weight}_x$$
>
> where the symbol |xxx| is used to indicate the corresponding vector in each referenced set. For example, |result| is the corresponding resultant vertex to vertex v in the neutral model |neutral| and |delta setx| is the corresponding vector for delta set x.

'278 Patent 1:65-2:13 (emphasis added). This portion of the patent specification makes no reference to the "typical case" and does not hold itself out as exemplary. Instead, it affirmatively provides the appropriate formula for computing a desired facial expression.

At the hearing, Plaintiff observed that the second sentence following the equation states, "***[f]or example***, |result| is the corresponding resultant vertex to vertex v in the neutral model |neutral| and |delta setx| is the corresponding vector for delta set x." *See id.* (emphasis added). Plaintiff suggested that the phrase "for example" demonstrated that the disclosed formula is

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the Court's determination, the Court does not find it necessary to rely on Defendants' contention in reaching its determination.

exemplary. Plaintiff does not credibly argue that the patent specification's use of the phrase "for example" in the context of explaining "the symbol |xxx|" should be imputed back to diminish the importance of the disclosed mathematical formula.

Plaintiff makes two passing comments that the '278 Patent's disclosed formula does not require any of the particular vectors to be a direction in three-dimensional space. *See* Docket No. 686 at 7, 9. Plaintiff does not cite to any evidence to support this assertion. As the formula states, the result is based on *adding* the neutral vector to the *product* of the delta set vector and the morph weight to obtain the result vector. Plaintiff fails to explain how this formula would still lead to the correct result (without some additional undisclosed math) if a delta set vector was understood to encompass, for example, a transform vector. At the hearing, Plaintiff made the same assertion that other vectors could satisfy the formula, again without further explanation or support. Indeed, Plaintiff followed up by insisting that it has no burden to submit evidence to prove this point because it is Defendants who are asking for a narrower claim construction. Plaintiff's argument − that it is somehow relieved of its responsibility to provide evidence to support the statements made by its attorneys because of its understanding of the nature of the dispute − is unpersuasive. The Court has explained why, on its face, the intrinsic record does not support Plaintiff's argument. Without evidence (or even a cogent explanation) to the contrary, Plaintiff's conclusory attorney statement holds no weight.

That this disclosure is in the "Background of the Invention" Section is also no reason to discount it. This disclosure comes immediately after the '278 Patent provides a definition for the term "delta set." Plaintiff's argument that the mathematical formula must be minimized because it is disclosed in the background section is undercut by its agreement that the immediately preceding disclosure regarding "delta set" is lexicographic. Indeed, the background section sets the stage for the disclosed invention. The '278 Patent explains that "the current practice for three dimensional computer generated speech animation is by manual techniques commonly using a 'morph target' approach." '278 Patent 1:48-50. The '278 Patent explains the shortcomings with manual speech animation, including that it can be "very tedious and time consuming, as well as inaccurate." *Id.* at 2:31-34. According to the '278 Patent,

> it is the ***primary object*** of this invention to provide a method for ***automatically*** animating lip synchronization and facial expression of three dimensional characters . . . . The method of the present invention further provides an extremely rapid and cost effective means to ***automatically*** create lip synchronization and

facial expression.

Id. at 2:43-52 (emphasis added). It is logical that explanations about speech animation methods in the background section are lexicographic where the "primary object" of the invention is aimed at automation. *See McRO*, 837 F.3d at 1303 (stating that the patent "relate[s] to ***automating*** part of a ***preexisting*** 3-D animation method." (emphasis added)).

As Defendants also note, this portion of the specification is the only aspect of the specification that describes delta sets and their relationship to morph weight sets, including how to use that relationship to create a desired facial expression. It would be improper to ignore this aspect of the '278 Patent's disclosure when there is no other disclosure otherwise describing this process, which is relevant to the asserted claims because of their reference to "morph weight sets."

The '278 Patent's disclosure regarding the work previously manually performed by animators and the invention's primary goal of automating that work is relevant for another reason. As Plaintiff's own expert states regarding bones animation,

> [a]t the time of the invention and patent filing (circa 1997), 'bones' were not a common approach to facial animation. While the technique was known . . . , it was not applied to facial animation in that era. 'Bones' did not become an attractive approach for facial animation ***until computer hardware advanced to provide [Graphical Processing Units] capable of performing the computations efficiently***. Therefore, it is not surprising that the '278 patent does not mention the approach.

Gleicher Decl ¶ 2.15 emphasis added). Even though submitted long after claim construction proceedings, this extrinsic evidence, consistent with the '278 Patent's disclosure, supports the conclusion that a person of ordinary skill in the art at the time the invention was filed would not understand the patented invention to relate to complex, non-three-dimensional-space delta vectors.

Of course, at the hearing, Plaintiff did not reference this statement, but instead heavily emphasized that both its expert ***and*** Defendants' expert purportedly agree that the term "vector" has a broader meaning. Dr. Gleicher, for instance, testifies in his expert report that

> [t]he term "vector" in mathematics, computer science and computer graphics is a general concept that roughly means an ordered list of numbers. My understanding of this term is consistent with one of the seminal texts on computer graphics, Real Time Rendering, which defines a "vector" as "an ordered list of real numbers."

Gleicher Decl. ¶ 2.16. But unlike Dr. Gleicher's other statement, Dr. Gleicher's testimony regarding the meaning of "vector" is not necessarily tied to the understanding of a person of ordinary skill in the art ***at the time of the invention***. Indeed, Dr. Gleicher's cited "seminal text," Real Time Rendering, was published in 2008, over ten years after the priority date of the '278 Patent. *See* Gleicher Decl., Ex. 2.

Dr. Dobkin's deposition testimony appears similarly divorced from the question of what a person of ordinary skill in the art at the time of the invention would understand the term "vector" to mean in the context of the '278 Patent. After counsel read the '278 Patent's definition of "delta set" to Dr. Dobkin, he testified:

> Q. It only says that the vectors must be – are computed, correct?
>
> A. It says . . . the vectors are computed. It doesn't, you know, say more than that.
>
> Q. Does it say how the vectors must be stored?
>
> A. It doesn't specifically say how they have to be stored.
>
> Q. Could the vectors be stored in a different form, say, angle of magnitude?
>
> A. That's a speculation that I'm not sure how to answer it.
>
> Q. Can you think of a way in which the vectors could be stored other than delta X, delta Y, delta Z?
>
> A. Hypothetically, I could imagine a number of ways, you know, create vectors and store vectors. But the court is pretty clear that if – you use a vector as a three-dimensional vector with three components.

Dobkin Tr. 108:24-110:5 (objections omitted). None of Dr. Dobkin's testimony directly tackles the relevant question. First, how vectors are stored is not relevant to the dispute at issue. Second, while Dr. Dobkin agrees that "hypothetically" he could "imagine" a number of ways to "create vectors and store vectors," it is unclear whether his testimony is tied to considering the term "vector" in the context of a person of ordinary skill in the art reading the '278 Patent at the time of the invention. Plaintiff's proffered testimony fails to rebut Dr. Gleicher's other testimony or the intrinsic disclosure.

Plaintiff's fourth argument relates to a portion of the patent specification that states that in a "morph target" speech animation approach:

> a reference model of a neutral mouth position, and several other mouth positions, each corresponding to a different phoneme or set of phonemes is used. These

> models are called "morph targets". Each morph target has the same topology as the neutral model, the same number of vertices, and each vertex on each model logically corresponds to a vertex on each other model, or example, vertex #n on all models represents the left corner of the mouth, ***and although this is the typical case, such rigid correspondence may not be necessary***.

'278 Patent 1:50-59 (emphasis added). The '278 Patent does not provide any further explanation for its assertion that "although this is the typical case, such rigid correspondence may not be necessary." *See id.* At most, this phrase may be referring to whether or not there is a perfect correspondence between vertices on the neutral model and target model. But as Defendants note, "it does not logically follow that the vectors need not be three-dimensional vectors." Docket No. 709 at 16. Ultimately, this statement in the specification does not outweigh the remainder of the intrinsic record regarding the meaning of the term "vector" in the context of the '278 Patent.[11]

For the reasons stated, the Court clarifies that the term "vector" in the context of the claim term "morph weight set[s]" refers to a vector with direction and magnitude in three-dimensional space.

B. Under the Proper Construction of Morph Weight Sets, Plaintiff Cannot Demonstrate Infringement as a Matter of Law

In its opposition to Defendants' motion for summary judgment of non-infringement, Plaintiff relies on the bones transform vectors to argue that the "delta set" aspect of the claim limitation "morph weight sets" is met by the accused games. Docket No. 686 at 16; *see also id.* at 17 ("'delta sets' are met by the 'vectors' that constitute the bone transforms. These 'vectors' are used to derive the positions of the vertices."). Defendants argue that Plaintiff's position is inconsistent with the testimony of Plaintiff's expert, Dr. Gleicher, but that under either Plaintiff's theory in opposing summary judgment or Defendants' understanding of the opinions disclosed by Dr. Gleicher in his expert report, Plaintiff cannot demonstrate infringement. Docket No. 709 at 1-13.

Plaintiff urges that it has maintained a consistent infringement theory with respect to bone animation throughout this litigation. Specifically, Plaintiff asserts that its position is that the bones transformation vectors constitute the delta sets necessary to correspond to the claimed morph weight sets. *See* Docket No. 727 at 2-6 (Plaintiff's Responses to Defendants' Request for

[11] As Defendants note, Dr. Gleicher also agrees that "[u]nder the Court's construction, a Delta Set also requires that each of the models has a corresponding set of vertices, otherwise there cannot be a vector between each vertex on the Neutral and Delta models." *See* Gleicher Decl. ¶ 6.10.

Evidentiary Rulings on Specified Objections re Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity). For purposes of Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity, the Court will accept as true Plaintiff's position that it has not changed its infringement theories over the course of recent litigation. In doing so, however, the Court understands that Plaintiff's sole infringement position is that bones transform vectors constitute delta sets, as argued in Plaintiff's opposition to Defendant's motion for summary judgment. In other words, the Court understands that Plaintiff is not maintaining that a resulting hypothetical 3-vector in the accused games could be calculated by simple subtraction between the vertex on the neutral model and target model and would constitute the claimed delta sets.[12] *See* Docket No. 710 ¶ 127 (Defendants' Response to Plaintiff's Statement of Alleged Disputes of Material Fact) (Plaintiff disputes Defendants' assertion that "[i]n his deposition, Dr. Gleicher said that the required vectors could be computed by subtraction or deduced via an equation in a textbook." In response, Plaintiff states, in part, "[t]he 'delta sets' are constituted in the bone transform vectors."); *but see id.* at ¶¶ 6, 62 (responding to Defendants' alleged undisputed fact by quoting from Dr. Gleicher's Expert Report, which states, "[t]he requirement for a vector between each corresponding pair of vertices is always met because every pair of vertices defines a vector (via subtraction)." Gleicher Decl. ¶ 6.11).

Under its infringement theory, Plaintiff fails to even attempt to argue that the accused products infringe the claims under the appropriate understanding of the term "vector." Plaintiff's entire opposition to Defendants' summary judgment motion of non-infringement is premised on its arguments that vectors in the context of the '278 Patent refer simply to an ordered set of numbers. *See* Docket No. 686 at 10-19. Because the Court has explained that the term "vector" in the context of the claim term "morph weight set[s]" refers to a vector with direction and magnitude in three-dimensional space, and Plaintiff nowhere disputes that bones transform vectors are not vectors with direction and magnitude in three-dimensional space, Plaintiff's sole

[12] The Court notes that an argument that a hypothetical 3-vector could constitute the claimed delta sets − even where bones animation does not actually perform such a calculation or output such a vector − would be unpersuasive. Such an understanding would impermissibly broaden the scope of the phrase "delta set" by implying that any time a person of ordinary skill in the art *could* perform a calculation that would satisfy the phrase, it would be met. Such a hypothetical understanding would mean that any time speech animation was performed by changing a neutral model with vertices to a target model with vertices, a person of ordinary skill in the art could backtrack and identify a resulting delta set as required by the '278 Patent, even if a delta set was not necessarily used to calculate the positions of the vertices of the target model in the first place. As Defendants observe, such a position would be inconsistent with the teachings of the patent and is rejected. *See* Docket No. 643-1 at 15-18.

infringement position fails as a matter of law.

Plaintiff attempts to characterize the issue regarding the proper interpretation of "vector" as a question of fact. Docket No. 686 at 10. However, the issue presented regarding the meaning of the term does not simply relate to its application to the accused products, *i.e.*, a question of infringement. Instead, both parties disputed the contents of the patent's intrinsic record at length to support their competing positions regarding the term "vector." *See id.* at 5-10. In other words, the parties submitted a dispute about the scope of the claims, a claim construction issue that is "exclusively within the province of the court." *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996); *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S.Ct. 831, 837-40 (2015) (claim construction is a question of law with underlying questions of fact).

Even if the Court had concluded that the '278 Patent refers to the term "vector" as simply an ordered set of numbers, Plaintiff's infringement position has other shortcomings. As Plaintiff notes, through bones animation, a small set of bones control large sets of vertices. Gleicher Decl., ¶¶ 2.7, 2.14. But more importantly, a single vertex can be attached to multiple bones. *Id.* In other words, in bones animation, the same vertex is likely to be influenced by multiple different bones transformations. As noted, Plaintiff's position is that the bones transformation vectors represent the delta sets. Docket No. 686 at 10. However, the '278 Patent explains that deltas are "***computed as a vector from each vertex n*** on the reference ***to each vertex n*** on each morph target." '278 Patent 1:60-64. Plaintiff's interpretation would result in a complex relationship between different bones transformations and individual vertices rather than the one-to-one relationship contemplated by the patent. The Court, however, need not reach a conclusive determination on this issue given its other conclusions regarding the meaning of "vector" and how they relate to Plaintiff's infringement position.

For the reasons stated, the Court would **GRANT** Defendants' Motion for Summary Judgment of Non-Infringement. Docket No. 643. Because the Defendants' remaining motions similarly relate to issues of non-infringement, the Court would **DENY** all of the Defendants' other pending motions before this Court as **MOOT**.

C. *Defendants' (Except Square) Counterclaims for Patent Invalidity*

Except for Square (*see* Docket No. 112 (Answer only)), the remaining Defendants in this action have counterclaims seeking a declaration of patent invalidity. Docket No. 488 (Activision and Blizzard's Answer and Counterclaims); Docket No. 322 (LucasArts' Answer and

Counterclaims); Docket No. 318 (Infinity Ward's Answer and Counterclaims); Docket No. 284 (Sony's Counterclaim); Docket No. 283 (Sucker Punch's Counterclaim); Docket No. 174 (Naughty Dog's First Amended Counterclaim); Docket No. 159 (Disney's First Amended Answer and Counterclaim).

For Square, because the Court would conclude that summary judgment should be granted on the basis that Defendants do not infringe the asserted claims of the '278 Patent, no disputes remain for adjudication and Square's affirmative defense of invalidity (and all other defenses to Plaintiff's claim of patent infringement) would be moot.

For the remaining Defendants besides Square, because the Court concludes that the term "vector" as used in the '278 Patent is limited to vectors with magnitude and direction in 3-dimensional space, it is the Court's understanding that Plaintiff's Motion for Summary Judgment of No Anticipation would be appropriately granted.[13] (*See* Docket No. 640.) At the hearing, Defendants indicated that, assuming the Court's tentative determination with respect to their motion for summary judgment of non-infringement does not change, they may be willing to drop their invalidity counterclaims if they do not succeed on their arguments regarding lack of enablement. On that basis, the Court finds that the remainder of the parties' dispute regarding patent invalidity on the ground of anticipation is not ripe for adjudication at this time.

V. CONCLUSION

The Court would tentatively **GRANT** Defendants' Motion for Summary Judgment of Non-Infringement. Docket No. 643. The Court would also **OVERRULE** Defendants' Objections to Plaintiff's Opposition to Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity. *See* Docket Nos. 711, 727. The Court would **DENY** all of the Defendants' other pending motions before this Court as **MOOT**.[14] The Court would **GRANT-IN-PART** Plaintiff's Motion for Summary Judgment of No Anticipation except as to two prior art references: (1) Catherine Pelachaud, "Communication and Coarticulation in Facial

[13] As Plaintiff notes, Defendants agree that except for two of the references raised in Plaintiff's motion, they "do not intend to rely on these references to prove anticipation," although they reserve the right to rely on them for other purposes. Docket No. 681 at 5 n.4. On this basis, the Court would **GRANT-IN-PART** Plaintiff's motion except as to two prior art references: (1) Catherine Pelachaud, "Communication and Coarticulation in Facial Animation" (1991); and (2) Antai Peng, "Speech Expression Modeling and Synthesis" (1996).

[14] This includes Defendants' still-pending early Motion for Summary Judgment of Non-Infringement, filed June 23, 2017. *See* Docket No. 431; *see also* Docket No. 448 (Plaintiff's *ex parte* application for leave to file a sur-reply to Defendants' early summary judgment motion); Docket No. 455 (Minutes of Hearing on early summary judgment motion and attached tentative ruling).

Animation" (1991); and (2) Antai Peng, "Speech Expression Modeling and Synthesis" (1996).

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	CV 12-10322-GW(FFMx)	Date	November 13, 2018
Title	*McRO, Inc., v. Namco Bandai Games America, Inc., and Related Actions*		

Present: The Honorable	GEORGE H. WU, UNITED STATES DISTRICT JUDGE	
Javier Gonzalez	None Present	
Deputy Clerk	Court Reporter / Recorder	Tape No.
Attorneys Present for Plaintiffs:	Attorneys Present for Defendants:	
None Present	None Present	

PROCEEDINGS: **IN CHAMBERS - FINAL RULING ON DEFENDANTS' MOTION FOR SUMMARY JUDGMENT OF INVALIDITY (FOR LACK OF ENABLEMENT) [756]**

Attached hereto is the Court's Final Ruling on Defendants' Motion for Summary Judgment of Invalidity (for Lack of Enablement). Defendants' Motion is GRANTED.

_____ : _____

Initials of Preparer JG

McRO, Inc., d.b.a. Planet Blue v. Namco Bandai Games America, Inc., Case No. CV 12-10322-GW (FFMx) (LEAD TRACK 1 CONSLIDATED CASE); Final Ruling on Defendants' Motion for Summary Judgment of Invalidity (for Lack of Enablement)

Plaintiff McRO, Inc., d.b.a. Planet Blue ("Plaintiff" or "Planet Blue") filed numerous patent infringement cases in this District.[1] Plaintiff alleges that the remaining Defendants[2] directly or indirectly infringe Claims 1, 4, and 13 of U.S. Patent No. 6,611,278 ("the '278 Patent").[3] *See* Docket No. 710 ¶¶ 13, 14. The '278 Patent relates to automatically animating the lip synchronization and facial expressions of 3-D characters.

In previous orders and hearings in this case, the Court expressed concerns about whether the "first set of rules" limitation of the asserted claims met the enablement requirements of 35 U.S.C. § 112. Despite the Court's comments on the issue, Defendants failed to challenge the asserted patents on the basis of enablement until ordered to do so at the hearing on the parties' latest round of summary judgment briefs. In that latest summary judgment round, the Court issued a tentative order that would grant Defendant's Motion for Summary Judgment of Non-Infringement (Docket No. 643).[4] *See* Docket No. 755. The Court indicated that it would not issue

[1] The remaining cases are: *McRO, Inc. v. Electronics Arts, Inc.*, CV 12-10329; *McRO, Inc. v. Naughty Dog, Inc.*, CV 12-10335; *McRO, Inc. v. Square Enix, Inc.*, CV 12-10338; *McRO, Inc. v. Sucker Punch Productions, LLC*, CV 14-332; *McRO, Inc. v. Activision Blizzard Inc.*, CV 14-336; *McRO, Inc. v. Infinity Ward, Inc.*, CV 14-352; *McRO, Inc. v. LucasArts Entertainment Company LLC*, CV 14-358; *McRO, Inc. v. Sony Computer Entertainment America, LLC*, et al., CV 14-383; and *McRO, Inc. v. Disney Interactive Studios, Inc.*, CV 12-10333.

[2] The remaining Defendants are: Electronic Arts Inc.; Naughty Dog, Inc.; Square Enix, Inc.; Activision Publishing, Inc.; Blizzard Entertainment, Inc.; Infinity Ward, Inc.; Sony Computer Entertainment America LLC (now known as Sony Interactive Entertainment LLC); Sucker Punch Productions LLC; Disney Interactive Studios, Inc.; and LucasArts, a division of Lucasfilm Entertainment Company Ltd. LLC (collectively, "Defendants").

[3] Although Plaintiff has not formally withdrawn its infringement claims as to the other previously-asserted patent (*i.e.* U.S. Patent No. 6,307,576 ("the '576 Patent")) from the case, Plaintiff states it has dropped its infringement claims for that patent. All of the remaining Defendants except Square Enix, Inc. have asserted non-infringement and invalidity counterclaims as to the '278 and '576 Patents. *See* Docket No. 488 (Activision and Blizzard's Answer and Counterclaims); Docket No. 322 (LucasArts' Answer and Counterclaims); Docket No. 318 (Infinity Ward's Answer and Counterclaims); Docket No. 284 (Sony's Counterclaim); Docket No. 283 (Sucker Punch's Counterclaim); Docket No. 174 (Naughty Dog's First Amended Counterclaim); Docket No. 159 (Disney's First Amended Answer and Counterclaim). For the first time in the current motion papers, the parties raise a dispute regarding the status of Defendants' counterclaims regarding the '576 Patent. The parties separately filed a report indicating that they dispute whether those counterclaims must be dismissed with or without prejudice. Docket No. 765. The Court declines to address this issue at this time and finds that additional briefing will be necessary to clarify the scope/circumstances of the dispute.

[4] The tentative ruling on the parties' summary judgment motions also included the Court's tentative views

a final ruling, however, until the parties had submitted briefs regarding the enablement issue for the Court's consideration.

With this directive, Defendants filed their Motion for Summary Judgment of Invalidity (for Lack of Enablement) on July 19, 2018. *See* Docket No. 756-1. Plaintiff has filed an Opposition (Docket No. 758) and Defendants have filed a Reply (Docket No. 760). The parties have also submitted their chart outlining allegedly uncontroverted/genuinely disputed facts. *See* Docket No. 761 (Defendants' Response to Plaintiff's Statement of Genuine Disputes in Response to Defendants' Statement of Uncontroverted Facts). A hearing was held on the Motion and a Tentative Order was issued. Docket No. 769. The matter was taken under submission. *Id.*

For the reasons stated in this Order, Defendants' Motion for Summary Judgment of Invalidity for Lack of Enablement (Docket No. 756) is **GRANTED**.

I. BACKGROUND

A. The '278 Patent

The '278 Patent issued August 26, 2003 to inventor Maury Rosenfeld. It is titled "Method for Automatically Animating Lip Synchronization and Facial Expression of Animated Characters."

Much of the factual background regarding the '278 Patent is explained in the Court's Final Ruling on Claim Construction (Docket No. 298), the Federal Circuit's opinion regarding the patent eligibility of the '278 and '576 Patents, *see McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1303-07 (Fed. Cir. 2016), and the Court's tentative ruling on Defendants' Motion for Summary Judgment of Non-infringement (Docket No. 755). Briefly, the patent "relate[s] to automating part of a preexisting 3-D animation method." *Id.* at 1303; *see also* '278 Patent Abstract, *id.* at 1:35-52. The animation method relies on a "neutral model" of a character's face

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that it would: (1) **OVERRULE** Defendants' Objections to Plaintiff's Opposition to Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity (*see* Docket Nos. 711, 727); (2) **DENY** all of the Defendants' other pending motions before the Court (including Defendants' still-pending early Motion for Summary Judgment of Non-Infringement, filed June 23, 2017 (*see* Docket No. 431)) as **MOOT** (*see also* Docket Nos. 638, 634, 628, 629, 632, and 635); and (3) **GRANT-IN-PART**, based on representations by Defendants, Plaintiff's Motion for Summary Judgment of No Anticipation except as to two prior art references: (1) Catherine Pelachaud, "Communication and Coarticulation in Facial Animation" (1991); and (2) Antai Peng, "Speech Expression Modeling and Synthesis" (1996). At the hearing on the summary judgment motions, Defendants further informed the Court that − if the Court adopted its tentative ruling regarding Defendants' Motion for Summary Judgment of Non-Infringement, but the Court ultimately denied Defendants' Motion for Summary Judgment for Lack of Enablement − Defendants would seek to withdraw their invalidity counterclaim for the '278 Patent. If Defendants were permitted to do so, this would also moot the remainder of Plaintiff's Motion for Summary Judgment of No Anticipation.

in conjunction with "morph targets." *Id.* at 1:48-59. A "morph target" is a character's expression as it pronounces a particular phoneme, *i.e.*, makes a certain sound. *Id.* Each morph target corresponds to a delta set "consisting of the vectors by which the vertices on that morph target differ from the neutral model." *McRO, Inc.*, 837 F.3d at 1303; *see also* '278 Patent 1:63-65.

Facial expressions are "described as a function of the amount each morph target, and its corresponding delta set, is applied to modify the character model." *McRO, Inc.*, 837 F.3d at 1304; *see also* '278 Patent 2:1-2:13. "In producing animation products, a value usually from 0 to 1 is assigned to each delta set by the animator and the value is called the 'morph weight.'" '278 Patent 1:65-67.

Animators previously accomplished lip synchronization using a "keyframe approach" where the artist manually set morph weights "at certain important times ('keyframes')." '278 Patent 2:29-32. "Animators knew what phoneme a character pronounced at a given time from a 'time aligned phonetic transcription' ('timed transcript')." *McRO*, 837 F.3d at 1305.

The purported aim of the '278 Patent was to "provide a method for automatically animating lip synchronization and facial expression." '278 Patent 2:44-45. In particular, the claims require using a computer to obtain and apply a set of rules to data to ultimately "generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence." *Id.* at Claim 1.

For instance, Claim 1 of the '278 Patent (the only remaining asserted independent claim in this case) recites:

> 1. A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:
>
> ***obtaining a first set of rules*** that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence;
>
> obtaining a plurality of sub-sequences of timed phonemes corresponding to a desired audio sequence for said three-dimensional characters;
>
> generating an output morph weight set stream ***by applying said first set of rules*** to each sub-sequence of said plurality of sub-sequences of timed phonemes; and
>
> applying said output morph weight set stream to an input sequence of animated characters to generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence.

'278 Patent, Claim 1 (emphasis added). The term "first set of rules" as it appears in Claim 1 of

the '278 Patent is the central issue of Defendants' current motion.

B. Relevant Procedural History

(1) Early District Court Proceedings

During claim construction, the Court found no construction necessary for the claim term "first set of rules." *See* Docket No. 298-1 at 18. In doing so, the Court rejected Defendants' argument that the claimed "first set of rules" means "a group of logic statements that are embodied in a computer software program and used together." *See id.* at 14-16. As part of its analysis, the Court noted that "the claims themselves set out meaningful requirements for the first set of rules: they 'define[] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence" . . . [and] 'generat[e] an output morph weight set stream by applying said first set of rules to each sub-sequence of said plurality of sub-sequences of timed phonemes.'" *Id.* at 16.

However, in deciding a Motion for Judgment on the Pleadings filed soon after, the Court concluded that the asserted claims were still drawn to patent-ineligible subject matter. *See* Docket No. 365. The Court found that the claimed first set of rules limitation was a critical aspect of the claimed invention. *Id.* at 18. The Court noted that according to the specification, "[i]n operation and use, the user must manually set up default correspondence rules' that 'specify the durational information needed to generate appropriate transitionary curves between morph weight sets, such as transition start and end times.'"[5] *Id.* (citing '576 Patent at 6:16-54). The Court further noted that "while the patent does provide an example of a very partial set of default and secondary rules, it expressly states that 'this is only an example of a set of rules which could be use[d] for illustrative purposes, and many other rules could be specified according to the method of the invention.'" *Id.* (citing '576 Patent at 7:36-9:23). The Court concluded that the asserted claims "preempt[ed] the field of such lip synchronization using a rules-based morph target approach." *Id.* at 19.

(2) The Federal Circuit's Decision

The Federal Circuit reversed this Court's § 101 determination. *See generally*, *McRO*, 837 F.3d at 1302-03 ("We hold that the ordered combination of claimed steps, using unconventional rules that relate subsequences of phonemes, timings, and morph weight sets, is not directed to an

[5] In Plaintiff's briefing on the issue, Plaintiff's expert opined "that a central part of the patents is 'using morph weight set representations of the facial shape coupled with rules, including explicit and distinct timing rules, to generate keyframes.'" Docket No. 365 at 17.

abstract idea and is therefore patent-eligible."). In describing the claimed invention, the Federal Circuit observed that:

> [e]ssentially, the patents aim to automate a 3-D animator's tasks, specifically, determining when to set keyframes and setting those keyframes. This automation is accomplished through rules that are applied to the timed transcript to determine the morph weight outputs. The patents describe many exemplary rule sets that go beyond simply matching single phonemes from the time transcript with the appropriate morph target. Instead, these rule sets aim to produce more realistic speech by "tak[ing] into consideration the differences in mouth positions for similar phonemes based on context."

Id. at 1307 (quoting '576 Patent at 10:6-7). The Federal Circuit went on to describe the patents' exemplary set of rules for a character transitioning from silence through saying "hello" and observed, "[t]he invention . . . uses rules to automatically set a keyframe at the correct point to depict more realistic speech, achieving results similar to those previously achieved manually by animators." *Id.* (citing '576 Patent at 7:36-9:22).

The Federal Circuit further characterized the rules claimed in the asserted patents as "limited to rules with certain common characteristics, i.e., a genus." *Id.* at 1313. The Federal Circuit observed:

> Claims to the genus of an invention, rather than a particular species, have long been acknowledged as patentable . . . Patent law has evolved to place additional requirements on patentees seeking to claim a genus; however, these limits have not been in relation to the abstract idea exception to § 101. Rather they have principally been in terms of whether the patentee has satisfied the tradeoff of broad disclosure for broad claim scope implicit in 35 U.S.C. § 112. *Carnegie Mellon Univ. v. Hoffmann–La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008).

Id. at 1313-14 (internal citation and parenthetical omitted). The Federal Circuit concluded that in the context of § 101, the use of the "genus" of rules claimed in the asserted patents improved an existing technological process "by allowing the automation of further tasks." *Id.* at 1314, 1315. The Federal Circuit further observed: "Claim 1 [of the '576 Patent] requires that the rules be rendered in a specific way: as a relationship between sub-sequences of phonemes, timing, and the weight to which each phoneme is expressed visually at a particular timing (as represented by the morph weight set)." *Id.* at 1315. On this basis, the Federal Circuit concluded that "[t]he specific structure of the claimed rules would prevent broad preemption of all rules-based means of automating lip synchronization, unless the limits of the rules themselves are broad enough to cover

all possible approaches."[6] *Id.*

(3) District Court Litigation after the Federal Circuit's Decision

After the Federal Circuit remanded the case back to this Court, Defendants filed an early summary judgment motion for non-infringement and requested supplemental claim construction regarding the "first set of rules" limitation. Defendants sought a new construction of the term "first set of rules" based on Plaintiff's characterization of the "first set of rules" limitation during appeal. Specifically, Defendants requested that the term be construed as "rules that evaluate the time-aligned phonetic transcript and (depending on the sequence of phonemes, the context of each phoneme with respect to surrounding phonemes, and the pace of speech) automatically determine when to set keyframes, the appropriate morph weight set at each keyframe, and how the animation should transition between keyframes." *See* Docket No. 455 at 14 (Court's Tentative Order[7] on Defendants' early motion for summary judgment of non-infringement and request for supplemental claim construction). The Court's Tentative Order found that Defendants' proposal was not supported by the record. The Tentative Order observed, for instance that:

> [t]he specification . . . repeatedly provides that its disclosure regarding rules is non-limiting and exemplary. '576 Patent 4:5-11 (describing "correspondence rules" and "transition rules" as part of "one embodiment"); 4:50-51 (stating "*[p]referably*, each rule comprises two parts"); 7:1-4 ("According to the method of the invention, other rules involving phoneme's duration and/or context can be specified."); 7:53-57 ("The following is an example of a set of rules, according to the present method, of course this is only an example of a set of rules which could be used for illustrative purposes, and many other rules could be specified according to the method of the invention."); 9:23-26 ("The rules of the present invention are extensible and freeform in the sense that they may be created as desired and adapted to a wide variety of animation, characters, situations, and products.").

Docket No. 455 at 15-16. The Tentative Order noted that even if the Court were to accept Defendants' argument that the exemplary rules in the specification only related to rules in the categories of "correspondence rules" and "transition rules," "Defendants [had] not demonstrated that the patentee had a clear intention to limit the claim scope to these two categories of rules." *Id.*

[6] The Federal Circuit noted Defendants' arguments to the contrary on the preemption point, but observed that there was "no record evidence" to support the conclusion that "any rules-based lip-synchronization process must use the claimed type of rules." *McRO*, 837 F.3d at 1315.

[7] The Court's Tentative Order regarding Defendants' early summary judgment motion and request for supplemental claim construction has not been adopted as the final ruling of this Court, and thus the views on supplemental claim construction expressed in the Tentative Order have not been entered in this matter.

at 16.

After further discussion after oral argument, a decision was made to wait until the normal dispositive motion deadline for Defendants to renew their non-infringement motion. Defendants eventually did bring a second motion for summary of non-infringement, but in that motion, Defendants did not renew their claim construction argument for the "first set of rules" limitation.

II. LEGAL STANDARD

A. Summary Judgment

Under Federal Rule of Civil Procedure ("Rule") 56, a party may move for summary judgment, identifying each claim or defense – or the part of each claim or defense – on which summary judgment is sought, and the court shall grant it when the pleadings, the discovery and disclosure materials on file, and any affidavits show that "there is no genuine issue as to any material fact and that the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(a); *see also Miranda v. City of Cornelius*, 429 F.3d 858, 860 n.1 (9th Cir. 2005). As to materiality, "[o]nly disputes over facts that might affect the outcome of the suit under the governing law will properly preclude the entry of summary judgment." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986). A dispute as to a material fact is "genuine" if there is sufficient evidence for a reasonable jury to return a verdict for the nonmoving party. *Id.*

To satisfy its burden at summary judgment, a moving party with the burden of persuasion must establish "beyond controversy every essential element of its [claim or defense]." *S. Cal. Gas Co. v. City of Santa Ana*, 336 F.3d 885, 888 (9th Cir. 2003); O'Connell & Stevenson, *Rutter Group Prac. Guide: Fed. Civ. Proc. Before Trial* ("*Federal Practice Guide*") § 14:126 (2016). By contrast, a moving party without the burden of persuasion "must either produce evidence negating an essential element of the nonmoving party's claim or defense or show that the nonmoving party does not have enough evidence of an essential element to carry its ultimate burden of persuasion at trial." *Nissan Fire & Marine Ins. Co., Ltd. v. Fritz Cos.*, Inc., 210 F.3d 1099, 1102 (9th Cir. 2000); *see also Devereaux v. Abbey,* 263 F.3d 1070, 1076 (9th Cir. 2001) (en banc) ("When the nonmoving party has the burden of proof at trial, the moving party need only point out 'that there is an absence of evidence to support the nonmoving party's case.'") (quoting *Celotex Corp. v. Catrett,* 477 U.S. 317, 325 (1986), and citing *Fairbank v. Wunderman Cato Johnson,* 212 F.3d 528, 532 (9th Cir. 2000) (holding that the *Celotex* "showing" can be made by "pointing out through argument . . . the absence of evidence to support plaintiff's claim")).

> If the party moving for summary judgment meets its initial burden of identifying for the court the portions of the materials on file that it believes demonstrate the absence of any genuine issue of material fact, the nonmoving party may not rely on the mere allegations in the pleadings in order to preclude summary judgment[, but instead] must set forth, by affidavit or as otherwise provided in Rule 56, specific facts showing that there is a genuine issue for trial.

T.W. Elec. Serv., Inc., v. Pac. Elec. Contractors Ass'n, 809 F.2d 626, 630 (9th Cir. 1987) (internal citations and quotation marks omitted) (citing, among other cases, *Celotex*, 477 U.S. at 323). "A non-movant's bald assertions or a mere scintilla of evidence in his favor are both insufficient to withstand summary judgment." *See FTC v. Stefanchik*, 559 F.3d 924, 929 (9th Cir. 2009). In addition, the evidence presented by the parties must be admissible. *See* Fed. R. Civ. P. 56(e). Conclusory, speculative testimony in affidavits and moving papers is insufficient to raise genuine issues of fact and defeat summary judgment. *See Thornhill Publ'g Co., Inc. v. GTE Corp.*, 594 F.2d 730, 738 (9th Cir. 1979). Relatedly, "[a]ny objections to declarations or other evidence must be made at or (preferably) before the hearing, and should be ruled upon by the court before ruling on the motion itself." *Federal Practice Guide* § 14:333 (citing *Hollingsworth Solderless Terminal Co. v. Turley*, 622 F.2d 1324, 1335 n.9 (9th Cir. 1980); *Sigler v. American Honda Motor Co.*, 532 F3d 469, 480 (6th Cir. 2008)). In judging evidence at the summary judgment stage, however, courts do not make credibility determinations or weigh conflicting evidence at the summary judgment stage, and must view all evidence and draw all inferences in the light most favorable to the non-moving party. *See T.W. Elec.*, 809 F.2d at 630-31 (citing *Matsushita Elec. Indus. Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574 (1986)); *Anderson*, 477 U.S. at 255 ("The evidence of the non-movant is to be believed and all justifiable inferences are to be drawn in [the non-movant's] favor.").

"If the court does not grant all the relief requested by the motion, it may enter an order stating any material fact – including an item of damages or other relief – that is not genuinely in dispute and treating the fact as established in the case." Fed. R. Civ. P. 56(g); *see also* Federal Practice Guide § 14:352 ("A partial summary judgment may be granted on motion of either party for adjudication of particular claims or defenses.") (citing *id.* § 14:33).

B. Patent Invalidity for Lack of Enablement

A patent's specification shall describe "the manner and process of making and using [the invention], in such clear, concise, and exact terms as to *enable* any person skilled in the art to

which it pertains, or with which it is most nearly connected, to make and use [the invention]." 35 U.S.C. § 112, ¶ 1 (emphasis added).[8] The enablement requirement implicit in 35 U.S.C. § 112, ¶ 1, "serves the dual function in the patent system of ensuring adequate disclosure of the claimed invention and of preventing claims broader than the disclosed invention." *MagSil Corp. v. Hitachi Glob. Storage Techs., Inc.*, 687 F.3d 1377, 1380-81 (Fed. Cir. 2012) (citations omitted). Enablement is a question of law based on underlying facts. *Wyeth and Cordis Corp. v. Abbott Labs.*, 720 F.3d 1380, 1384 (Fed. Cir. 2013).

The search for enablement requires a determination of whether there is "sufficient disclosure, either through illustrative examples or terminology, to teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed." *In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991). Even if a considerable amount of experimentation would be necessary for a person of skill in the art to practice the full scope of the claimed invention, a claim is sufficiently enabled "so long as the experimentation 'is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed.'" *Vasudevan Software, Inc. v. MicroStrategy Inc.*, 782 F.3d 671, 684 (Fed. Cir. 2015) (citing *In re Wands,* 858 F.2d 731, 737 (Fed. Cir. 1988)). In determining whether experimentation is undue, courts may consider the *Wands* factors: (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. *Id*. (quoting *In re Wands*, 858 F.2d at 737). The *Wands* factors, however, are "illustrative, not mandatory." *Amgen, Inc. v. Chugai Pharm. Co.,* 927 F.2d 1200, 1213 (Fed. Cir. 1991). "What is relevant depends on the facts." *Id.*

For claims that cover multiple embodiments, "the specification must enable the full scope of the claims." *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.,* 501 F.3d 1274, 1285 (Fed. Cir. 2007) (finding the asserted patent invalid for lack enablement when the specification, which enabled mechanical side impact sensors, did not satisfy the enablement requirement for claim

[8] The America Invents Act did not change the relevant language of 35 U.S.C. § 112 at issue here, but did change the paragraph numbering convention for this section of the statute from numbers to letters. In other words, for patent applications filed after September 16, 2012, 35 U.S.C. § 112(a) applies rather than 35 U.S.C. § 112 ¶ 1. The patent at issue in this case was first filed before September 16, 2012, and thus the Court will refer to the pre-AIA section numbers.

limitations which included both mechanical and electronic side impact sensors). However, this does not necessarily mean that a patent must disclose every embodiment, *i.e.* species, implicated by a claimed genus. *In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991) ("It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art."). Instead, "the disclosure must adequately guide the art worker to determine, without undue experimentation, which species among all those encompassed by the claimed genus possess the disclosed utility." *Id.* (footnote omitted); *cf. Auto Techs.*, 501 F.3d at 1285 ("[e]lectronic side impact sensors are not just another known species of a genus consisting of sensors, but are a distinctly different sensor compared with the well-enabled mechanical side impact sensor that is fully discussed in the specification.").

III. ANALYSIS

A. Scope of the Claims

Apparently the parties still dispute the scope of the claims, particularly as to the meaning of the phrase "first set of rules." The parties' dispute over the scope of the claims does not take center stage in their briefs. Plaintiff takes the position that the claims do not require a person to be in possession of a set of rules for every visual phoneme relating to every word in the English language. As Plaintiff puts it, "the claims require only rules that are applied to the phoneme sub-sequences in a transcript. For example, as taught in the specification, animating the word 'hello' requires as few as four rules." Docket No. 758 at 17. Defendants respond by arguing that, according to the specification, "[i]n operation and use, the user must manually set up default correspondence rules between ***all visual phoneme groups*** and morph weight sets." Docket No. 760 at 15 (citing '278 Patent at 6:43–45). Relatedly, the parties dispute whether the animation produced by the claimed method must be "high-quality" to be consistent with the disclosure in the specification. *See* Docket No. 758 at 16 ("the claims are not directed to 'high quality' animation at all, let alone for every known phoneme sequence in the English language."); Docket No. 760 at 15 ("the specification states that the 'primary object' of the invention is 'producing ***accurate and realistic*** lip synchronization and facial expressions in animated characters." (emphasis in original).)

Although these disputes raise unique claim scope issues that, notably, neither party has previously raised in this litigation, it is not necessary to resolve them for purposes of Defendants' summary judgment motion. Plaintiff argues that these issues are relevant based on the Federal

Circuit's decision in *CFMT, Inc. v. Yieldup Int'l Corp.*, 349 F.3d 1333, 1338-40 (Fed. Cir. 2003). In *CFMT*, the Federal Circuit considered whether claims directed to a "method for the cleaning of semiconductor wafers" were enabled. *Id.* at 1336. The district court in that case had construed the term "cleaning" in the claim preamble to mean removing contaminants from the water surface but found that the claims were not enabled. The district court relied on data showing that practicing the claimed method led to wafers that appeared clean to the naked eye, but that were filthy when viewed using laser scanning. *Id.* at 1337. The Federal Circuit reversed, finding that "[a]bsent some standard for cleanliness in the claims, this court proceeds to examine the record for a showing that the disclosures of the CFMT patents would enable a person of skill in the art to make and use a system or apparatus to achieve any level of contaminant removal without undue experimentation." *Id.* at 1338-39. The Federal Circuit further stated, "[b]ecause the preamble term 'cleaning' means only 'removal of contaminants,' not removal of all contaminants or removal of contaminants according to the TI commercial standard, the inventor shows utility and enables the invention by disclosing 'removal of contaminants.'" *Id.* at 1339.

The issues raised in *CFMT* are not the same as those raised here. At least on appeal, the issue in *CFMT* was not whether the actual method steps recited in the claims at issue were enabled. The issue in *CFMT* was essentially a question of utility: whether the claimed method could even achieve cleanliness as required under the district court's interpretation and understanding of the term "cleaning" in the preamble. The Federal Circuit found that the district court improperly placed a standard of cleanliness on the claims where none existed, and on this basis, found that the claimed method could be practiced without undue experimentation.

Here, the issue is not one of improperly narrow claim interpretation leading to questions of utility. The "first set of rules" limitation is not a preamble term, but part of a specific claim limitation. *See* '278 Patent, Claim 1 ("A method . . . comprising: obtaining a first set of rules that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence."). The parties no longer dispute the asserted claims' utility, and the specification provides at least one example for applying a set of rules to a time aligned phonetic transcription ("TAPT") for the word "hello" in a manner that would suggest that the claims have utility. *See* '278 Patent at 7:33-9:14. Moreover, the parties agree for purposes of this motion that the Court's construction of "first set of rules" is broad, encompassing more than simply a rule scheme that involves rules applied at keyframes or rules in the form of "if . . . then . . . else"

constructs.[9] *See, e.g.*, Docket No. 758 at 4-5; Docket No. 760 at 1 ("Defendants do not dispute that McRO prevailed on having the Court adopt its broad construction of 'first set of rules.'"); Expert Report of Michael Gleicher Regarding Validity ("Gleicher Decl."), Docket No. 658-6 ¶ 199 (Plaintiff's expert opining that the invention is not limited to "if . . . then . . . else" rules). Plaintiff's new claim interpretation arguments would make the claims even broader in scope, encompassing not only expansive sets of sophisticated rules defining morph weight set streams as a function of phoneme sequence and time for all phonemes, but also "crude" rules or small rule sets directed at specific subsets of phonemes. In other words, the parties are presenting a dispute about the "floor" for the meaning of the "first set of rules" term. But this dispute is irrelevant when the real enablement question goes to the "ceiling." That is, in the context of the claim language, the relevant question for enablement is not whether the specification enables a person of skill in the art at the time of the invention to use a minimal/unsophisticated rule set to practice the invention, but instead whether the specification enables the ***full scope*** of rule sets that could be used to practice the invention, including complex, detailed rule sets for all known phonemes.

As the Federal Circuit observed in *MagSil*,

> [e]nablement serves the dual function in the patent system of ensuring adequate disclosure of the claimed invention and of preventing claims broader than the disclosed invention. This important doctrine prevents both inadequate disclosure of an invention and overbroad claiming that might otherwise attempt to cover more than was actually invented. Thus, a patentee chooses broad claim language at the peril of losing any claim that cannot be enabled across its full scope of coverage.

MagSil Corp. v. Hitachi Glob. Storage Techs., Inc., 687 F.3d 1377, 1380–81 (Fed. Cir. 2012) (citations omitted). The analysis in *MagSil* is instructive. The claims at issue in *MagSil* required a device where "applying a small magnitude of electromagnetic energy . . . causes a change in the resistance by at least 10% at room temperature." *Id.* at 1381. The Federal Circuit found the claims were not enabled. In relevant part, the panel observed that the patent specification "only disclose[d] enough information to achieve an 11.8% resistive change," even though the claims were construed to cover resistive changes "from 10% up to infinity." *Id.* at 1383. The Federal Circuit further stated, "[t]he record contains no showing that the knowledge of that artisan would permit, at the time of filing, achievement of the modern values above 600% without undue

[9] Defendants state that they reserve the right to appeal the Court's claim construction for this term, but accept the current interpretation of the limitation for purposes of their motion only.

experimentation, indeed without the nearly twelve years of experimentation necessary to actually reach those values." *Id.* at 1384. Here, the issue is similar: do the exemplary rules disclosed in the specification enable the full scope of the "first set of rules" limitation as broadly urged by Plaintiff and construed by the Court? The question depends on the specification's disclosure and whether it would "teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed." *In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991).

B. Scope of Specification's Exemplary Disclosure

Defendants spend a significant portion of their opening brief "setting the stage" for their enablement arguments by characterizing the '278 Patent specification as only providing any amount of specific information about rules that are part of a "keyframe approach." According to the '278 Patent, the general structure of a "keyframe approach" is a two-step process. First, a set of "correspondence rules" marks the beginning of each new phoneme (*i.e.*, each "keyframe"). *See, e.g.*, '278 Patent at 4:1-11. Second, a set of "transition rules" is used to interpolate between the keyframes.[10] *Id.* Defendants argue that the '278 Patent's only general description explaining how rules are applied to create an animation is explained in terms of these correspondence rules and transition rules. Docket No. 756-1 at 4 (citing '278 Patent at 5:45-6:2). Defendants further state that the "small set of examples of specific rules – twenty in all" each "hew" to these same correspondence and transition rules. *Id.* at 5.

Plaintiff refers to two portions of the specification to support its argument that "none of the disclosed rules require implementation as a 'correspondence' or 'transition' at keyframes." Docket No. 758 at 4. Plaintiff cites a portion of the '278 Patent describing "post processing rules" that states, "some rules may apply only to keyframes before interpolation, some to interpolated data." '278 Patent at 7:17-19. Notably, as Defendants observed at the hearing, Plaintiff's cited portions of the specification relate to an embodiment that still uses keyframing and interpolation as part of the animation process, but simply includes additional rules on top of those applied at keyframes. *See* '278 Patent at 7:16-32; 9:15-27; *see also* '278 Patent at 9:15-27 (describing post-processing rules that can be applied to a morph weight set stream after interpolation).

[10] This approach is very similar to the process for manual animation described in the Background of the Invention section of the '278 Patent. *See* '278 Patent at 2:27-32 ("to animate speech, the artist needs to set all of these weights at each frame to an appropriate value. Usually this is assisted by using a 'keyframe' approach, where the artist sets the appropriate weights at certain important times ('keyframes') and a program interpolates each of the channels at each frame.").

Ultimately, the Court agrees with Plaintiff that the specification uses broad, sweeping language to state that the invention is intended to encompass a wide range of rule sets. Indeed, it is for this reason that the phrase "first set of rules" has been construed broadly. Nor do Defendants dispute this broad construction for purposes of their motion. In one memorable portion, the specification states, "[t]he rules of the present invention are extensible and freeform in the sense that they may be created as desired and adapted to a wide variety of animation characters, situations, and products." '278 Patent at 9:28-31. Elsewhere, the specification describes the rules as "categorized in three main groupings; default rules, auxiliary rules and post processing rules." '278 Patent at 5:5-7. The '278 Patent states,

> [t]he default rules must be complete enough to create valid output for any TAPT encountered at any point in the TAPT. The secondary rules are used in special cases; for example, to substitute alternative morph weight set correspondences and/or transition rules if the identified criteria are met. The post processing rules are used to further manipulate the morph weight set stream after the default or secondary rules are applied, and can further modify the members of the morph weight sets determined by the default and secondary rules and interpolation.

Id. at 5:7-16.

However, as far as tangible examples of rules that would fall into the claimed "first set of rules" limitation, Plaintiff does not present persuasive evidence to show that the specification describes any exemplary rules that fall outside of rules related to a keyframe approach. Indeed, even the '278 Patent's general description of its three groupings for rules assumes interpolation, a concept related to a keyframe approach. *See id.* at 5:16.

Relatedly, the '278 Patent focuses on "the rule's criteria and the rule's function." *See id.* at 4:46-47; *see also id.* at 9:31-34 ("As each rule comprise a criteria and a function, as in an 'if . . . then . . . else' construct. The following are illustrative examples of other rules which may be used with the present methodology."). Plaintiff calls the specification's reference to "if . . . then . . . else" statements a "preferred embodiment," but Plaintiff does not identify any other preferred embodiments in the specification disclosing rules relying on an alternative programming construct.

A review of the specification supports the conclusion that the patent disclosure only provides working examples of rules related to a keyframe approach using an "if . . . then . . . else" construct. A review of the specification also supports the conclusion that the specification, on its face, does not disclose a full set of rules for all English phonemes. Although Plaintiff disagrees with Defendants that the patent's twenty keyframe examples represent only a "small set" of

examples, Plaintiff does not provide any context for its challenge to Defendants' characterization. After establishing the Court's legal interpretation of the scope of the claims and patent disclosure, the Court considers whether a person of skill in the art reviewing the disclosure of the '278 Patent would find the full scope of the "first set of rules" limitation enabled.

C. The Understanding of a Person of Skill in the Art as to the Meaning/Scope of "First Set of Rules" (Examples of Rules that Defendants Argue Are Not Enabled)

Plaintiff argues that the claim language itself places meaningful boundaries on the "first set of rules" claim phrase such that the full scope of the claims could be practiced by a person of skill in the art at the time of the invention without undue experimentation. Specifically, Plaintiff reiterates that the claims require a "rule scheme" of a first set of rules "that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence." Based on the claim language and the exemplary rules disclosed in the specification (and the statements of its expert, Gleicher), Plaintiff argues that the claims are enabled.

At the hearing, Plaintiff also argued that Defendants had not met their burden to prove lack of enablement in part because "counsel has said something other than keyframing is not enabled . . . in every case [Defendants] rely on, there is a specific example of something covered by the claims that an expert opines would require excess experimentation. Defendants and their expert provide no such example." Transcript of Hearing on Defendants' Motion for Summary Judgment, September 14, 2018 ("Tr."), Docket No. 771 at 34:11-20.

Plaintiff's position raises concerns. As one district court has explained in the context of a written description challenge,

> [a] patentee may not draft claims that are sweepingly broad and then defend against a challenge to their breadth by pointing out that the challenger has failed to show that there are any operative embodiments within the broad scope of the claims other than those that were specifically disclosed in the specification. To sustain patent claims on that ground would permit a patentee to "attempt to preempt the future before it has arrived," *Fiers v. Revel*, 984 F.2d 1164, 1171 (Fed. Cir. 1993), and then be rewarded in that effort if the challenger cannot point out exactly how the future will unfold.

Pernix Ireland Pain DAC v. Alvogen Malta Operations Ltd., 323 F. Supp. 3d 566, 629 (D. Del. 2018). Here, as in *Pernix*, Plaintiff does not dispute that the phrase "first set of rules" as currently construed covers more than a keyframe approach. Indeed, beyond citing to the language of the claim itself, Plaintiff does not provide the Court with any exemplary metric that might allow the Court to understand the exact bounds of what is claimed in the '278 Patent as a first set of rules.

Although "[a]n applicant is not required to describe in the specification every conceivable and possible future embodiment of his invention," *Cordis Corp. v. Medtronic AVE Inc.*, 339 F.3d 1352, 1365 (Fed. Cir. 2003), Plaintiff has received the broad claim construction that it sought, and it cannot now avoid an enablement challenge by simply arguing that Defendants have failed to identify an operative alternative embodiment.

More importantly, as Defendants noted at the hearing, their expert, Wyvill, has identified some examples of constructs that he believes would be covered by Plaintiff's interpretation of the claims, but would require excess experimentation when considering the scope of the patent disclosure. Expert Report of Defendants' Expert Dr. Brian Wyvill ("Wyvill Decl."), Docket No. 659 at ¶¶ 370-74. Wyvill, for instance, refers to rules for bones animation in the context of his written description opinions:

> Bones animation . . . relies on the manipulation of 'bones' − disembodied objects used to manipulate relatively large portions of a body or facial model. Because bones are disembodied objects, bones are not 'on' the model. When an animator manipulates a bone, the bone manipulation has a cascade effect (defined by a complex set of rules) that results in the movement of potentially thousands of vertices that are actually on the model.
>
> Nothing in the '278 Patent even remotely suggests that the inventor had possession of the species of rule sets that defines a morph weight set stream as a function of phoneme sequence and time for bone animation . . . . The crude, simplistic examples provided by the '278 Patent in no way inform a person of ordinary skill in the art that the inventor had in his possession a rule set for generating morph weight sets streams for a system using bones.

Id. ¶ 373-74. Plaintiff's expert, Gleicher, does not respond to this point. Defendants do not dispute Plaintiff's argument that "[i]t is the asserted claims rather than the accused device which must be 'enabled' by the patent-in-suit." Docket No. 758 at 9 (quoting *Edwards Lifesciences AG v. CoreValve, Inc.*, No. C.A. 08-91-GMS, 2011 WL 446203, at *6 (D. Del. Feb. 7, 2011), *aff'd in part, remanded in part on other grounds*, 699 F.3d 1305 (Fed. Cir. 2012)). Although Plaintiff's position is supported by legal authority, the accused products are still a relevant example of a modern system Plaintiff previously argued as covered by the "first set of rules" limitation of the claims.[11] *MagSil*, 687 F.3d at 1382–84 ("The record contains no showing that the knowledge of that artisan would permit, at the time of filing, achievement of the modern values above 600%

[11] The Court's tentative order on Defendants' Motion for Summary Judgment of Non-Infringement concluded that "bones" animation does not infringe the asserted claims of the '278 Patent because it does not use morph weight set streams comprised of delta sets.

without undue experimentation."); *cf. Edwards*, 2011 WL 446203 ("In this case, the court did not construe the asserted claims to cover the four attributes of the accused device that CoreValve raises in its non-enablement argument, and CoreValve does not appear to make any effort to tie those attributes back to the actual claim language or to argue that actual limitations appearing in the asserted claim are not enabled."). Notably, in performing his infringement analysis, Gleicher acknowledged that bones were not an attractive approach to facial animation at the time of the invention because of the computations involved:

> [a]t the time of the invention and patent filing (circa 1997), "bones" were not a common approach to facial animation. While the technique was known . . . , it was not applied to facial animation in that era. "Bones" did not become an attractive approach for facial animation until computer hardware advanced to provide [Graphical Processing Units] capable of performing the computations efficiently. Therefore, it is not surprising that the '278 patent does not mention the approach.

Declaration of Michael Gleicher in Support of Plaintiff's Opposition to Defendants' Motion for Summary Judgment of Non-Infringement, Docket No. 658-5 (sealed), ¶ 2.15. Gleicher's statements, in combination with Wyvill's, suggest that at the time of the invention, a person of skill in the art would not have the tools to practice the full scope of the "first set of rules" limitation (that is, a person of skill in the art at the time of the invention would not have the tools based on the patent specification to create a set of rules for a bones animation application that would meet the requirements of the claims) without undue experimentation.

> Wyvill also discloses another example based on the prior art:
>
> The BALDI system provides a good example of a system that uses "rules" that are far more complex and intricate than anything the '278 Patent describes. Its "rules" consist of an interlocking set of mathematical equations . . . that balance the influence of different proximate phonemes on various aspects of the model's facial expression to calculate its "strength" value for each parameter for each phoneme at each point in time. While the system starts with a simpler set of "correspondence" rules that define a target value for each parameter for each phoneme, it then applies a complex set of mathematical operations that (while they can still be characterized as "rules") are far beyond anything the '278 Patent describes.

Wyvill Decl. ¶ 371. Interestingly, rather than take the position that the patent specification on its face would enable rules similar to those disclosed in the BALDI system, Plaintiff relies on BALDI and another prior art reference, Pelachaud, to support an argument that, because systems for formulating rules for lip synchronization were disclosed in the prior art, it was not necessary for the '278 Patent to disclose detailed rule sets.

In support of Plaintiff's position, Gleicher opines that the '278 Patent "instructs one of skill in the art on how to transfer known rules from other systems."[12] Expert Report of Dr. Gleicher Decl. ¶ 204; *see also id.* ¶ 205 ("[t]he '278 [Patent] does not waste time listing the sets of coarticulation rules that were known in the literature (such as from Pelachaud or CM93). Instead, it instructs one of skill in the art in how to transfer this knowledge into a production compatible system."). Gleicher's support for this claim is based on what he refers to as the specification's disclosure of a "rule schema" and the specification's "examples of . . . the different types of rules and how they may be framed within the schema." *Id.* ¶ 205.

Both Plaintiff and Gleicher use the phrase "rule schema"/"rule scheme" even though it appears nowhere in the claims or specification of the '278 Patent. Through this catchphrase, Plaintiff and Gleicher appear to simply be attempting to refer back to the claim language itself and the requirement that the "first set of rules" be used to "define[ ] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence." *See* Docket No. 758 at 13 (citing Gleicher Decl. ¶ 202). This claim language falls a step short of defining an actual required rule set. Plaintiff calls it a "rule schema;" Defendants call it language relating to

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[12] When it comes to the prior art, each side's expert puts itself between a rock and a hard place in attempting to balance opinions relating to § 103 and § 112. Wyvill, for instance, makes statements about the BALDI system in the context of the written description requirement, but elsewhere asserts that the '278 Patent's claimed rules were "one of the simplest and best-known ways known in the art to describe a facial expression, and prior art like Pelachaud and the BALDI system used rule-based algorithms to output more sophisticated forms of blending parameters." Wyvill Decl. ¶ 343; *see also id.* ¶ 173 ("[o]ne of skill in the art in 1996 would have known that it was trivial to apply the algorithms described in Pelachaud to blend AUs defined as delta sets."). As for Gleicher, in disputing obviousness, he argues that:

> Pelachaud shows that the system creator can define the behavior of the face in response to a sequence of phonemes by defining rules that govern the influence of the phonemes over the human face model's detailed musculature in order to create resulting motion . . . it means that the rule author must think in terms of the complexities of human anatomy. This means that defining new rules, or tweaking existing ones, requires a great deal of specialized knowledge. ***It also means that the approach may not apply to characters whose facial features are not defined on human musculature***.

Gleicher Decl. ¶ 61 (emphasis added).

Wyvill's and Gleicher's seemingly conflicting statements in the § 103 and § 112 contexts are notable, but they ultimately distract from the core issue: whether the '278 Patent's disclosure would enable a person of skill in the art at the time of the invention to practice the invention without undue experimentation. This issue is not necessarily the same as the question of whether a person of skill in the art at the time of the invention reviewing the disclosure of the prior art would find that all elements of the invention were previously disclosed (or would be obvious to a person of skill). In other words, whether a person of skill in the art at the time of the invention presented with Pelachaud could reimagine Pelachaud in a way consistent with the '278 Patent claims ***is a different question*** from whether a person of skill presented with the '278 Patent specification would understand how to practice the '278 Patent claims without undue experimentation using rules modified from those disclosed by Pelachaud.

the required inputs and outputs for a first set of rules. Either way, the parties do not dispute that beyond this information, there are no limits on any exact rule sets that must be employed to practice the claims in the claim language itself. As to what is taught in the specification, as previously noted, the exemplary rules all relate to a narrow subset of rules that are relevant to an "if . . . then . . . else" keyframing approach. In other words, the "different types of rules" in the specification to which Gleicher refers all fall into a few narrow species within the claimed rule genus. Beyond these two aspects of the disclosure – the claim language itself and the "different types of rules" disclosed in the specification – Gleicher provides no explanation to support his conclusory assertion that a person of skill in the art would understand the '278 Patent to teach how to "transfer" complex rule sets as described in the prior art and modify them for use consistent with its disclosure. Indeed, there is no language in the specification relating to "transferring" rules from other systems for use consistent with the claimed invention, particularly rule sets that do not rely on "if . . . then . . . else" keyframing. Because Gleicher's assertions are conclusory and unsupported by the patent intrinsic record, they can be rejected. *Telemac Cellular Corp. v. Topp Telecom, Inc.*, 247 F.3d 1316, 1329 (Fed. Cir. 2001) ("Broad conclusory statements offered by Telemac's experts are not evidence and are not sufficient to establish a genuine issue of material fact."). Gleicher's conclusory assertions do not create a genuine question of material fact regarding whether the prior art can supply the relevant disclosure missing from the patent specification to enable a person of skill in the art to practice the full scope of the "first set of rules" limitation.

The shortcomings in Gleicher's assertions are relevant. There can be no dispute that the novel aspect of the '278 Patent's asserted claims relates to the "first set of rules" limitation. That limitation was the entire focus of Plaintiff's arguments that the claims satisfied § 101 and the entire focus of the Federal Circuit's § 101 determination at the pleadings stage. *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1315 (Fed. Cir. 2016) ("The claimed process uses a combined order of specific rules that renders information into a specific format that is then used and applied to create desired results: a sequence of synchronized, animated characters."). As the novel aspect of the claim language, enablement requires disclosure in the specification itself:

> that general, oft-repeated statement [that a specification need not disclose what is well known in the art] is merely a rule of supplementation, not a substitute for a basic enabling disclosure. It means that the omission of minor details does not cause a specification to fail to meet the enablement requirement. However, when

> there is no disclosure of any specific starting material or of any of the conditions under which a process can be carried out, undue experimentation is required; there is a failure to meet the enablement requirement that cannot be rectified by asserting that all the disclosure related to the process is within the skill of the art. It is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement.

Genentech, Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1366 (Fed. Cir. 1997); *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274, 1283 (Fed. Cir. 2007) ("Although the knowledge of one skilled in the art is indeed relevant, the novel aspect of an invention must be enabled in the patent."). Here, Wyvill has provided examples of rule sets that would be covered by the "first set of rules" limitation but are not disclosed in any form in the patent specification. As the "first set of rules" is the novel aspect of the invention, enabling disclosure related to the full scope of that limitation must be found in the patent specification itself, not just in prior art systems employing rules in a different way. Indeed, there are no tangible rule sets described in the '278 Patent beyond an "if . . . then . . . else" keyframing approach as the starting place for creating an exemplary set of rules for defining a morph weight set stream as a function of time and phoneme sub-sequence. Setting that information aside, the '278 Patent provides no information to support how/why a set of "transferred" prior art rules could be appropriately implemented consistent with the claimed invention. In other words, to the extent there could even be a question of "transferred" prior art rule sets, "there is no disclosure of any specific starting material or of any of the conditions under which a process can be carried out." *Genentech*, 108 F.3d at 1366; *Auto. Techs.*, 501 F.3d at 1283.

Defendants rely on − and Plaintiff attempts to distinguish − the Federal Circuit's decision in *Auto. Techs.*. The patent in that case involved side-door crash-sensing devices. *Auto. Techs.*, 501 F.3d at 1276-77. The district court construed the claims to cover not only mechanical switch assemblies, but also electronic switch assemblies to serve as the claimed sensing device. *Id.* at 1279. The Federal Circuit affirmed the district court's conclusion that the claims were not enabled to cover their full scope. *Id.* at 1285. The Federal Circuit observed that even though there was some disclosure of electronic switch assemblies in the specification, there was not any discussion of the circuitry involved or other information about how the circuit operated. *Id.* at 1282-83 ("Figure 11 represents a concept of an electronic sensor, not a figure providing details that would show one skilled in the art how to make or use an electronic side impact sensor"). The patentee's expert opined that electronic sensors for frontal impacts were widely known at the time the patent was filed and that a person of skill in the art would have known how to adapt then-existing

technology to create an electronic side-impact sensor. *Id.* at 1285-86. The court observed, however, that the expert provided no detail on how to adapt the existing technology and on that basis found the expert's testimony did not create a genuine issue of material fact. *Id.* The situation is analogous here. The specification discloses limited examples of certain types of rules that could be instituted consistent with the claims. Defendants have submitted clear and convincing evidence of rule sets that are uniquely different from those disclosed in the '278 Patent. Although the '278 Patent claims' reference to a "first set of rules" has been characterized as a genus, the evidence shows that the species within that genus are distinct. Beyond the requirement that the first set of rules define a morph weight set stream as a function of time and phoneme sub-sequence, the evidence suggests that they do not necessarily share common traits such that identifying one is sufficient to identify the rest. As in *Auto. Techs.*, Plaintiff's expert here attempts to rely on prior art systems to supply additional information about the "first set of rules," but fails to explain how a person of skill in the art would be able to adapt then-existing technology to satisfy the requirements of the claimed invention of the '278 Patent.

D. Whether the "First Set of Rules" Limitation Is Enabled as a Matter of Law

Defendants have submitted expert testimony[13] and specific evidence of rule sets that would be covered by the "first set of rules" limitation even though they are not specifically disclosed by the '278 Patent. Defendants have further submitted expert testimony to support their position that a person of skill in the art at the time of the invention would not find these examples enabled by the patent disclosure. As previously explained, Plaintiff fails to provide adequate rebuttal to this evidence; Plaintiff either fails to provide a response at all or submits conclusory evidentiary arguments that are premised on an incorrect understanding of the law of enablement. Although they are "illustrative, not mandatory," *Amgen,* 927 F.2d at 1213, the *Wands* factors further confirm that on the current record Plaintiff has failed to present a genuine factual dispute to rebut Defendant's showing that the "first set of rules" limitation is not enabled.

(1) The quantity of experimentation necessary

As previously discussed *supra*, Plaintiff improperly relies on *CFMT* to support its position

[13] Plaintiff also argues that Defendants' expert's testimony should be rejected because Wyvill demonstrated a "fundamental misunderstanding of the '278 Patent and the claims" during his deposition. Docket No. 758 at 18. A review of Plaintiff's narrow citations from Wyvill's deposition do not support Plaintiff's sweeping claim. Moreover, as Defendants observed, none of Plaintiff's citations relate to the issue of enablement at all. The Court declines to reject the portions of Wyvill's opinions that it relies upon in this Order.

that the claims need only enable elementary rules without undue experimentation, including rule sets for limited subsets of phonemes. Plaintiff's arguments can be rejected for relying on an inconsistent understanding of the law of enablement. The full scope of the claims must be enabled.

In addition to the aspects of enablement caselaw already discussed, Plaintiff's brief and its expert's report both further imply that the requirements of enablement are satisfied when a patent adequately discloses a single "mode" to achieve the claimed invention. This assumption also colors some of Plaintiff's positions and arguments, particularly those related to undue experimentation. For instance, Plaintiff states in opposition, "[a]s a general rule, in the predictable arts 'the enablement requirement is met if the description enables ***any mode of making and using the invention***.'" Docket No. 758 at 8 (quoting *Invitrogen Corp. v. Clontech Labs., Inc.*, 429 F.3d 1052, 1071 (Fed. Cir. 2005)); *see also id.* at 16-17. The *Invitrogen* case, however, was specifically limited to addressing the enablement of a claimed composition, not a claimed method. Indeed, *Invitrogen* specifically distinguished itself from other cases involving questions of enablement of method claims more similar to the ones at issue in this case. *Invitrogen*, 429 F.3d at 1071 (citing *Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1198 (Fed. Cir. 1999)) (observing that in *National Products*, "[t]he claim was to a method, not a compound."). In the context of method claims, the issue is not as black and white as composition claims. Disclosing only one species of a genus is not necessarily enough. *See, e.g.*, *Auto Techs.*, 501 F.3d at 1285; *In re Vaeck*, 947 F.2d 488, 495-96 (Fed. Cir. 1991) ("[i]t is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art . . . . However, there must be sufficient disclosure, either through illustrative examples or terminology, to teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed."). Plaintiff's assumptions about the sufficiency of disclosing only a "single mode" similarly conflict with Federal Circuit law that focuses on and emphasizes the importance of enabling the full scope of the claims. *See, e.g.*, *Auto. Techs.*, 501 F.3d at 1276-77.

In addition to his statements regarding "bones" animation and BALDI/Pelachaud, in the context of his written description opinions, Wyvill submits expert testimony stating,

> [t]here are innumerable ways a programmer might use "rules" to define a morph weight set stream, including many ways that are far more complex than anything that Mr. Rosenfeld described in the '278 Patent. However, to the extent the specification discloses specific examples of particular rules at all, its disclosure is limited to a handful of crude, simplistic "if [ ] then" statements . . . . And even here, the specification does not provide a set of rules sufficient to actually construct a

working system.

Wyvill Decl., ¶ 363. Wyvill observes that the '278 Patent itself explains that all rules must be manually set up by the user. *Id.* ¶ 378 (citing '278 Patent at 6:43-45). Wyvill notes that even the examples disclosed by the '278 Patent "fail[ ] to provide default rules that cover even a small percentage of the potential sequences that could arise in a time-aligned phonetic transcript." *Id.* ¶ 379. This evidence supports a conclusion that the full scope of the claims requires undue experimentation.

Gleicher responds to Wyvill's assertions in part by asserting that Wyvill "applies an incorrect standard as the claims do not recite a limitation that the animation necessarily be 'high-quality.'" Gleicher Decl. ¶ 206. For the reasons stated, Gleicher fails to meaningfully respond to Wyvill's position regarding undue experimentation because his arguments are drawn to the incorrect legal standard. There is no genuine dispute of material fact related to this factor. It weighs in favor of a finding that the claim term is not enabled.

(2 & 3) The amount of direction or guidance presented and the presence or absence of working examples

The experts' dispute regarding *Wands* factors 2 and 3 relates back to issues already addressed *supra*. The '278 Patent provides 20 examples of individual rules, but all of those examples are in the context of "if . . . then . . . else" keyframing. Plaintiff's attempt to characterize the patent specification as providing examples of rules beyond those related to an "if . . . then . . . else" keyframing approach has already been rejected. The '278 Patent also provides just one working example for a character speaking the word "hello." *See* '278 Patent at 7:55-8:55. This working example similarly relates to an "if . . . then . . . else" keyframing approach.

There is no reasonable dispute that the claim phrase "first set of rules" has been construed to be much broader than rules related to "if . . . then . . . else" keyframing. For reasons previously stated, there is also no reasonable dispute that a person of skill in the art at the time of the invention would find the disclosure related to "if . . . then . . . else" keyframing insufficient to provide guidance as to other types of rules that define morph weight set streams as a function of time and phoneme sub-sequence. Namely there is insufficient evidence to suggest how a person of skill would adapt or "transfer" other rule constructs for use consistent with the claimed invention and its "rule scheme." Although Defendants conceded at the hearing that the claims might be enabled to the extent they related to a set of rules for the word "hello" and the patent could be interpreted

to conclude that they are enabled for "if . . . then . . . else" rules or rules relating to keyframing, the claims have been interpreted much more broadly. There is no genuine dispute of material fact related to these factors. They weigh in favor of a finding that the claim term is not enabled.

(4 - 6) The nature of the invention, the state of the prior art, and the relative skill of those in the art

Plaintiff argues that *Wands* factors 4-6 "strongly counsel" against a finding of non-enablement because "computer animation was a well-developed field at the time of the invention." Docket No. 758 at 20. It is in discussing these factors that Plaintiff refers to the rules known in the prior art and how rules regarding co-articulation from prior art references could be modified consistent with the '278 Patent disclosure without undue experimentation. *Id.* at 21-22.

As previously stated, the nature of the invention and specifically the novel aspect of the invention relates to using a first set of rules to define a morph weight set stream as a function of timing and phoneme sub-sequence. The invention is thus not just related to the field of computer animation, but to the field of automating lip-sync computer animation using certain rules. In this area, the '278 Patent suggests that it is at the forefront as far as technological innovation, explaining how prior art systems involved animators manually entering morph weights for a character's facial expression based on listening to a time aligned phonetic transcript. '278 Patent 2:29-32.

Although both experts apparently agree that the state of computer animation overall and the development of rules for animation was well-developed in other contexts (*e.g.*, Pelachaud and BALDI) as previously discussed, the prior art cannot serve as a substitute for enabling disclosure for the novel aspects of the invention.

These factors are largely irrelevant to the core issue influencing enablement in this case: whether the novel aspect of the claimed invention is enabled based on the specification's disclosure. *See Auto. Techs.*, 501 F.3d at 1283.

(7) The predictability or unpredictability of the art

As Plaintiff puts it, "the '278 Patent's preferred embodiment teaches a computer program comprised of if-then-else statements . . . . Such a computer program would necessarily yield predictable results, *i.e.*, if X, then Y, else Z, and Defendants do not identify any rule set that would not yield predictable results." Docket No. 758 at 23. Plaintiff's argument rests on similar logical fallacies to those already addressed. First, Plaintiff focuses on the '278 Patent's disclosure of "if . . . then . . . else" rules even though Plaintiff and its expert take the position that the asserted claims

are not limited to "if . . . then . . . else" rules. Second, Plaintiff blames Defendants for allegedly failing to identify relevant rule sets that would not yield predictable results. As previously noted, such an argument both loses focus of the relevant § 112 inquires and is factually incorrect.

Wyvill states that "the results of experimenting with new sets of rules would have been difficult to predict, particularly for more complicated sets of rules." Wyvill Decl. ¶ 380. Wyvill also specifically emphasizes that:

> formulating a set of rules with the necessary complexity would require far more technical sophistication than the patent even hints at, as I know from attempting to do it myself in the 1980s, and as is evident from, for example, the PhD work of Catherine Pelachaud and the BALDI system. For example, the '278 Patent provides no real insight on how to implement rules to perform coarticulation, which is a complicated subject that scholars have spent years studying.

Wyvill Decl. ¶ 381. As with other *Wands* factor, the key issue is that the programmed/automated aspect of the claims, and specifically the use of a first set of rules that can define morph weight set streams as a function of time and phoneme sequence, is the novel aspect. As also previously stated, Plaintiff has not provided substantial evidence to show how complex rule sets from prior art systems could be transferred for use consistent with the requirements of the claims. Particularly as to predicting whether certain rules would function adequately in the context of the requirements of the claimed "first set of rules," Plaintiff has not submitted factual matter based on the proper understanding of the law to support its argument and to rebut Defendants' clear and convincing evidence.

(8) The breadth of the claims

Although Plaintiff argues that the breadth of the claims is narrow, Plaintiff again does not dispute that the "first set of rules" limitation encompasses far more than "if . . . then . . . else" keyframing rules. Indeed, beyond the requirement that claimed rules "define[ ] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence," there is no evidence establishing the boundaries of the "first set of rules" limitation. Like the claims in *MagSil*, the "first set of rules" limitation has the ability to expand to absorb modern rule sets even though the '278 Patent fails to disclose even a full set of rules for a simple "if . . . then . . . else" keyframe approach. *MagSil, Inc.*, 687 F.3d at 1380-81. There is no genuine dispute of material fact related to this factor. It weighs in favor of a finding that the claim term is not enabled.

E. Dependent Claims

In the Motion, Defendants argue that the asserted dependent claims are not enabled for the same reasons as Claim 1. Docket No. 756-1 at 17. Defendants observe that neither Claim 4 nor Claim 13 "are directed to a narrower species of rules than the 'first set of rules' recited in claim 1." *Id.* Plaintiff does not respond to this argument, and an independent review of Claims 4 and 13 support Defendants' position. A non-enablement determination is appropriate as to all three asserted claims.

III. CONCLUSION

Plaintiff's "difficulty in enabling the asserted claims is a problem of its own making." *Id.* at 1384. Plaintiff received broad claim scope and presents arguments suggesting it should be even broader in response to Defendants' summary judgment motion. Plaintiff has failed to submit sufficient evidence to demonstrate a question of material fact − in light of the state of the law on enablement and Defendants' clear and convincing evidence that the asserted claims are not enabled.

For the reasons stated in this Order, Defendants' Motion for Summary Judgment of Invalidity for Lack of Enablement (Docket No. 756) is **GRANTED**.

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	CV 12-10322-GW(FFMx)	Date	November 13, 2018
Title	*McRO, Inc., v. Namco Bandai Games America, Inc., and Related Actions*		

Present: The Honorable	GEORGE H. WU, UNITED STATES DISTRICT JUDGE	
Javier Gonzalez	None Present	
Deputy Clerk	Court Reporter / Recorder	Tape No.
Attorneys Present for Plaintiffs:	Attorneys Present for Defendants:	
None Present	None Present	

PROCEEDINGS: IN CHAMBERS - FINAL RULING AND ORDER RE STATUS CONFERENCE FOR ALL REMAINING MATTERS

Attached hereto is the Court's Final Ruling and Order Re: status Conference for All Remaining Matters. A Telephonic Status Conference is set for November 26, 2018 at 8:30 a.m. to discuss any remaining issues the parties wish to have addressed before they are directed to meet and confer regarding the form of a final judgment for this matter.

_____ : _____

Initials of Preparer JG

McRO, Inc., d.b.a. Planet Blue v. Namco Bandai Games America, Inc., Case No. CV 12-10322-GW (FFMx) (LEAD TRACK 1 CONSLIDATED CASE); Adoption of Amended Tentative Ruling (Docket No. 755) as Final Ruling and Order re Status Conference for All Remaining Matters

The Court has issued a Final Ruling on Defendants' Motion for Summary Judgment of Invalidity for Lack of Enablement. *See* Docket No. . Consistent with previous discussions with the parties, the Court hereby also adopts its "Amended Tentative Ruling on Scheduled Motions" at Docket No. 755 as a Final Ruling of this Court. As stated in the Amended Tentative Ruling, the Court rules as follows:

The Court **GRANTS** Defendants' Motion for Summary Judgment of Non-Infringement. Docket No. 643. The Court **OVERRULES** Defendants' Objections to Plaintiff's Opposition to Defendants' Motion for Summary Judgment of Non-Infringement or Invalidity. *See* Docket Nos. 711, 727. The Court **DENIES** all of the Defendants' other pending motions before this Court as **MOOT**.[1]

In light of the Court's Final Ruling finding the asserted claims invalid for lack of enablement, the Court would also modify the Amended Tentative Ruling to **DENY** Plaintiff's Motion for Summary Judgment of No Anticipation as **MOOT**.

As discussed in Footnote 3 of the Court's Final Ruling on Defendants' Motion for Summary Judgment for Lack of Enablement, the Court understands that a dispute remains regarding the terms of dismissal of Defendants' (except Square Enix's) counterclaims regarding the '576 Patent. The parties are **ORDERED** to file a joint status report by November 19, 2018 not to exceed seven pages indicating whether their respective positions regarding this dispute have

[1] This includes:

- Defendants' Motion for Summary Judgment or Partial Summary Judgment of Non-Infringement Under 35 U.S.C. § 271(g) (Docket No. 638);
- Defendants' Motion for Summary Judgment of No Willful Infringement (Docket No. 634 (public notice of motion); Docket No. 655 (sealed));
- Defendant Square's Motion to Strike Portions of Gleicher Expert Report (Docket No. 628);
- Defendant Square's [Corrected] Motion for Summary Judgment of Non-Infringement Due to Failure of Proof (Docket No. 632; *see also* Docket No. 629 (original Notice of Motion for Failure of Proof));
- Defendant Square's Motion for Summary Judgment that Plaintiff's Claims are Barred by 35 U.S.C. § 287(b)(2) (Docket No. 635); and
- Defendants' still-pending early Motion for Summary Judgment of Non-Infringement, filed June 23, 2017. *See* Docket No. 431; *see also* Docket No. 448 (Plaintiff's *ex parte* application for leave to file a sur-reply to Defendants' early summary judgment motion); Docket No. 455 (Minutes of Hearing on early summary judgment motion and attached tentative ruling).

changed and, if they so choose, providing additional information to support their respective positions. A Telephonic Status Conference is set for November 26, 2018 at 8:30 am to discuss any remaining issues the parties wish to have addressed before they are directed to meet and confer regarding the form of a final judgment for this matter.

US006611278B2

(12) **United States Patent**
Rosenfeld

(10) **Patent No.: US 6,611,278 B2**
(45) **Date of Patent: *Aug. 26, 2003**

(54) **METHOD FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF ANIMATED CHARACTERS**

(76) Inventor: **Maury Rosenfeld**, 4941 Ambrose Ave, Los Angeles, CA (US) 90027

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/960,831**

(22) Filed: **Sep. 21, 2001**

(65) **Prior Publication Data**

US 2002/0101422 A1 Aug. 1, 2002

Related U.S. Application Data

(63) Continuation of application No. 08/942,987, filed on Oct. 2, 1997, now Pat. No. 6,307,576.

(51) **Int. Cl.**[7] **G06T 13/00**; G09G 5/00

(52) **U.S. Cl.** **345/956**; 345/473; 345/646

(58) **Field of Search** 345/473, 646, 345/647, 951, 953, 955, 956, 957

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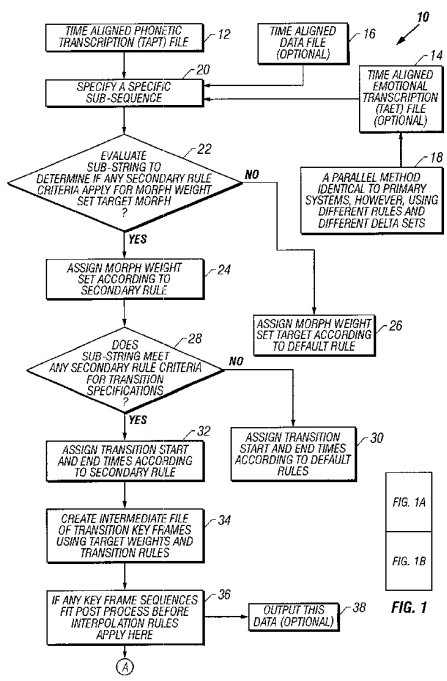
* cited by examiner

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Assistant Examiner—Ryan Yang
(74) *Attorney, Agent, or Firm*—The Hecker Law Group

(57) **ABSTRACT**

A method for controlling and automatically animating lip synchronization and facial expressions of three dimensional animated characters using weighted morph targets and time aligned phonetic transcriptions of recorded text. The method utilizes a set of rules that determine the systems output comprising a stream of morph weight sets when a sequence of timed phonemes and/or other timed data is encountered. Other data, such as timed emotional state data or emotemes such as "surprise, "disgust, "embarrassment", "timid smile", or the like, may be inputted to affect the output stream of morph weight sets, or create additional streams.

36 Claims, 4 Drawing Sheets



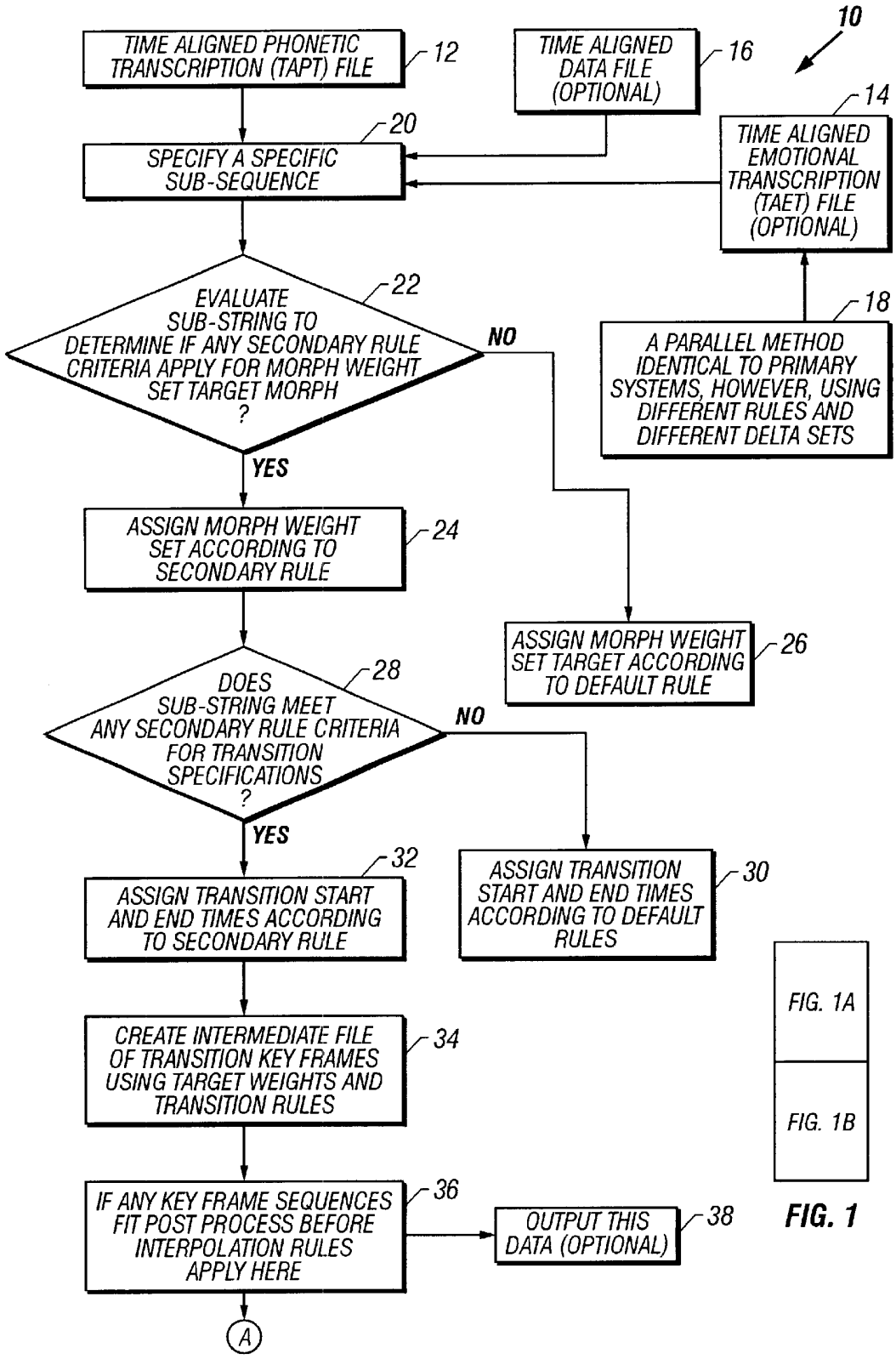

10
TIME ALIGNED PHONETIC TRANSCRIPTION (TAPT) FILE
12
TIME ALIGNED DATA FILE (OPTIONAL)
16
14
TIME ALIGNED EMOTIONAL TRANSCRIPTION (TAET) FILE (OPTIONAL)
20
SPECIFY A SPECIFIC SUB-SEQUENCE
22
EVALUATE SUB-STRING TO DETERMINE IF ANY SECONDARY RULE CRITERIA APPLY FOR MORPH WEIGHT SET TARGET MORPH ?
NO
YES
18
A PARALLEL METHOD IDENTICAL TO PRIMARY SYSTEMS, HOWEVER, USING DIFFERENT RULES AND DIFFERENT DELTA SETS
ASSIGN MORPH WEIGHT SET ACCORDING TO SECONDARY RULE
24
ASSIGN MORPH WEIGHT SET TARGET ACCORDING TO DEFAULT RULE
26
28
DOES SUB-STRING MEET ANY SECONDARY RULE CRITERIA FOR TRANSITION SPECIFICATIONS ?
NO
YES
32
ASSIGN TRANSITION START AND END TIMES ACCORDING TO SECONDARY RULE
ASSIGN TRANSITION START AND END TIMES ACCORDING TO DEFAULT RULES
30
CREATE INTERMEDIATE FILE OF TRANSITION KEY FRAMES USING TARGET WEIGHTS AND TRANSITION RULES
34
IF ANY KEY FRAME SEQUENCES FIT POST PROCESS BEFORE INTERPOLATION RULES APPLY HERE
36
OUTPUT THIS DATA (OPTIONAL)
38
A
FIG. 1A
FIG. 1B

FIG. 1

FIG. 1A

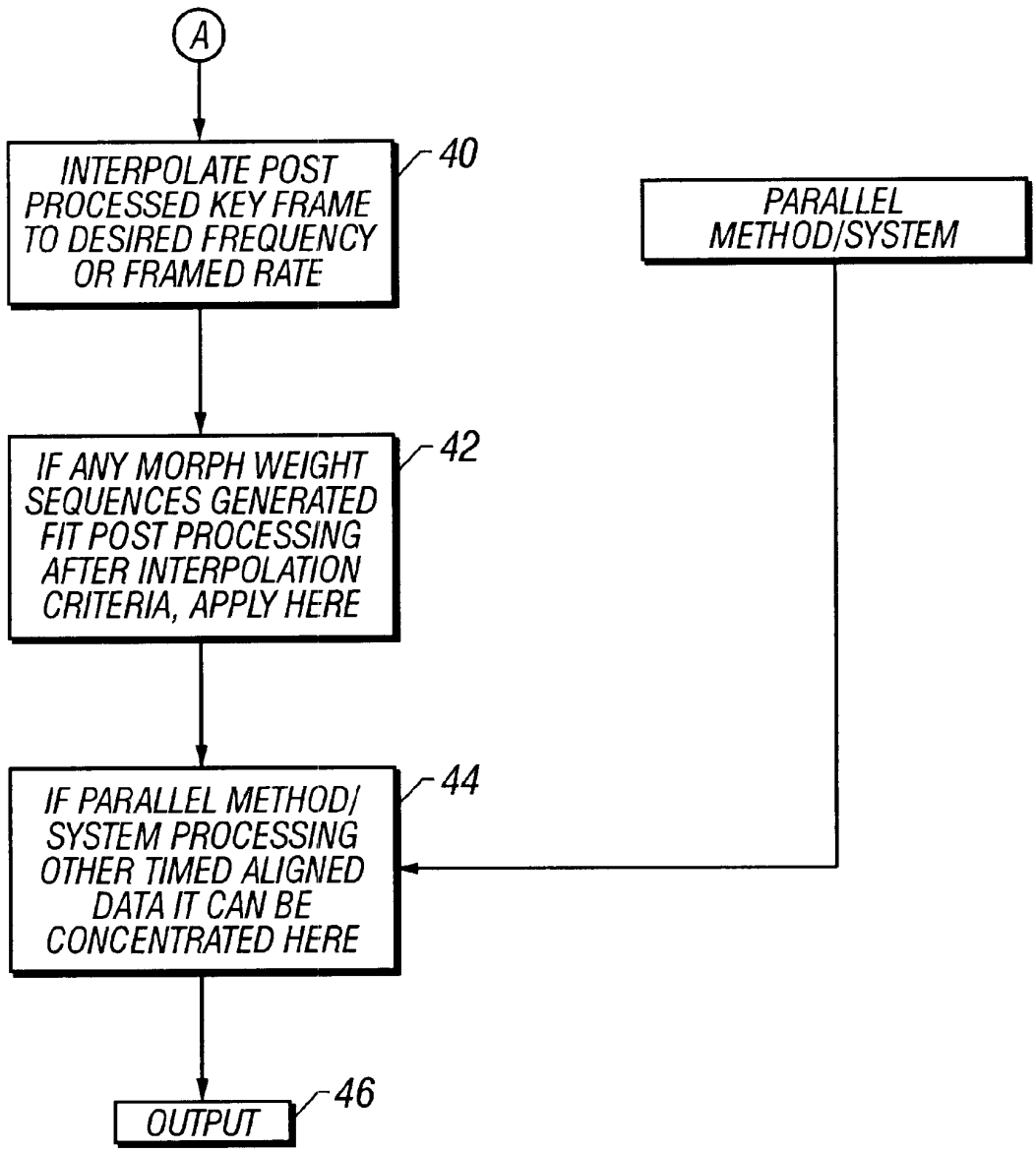

A
INTERPOLATE POST PROCESSED KEY FRAME TO DESIRED FREQUENCY OR FRAMED RATE
40
PARALLEL METHOD/SYSTEM
IF ANY MORPH WEIGHT SEQUENCES GENERATED FIT POST PROCESSING AFTER INTERPOLATION CRITERIA, APPLY HERE
42
IF PARALLEL METHOD/ SYSTEM PROCESSING OTHER TIMED ALIGNED DATA IT CAN BE CONCENTRATED HERE
44
OUTPUT
46

FIG. 1B

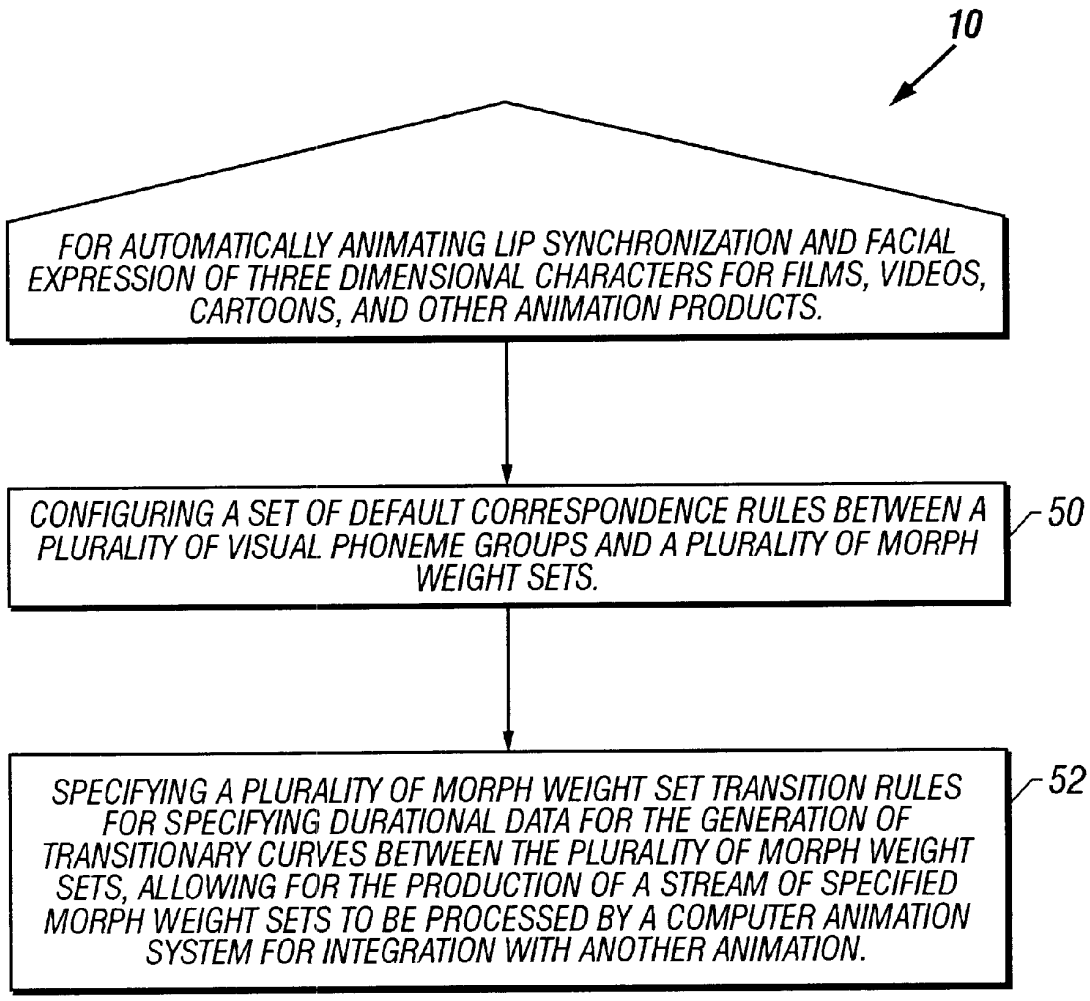

10
FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF THREE DIMENSIONAL CHARACTERS FOR FILMS, VIDEOS, CARTOONS, AND OTHER ANIMATION PRODUCTS.
CONFIGURING A SET OF DEFAULT CORRESPONDENCE RULES BETWEEN A PLURALITY OF VISUAL PHONEME GROUPS AND A PLURALITY OF MORPH WEIGHT SETS.
50
SPECIFYING A PLURALITY OF MORPH WEIGHT SET TRANSITION RULES FOR SPECIFYING DURATIONAL DATA FOR THE GENERATION OF TRANSITIONARY CURVES BETWEEN THE PLURALITY OF MORPH WEIGHT SETS, ALLOWING FOR THE PRODUCTION OF A STREAM OF SPECIFIED MORPH WEIGHT SETS TO BE PROCESSED BY A COMPUTER ANIMATION SYSTEM FOR INTEGRATION WITH ANOTHER ANIMATION.
52

FIG. 2

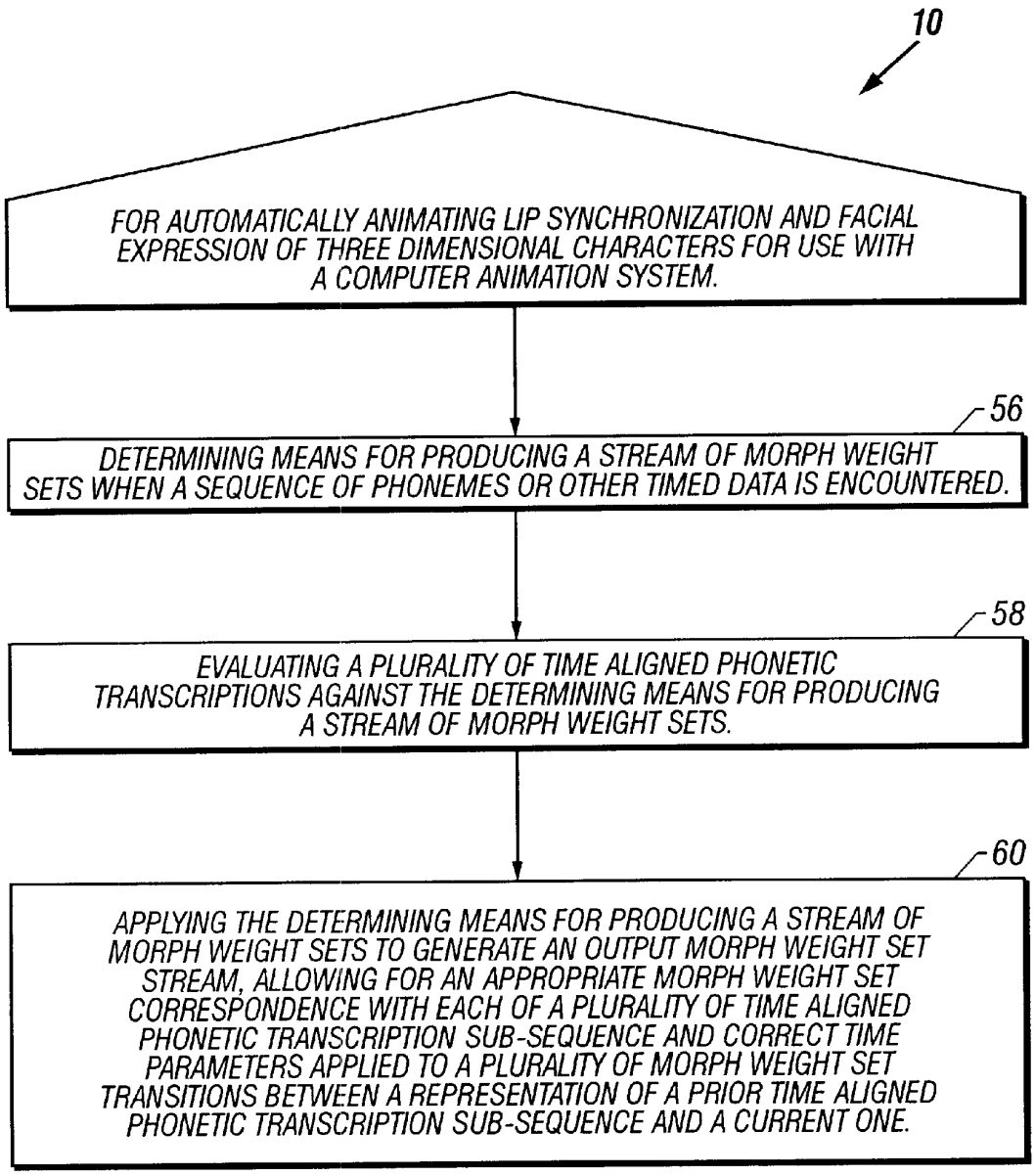

10
FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF THREE DIMENSIONAL CHARACTERS FOR USE WITH A COMPUTER ANIMATION SYSTEM.
56
DETERMINING MEANS FOR PRODUCING A STREAM OF MORPH WEIGHT SETS WHEN A SEQUENCE OF PHONEMES OR OTHER TIMED DATA IS ENCOUNTERED.
58
EVALUATING A PLURALITY OF TIME ALIGNED PHONETIC TRANSCRIPTIONS AGAINST THE DETERMINING MEANS FOR PRODUCING A STREAM OF MORPH WEIGHT SETS.
60
APPLYING THE DETERMINING MEANS FOR PRODUCING A STREAM OF MORPH WEIGHT SETS TO GENERATE AN OUTPUT MORPH WEIGHT SET STREAM, ALLOWING FOR AN APPROPRIATE MORPH WEIGHT SET CORRESPONDENCE WITH EACH OF A PLURALITY OF TIME ALIGNED PHONETIC TRANSCRIPTION SUB-SEQUENCE AND CORRECT TIME PARAMETERS APPLIED TO A PLURALITY OF MORPH WEIGHT SET TRANSITIONS BETWEEN A REPRESENTATION OF A PRIOR TIME ALIGNED PHONETIC TRANSCRIPTION SUB-SEQUENCE AND A CURRENT ONE.

FIG. 3

METHOD FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF ANIMATED CHARACTERS

This is a continuation of application Ser. No. 08/942,987 filed Oct. 2, 1997, now U.S. Pat. No. 6,307,576.

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates generally to animation producing methods and apparatuses, and more particularly is directed to a method for automatically animating lip synchronization and facial expression for three dimensional characters.

2. Description of the Related Art

Various methods have been proposed for animating lip synchronization and facial expressions of animated characters in animated products such as movies, videos, cartoons, CD's, and the like. Prior methods in this area have long suffered from the need of providing an economical means of animating lip synchronization and character expression in the production of animated products due to the extremely laborious and lengthy protocols of such prior traditional and computer animation techniques. These shortcomings have significantly limited all prior lip synchronization and facial expression methods and apparatuses used for the production of animated products. Indeed, the limitations of cost, time required to produce an adequate lip synchronization or facial expression in an animated product, and the inherent imitations of prior methods and apparatuses to satisfactorily provide lip synchronization or express character feelings and emotion, leave a significant gap in the potential of animated methods and apparatuses in the current state of the art.

Time aligned phonetic transcriptions (TAPTS) are a phonetic transcription of a recorded text or soundtrack, where the occurrence in time of each phoneme is also recorded. A "phoneme" is defined as the smallest unit of speech, and corresponds to a single sound. There are several standard phonetic "alphabets" such as the International Phonetic Alphabet, and TIMIT created by Texas instruments, Inc. and MIT. Such transcriptions can be created by hand, as they currently are in the traditional animation industry and are called "x" sheets, or "gray sheets" in the trade. Alternatively such transcriptions can be created by automatic speech recognition programs, or the like.

The current practice for three dimensional computer generated speech animation is by manual techniques commonly using a "morph target" approach. In this practice a reference model of a neutral mouth position, and several other mouth positions, each corresponding to a different phoneme or set of phonemes is used. These models are called "morph targets". Each morph target has the same topology as the neutral model, the same number of vertices, and each vertex on each model logically corresponds to a vertex on each other model, or example, vertex #n on all models represents the left corner of the mouth, and although this is the typical case, such rigid correspondence may not be necessary.

The deltas of each vertex on each morph target relative to the neutral are computed as a vector from each vertex n on the reference to each vertex n on each morph target. These are called the delta sets. There is one delta set for each morph target.

In producing animation products, a value usually from 0 to 1 is assigned to each delta set by the animator and the value is called the "morph weight". From these morph

weights, the neutral's geometry is modified as follows: Each vertex N on the neutral has the corresponding delta set's vertex multiplied by the scalar morph weight added to it. This is repeated for each morph target, and the result summed. For each vertex v in the neutral model:

$$|\text{result}| = |\text{neutral}| + \Sigma_{x=1}{}^{n} |\text{delta setx}| |\text{morph weigh}$$

where the symbol |xxx| is used to indicate the corresponding vector in each referenced set. For example, |result| is the corresponding resultant vertex to vertex v in the neutral model |neutral| and |delta setx| is the corresponding vector for delta set x.

If the morph weight of the delta set corresponding to the morph target of the character saying, for example, the "oh" sound is set to 1, and all others are set to 0, the neutral would be modified to look like the "oh target. If the situation was the same, except that the "oh" morph weight was 0.5, the neutral's geometry is modified half way between neutral and the "oh" morph target.

Similarly, if the situation was as described above, except "oh" weight was 0.3 and the "ee" morph weight was at 0.7, the neutral geometry is modified to have some of the "oh" model characteristics and more of the "ee" model characteristics. There also are prior blending methods including averaging the delta sets according to their weights.

Accordingly, to animate speech, the artist needs to set all of these weights at each frame to an appropriate value. Usually this is assisted by using a "keyframe" approach, where the artist sets the appropriate weights at certain important times ("keyframes") and a program interpolates each of the channels at each frame. Such keyframe approach is very tedious and time consuming, as well as inaccurate due to the large number of keyframes necessary to depict speech.

The present invention overcomes many of the deficiencies of the prior art and obtains its objectives by providing an integrated method embodied in computer software for use with a computer for the rapid, efficient lip synchronization and manipulation of character facial expressions, thereby allowing for rapid, creative, and expressive animation products to be produced in a very cost effective manner.

Accordingly, it is the primary object of this invention to provide a method for automatically animating lip synchronization and facial expression of three dimensional characters, which is integrated with computer means for producing accurate and realistic lip synchronization and facial expressions in animated characters. The method of the present invention further provides an extremely rapid and cost effective means to automatically create lip synchronization and facial expression in three dimensional animated characters.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

SUMMARY OF THE INVENTION

To achieve the foregoing objects, and in accordance with the purpose of the invention as embodied and broadly described herein, a method is provided for controlling and automatically animating lip synchronization and facial expressions of three dimensional animated characters using weighted morph targets and time aligned phonetic transcrip-

tions of recorded text, and other time aligned data. The method utilizes a set of rules that determine the systems output comprising a stream or streams of morph weight sets when a sequence of timed phonemes or other timed data is encountered. Other timed data, such as pitch, amplitued, noise amounts, or emotional state data or emotemes such as "surprise, "disgust, "embarrassment", "timid smile", or the like, may be inputted to affect the output stream of morph weight sets.

The methodology herein described allows for automatically animating lip synchronization and facial expression of three dimensional characters in the creation of a wide variety of animation products, including but not limited to movies, videos, cartoons, CD's, software, and the like. The method and apparatuses herein described are operably integrated with computer software and hardware.

In accordance with the present invention there also is provided a method for automatically animating lip synchronization and facial expression of three dimensional characters for films, videos, cartoons, and other animation products, comprising configuring a set of default correspondence rules between a plurality of visual phoneme groups and a plurality of morph weight sets; and specifying a plurality of morph weight set transition rules for specifying durational data for the generation of transitionary curves between the plurality of morph weight sets, allowing for the production of a stream of specified morph weigh sets to be processed by a computer animation system for integration with other animation, whereby animated lip synchronization and facial expression of animated characters may be automatically controlled and produced.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate a preferred embodiment of the invention and, together with a general description given above and the detailed description of the preferred embodiment given below, serve to explain the principles of the invention.

FIG. **1** is a flow chart showing the method of the invention with an optional time aligned emotional transcription file, and another parallel timed data file, according to the invention.

FIG. **2** is a flow chart illustrating the principal steps of the present method, according to the invention.

FIG. **3** is another representational flow chart illustrating the present method, according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the invention as illustrated in the accompanying drawings.

In accordance with the present invention, there is provided as illustrated in FIGS. **1–3**, a method for controlling and automatically animating lip synchronization and facial expressions of three dimensional animated characters using weighted morph targets and time aligned phonetic transcriptions of recorded text. The method utilizes a set of rules that determine the systems output comprising a stream of morph weight sets when a sequence of timed phonemes is encountered. Other timed data, such as timed emotional state data or emotemes such as "surprise, "disgust, "embarrassment", "timid smile", pitch, amplitued, noise amounts or the like, may be inputted to affect the output stream of morph weight sets.

The method comprises, in one embodiment, configuring a set of default correspondence rules between a plurality of visual phoneme groups and a plurality of morph weight sets; and specifying a plurality of morph weight set transition rules for specifying durational data for the generation of transitionary curses between the plurality of morph weight sets, allowing for the production of a stream of specified morph weight sets to be processed by a computer animation system for integration with other animation, whereby animated lip synchronization and facial expression of animated characters may be automatically produced.

There is also provided, according to the invention a method for automatically animating lip synchronization and facial expression of three dimensional characters for use with a computer animation system, comprising the steps of: determining means for producing a stream of morph weight sets when a sequence of phonemes is encountered; evaluating a plurality of time aligned phonetic transcriptions or other timed data such as pitch, amplitude, noise amounts and the like, against the determining means for producing a stream of morph weight sets; applying said determining means for producing a stream of morph weight sets to generate an output morph weight set stream, allowing for an appropriate morph weight set correspondence with each of a plurality of time aligned phonetic transcription subsequences and correct time parameters applied to a plurality of morph weight set transitions between a representation of a prior time aligned phonetic transcription subsequence and a current one, whereby lip synchronization and facial expressions of animated characters is automatically controlled and produced.

The method preferably comprises a set of rules that determine what the output morph weight set stream will be when any sequence or phonemes and their associated times is encountered. As used herein, a "morph weight set" is a set of values, one for each delta set, that, when applied as described, transform the neutral mode to some desired state, such as speaking the "oo" sound or the "th" sound. Preferably, one model id designated as the anchor model, which the deltas are computed in reference to. If for example, the is a morph target that represents all possible occurrences of an "e" sound perfectly, it's morph weight set would be all zeros for all delta sets except for the delta set corresponding to the "ee" morph target, which would set to 1.

Preferably, each rule comprises two parts, the rule's criteria and the rule's function. Each sub-sequence of time aligned phonetic transcription (TAPT) or other timed data such as pitch, amplitude, noise amount or the like, is checked against a rule's criteria to see if that rule is applicable. If so, the rule's function is applied to generate the output. The primary function of the rules is to determined 1) the appropriate morph weight set correspondence with each TAPT sub-sequence; and 2) the time parameters of the morph weight set transitions between the representation of the prior TAPT sub-sequence or other timed data and the current one. Conditions 1) and 2) must be completely specified for any sequence of phonemes and times encountered. Together, such rules are used to create a continuous stream of morph weight sets.

In the present method, it is allowable for more than one phoneme to be represented by the same morph target, for example, "sss" and "zzz". Visually, these phonemes appear similar. Through the use of such rules, the user can group phonemes together that have a similar visual appearance into visual phonemes" that function the same as one another. It is also acceptable, through the rules, to ignore certain

phoneme sequences. For example, a rule could specify: "If in the TAPT, there are two or more adjacent phonemes that are in the same "visual phoneme" group, all but the first are ignored".

The rules of the present method may be categorized in three main groupings; default rules, auxiliary rules and post processing rules. The default rules must be complete enough to create valid output for any TAPT encountered at any point in the TAPT. The secondary rules are used in special cases; for example, to substitute alternative morph weight set correspondences and/or transition rules if the identified criteria are met. The post processing rules are used to further manipulate the morph weight set stream after the default or secondary rules are applied, and can further modify the members of the morph weight sets determined by the default and secondary rules and interpolation.

If for example, specific TAPT subsequence does not fit the criteria for any secondary rules, then the default rules take effect. If, on the other hand, the TAPT sub-sequence does fit the criteria for a secondary rule(s) they take precedence over the default rules. A TAPT sub-sequence take into account the current phoneme and duration, and a number of the preceding and following phonemes and duration's as well may be specified.

Preferably, the secondary rules effect morph target correspondence and weights, or transition times, or both. Secondary rules can create transitions and correspondences even where no phoneme transitions exist. The secondary rules can use as their criteria the phoneme, the duration or the phoneme's context in the output stream, that is what phonemes are adjacent or in the neighborhood to the current phoneme, what the adjacent duration's are, and the like.

The post processing rules are preferably applied after a preliminary output morph weight set is calculated so as to modify it. Post processing rules can be applied before interpolation and/or after interpolation, as described later in this document. Both the secondary and post processing rules are optional, however, they may in certain applications be very complex, and in particular circumstances contribute more to the output than the default rules.

In FIG. **1**, a flow chart illustrates the preferred steps of the methodology **10** or automatically animating lip synchronization and facial expression of three dimensional animated characters of the present invention. A specific sub-sequence **20** is selected from the TAPT file **12** and is evaluated **22** to determine if any secondary rule criteria for morph weight set target apply. Time aligned emotional transcription file **14** data may be inputted or data from an optional time aligned data file **16** may be used. Also shown is a parallel method **18** which may be configured identical to the primary method described, however, using different timed data rules and different delta sets. Sub-sequence **20** is evaluated **22** to determine if any secondary rule criteria apply. If yes, then a morph weight set is assigned **24** according to the secondary rules, if no, then a morph weight set is assigned **26** according to the default rules. If the sub-string meets any secondary rule criteria for transition specification **28** then a transition start and end time are assigned according to the secondary rules **32**, if no, then assign transition start and end times **30** according to default rules. Then an intermediate file of transition keyframes using target weights and transition rules as generated are created **34**, and if any keyframe sequences fit post process before interpolation rules they are applied here **36**. This data may be output **38** here if desired. If not, then interpolate using any method post processed keyframes to a desired frequency or frame rate **40** and if any morph weight sequences generated fit post processing after interpolation criteria, they are applied **42** at this point. If parallel methods or systems are used to process other timed aligned data, they may be concatenated here **44**, and the data output **46**.

In FIG. **2**, the method for automatically animating lip synchronization and facial expression of three dimensional characters for films, videos, cartoons, and other animation products **10** is shown according to the invention, where box **50** show the step of configuring a set of default correspondence rules between a plurality of visual phoneme groups or other timed input data and a plurality of morph weight sets. Box **52** shows the steps of specifying a plurality of morph weight set transition rules for specifying durational data for the generation of transitionary curves between the plurality of morph weight sets, allowing for the production of a stream of specified morph weight sets to be processed by a computer animation system for integration with other animation, whereby animated lip synchronization and facial expression of animated characters may be automatically produced.

With reference now to FIG. **3**, method **10** for automatically animating lip synchronization and facial expression of three dimensional characters for use with a computer animation system is shown including box **56** showing the step of determining means for producing a stream of morph weight sets when a sequence of phonemes is encountered. Box **53**, showing the step of evaluating a plurality of time aligned phonetic transcriptions or other timed ata such as pitch, amplitude, noise amounts, and the like, against said determining means for producing a stream of morph weight sets. In box **60** the steps of applying said determining means for producing a stream of morph weight sets to generate an output morph weight set stream, allowing for an appropriate morph weight set correspondence with each of a plurality of time aligned phonetic transcription sub-sequences and correct time parameters applied to a plurality of morph weight set transitions between a representation of a prior time aligned phonetic transcription sub-sequence and a current one, whereby lip synchronization and facial expressions of animated characters is automatically controlled and produced are shown according to the invention.

In operation and use, the user must manually set up default correspondence rules between all visual phoneme groups and morph weight sets. To do this, the user preferably specifies the morph weight sets which correspond to the model speaking, for example the "oo" sound, the "th" sound, and the like. Next, default rules must be specified. These rules specify the durational information needed to generate appropriate transitionary curves between morph weight sets, such as transition start and end times. "transition" between two morph weigh sets is defined as each member of the morph weight set transitions from it's current state to it's target state, starting at the transition start time and ending at the transition end time. The target state is the morph weight set determined by a correspondence rule.

The default correspondence rules and the default morph weight set transition rules define the default system behavior. If all possible visual phoneme groups or all members of alternative data domains have morph weight set correspondence, any phoneme sequence can be handled with this rule set alone. However, additional rules are desirable for effects, exceptions, and uniqueness of character, as further described below.

According to the method of the invention, other rules involving phoneme's duration and/or context can be speci-

fied. Also, any other rules that do not fit easily into the above mentioned categories can be specified. Examples of such rules are described in greater detail below and are termed the "secondary rules". If a timed phoneme or sub-sequence of timed phonemes do not fit the criteria for any of the secondary rules, the default rules are applied as seen in FIG. **1**.

It is seen that through the use or these rules, an appropriate morph weight stream is produced. The uninterpolated morph weight stream has entries only at transition start and end time, however. These act as keyframes. A morph weight set may be evaluated at any time by interpolating between these keyframes, using conventional methods. This is how the output stream is calculated each desired time frame. For example, for television productions, the necessary resolution is 30 evaluations per second.

The post processing rules may be applied either before or after the above described interpolation step, or both. Some rules may apply only to keyframes before interpolation, some to interpolated data. If applied before the interpolation step, this affects the keyframes. if applied after, it effects the interpolated data. Post processing can use the morph weight sets calculated by the default and secondary rules. Post processing rules can use the morph weigh sets or sequences as in box **44** of FIG. **1**, calculated by the default and secondary rules. Post processing rules can modify the individual members of the morph weight sets previously generated. Post processing rules may be applied in addition to other rules, including other post processing rules. Once the rule set up is completed as described, the method of the present invention can take any number and length TAPT's as input, and automatically output the corresponding morph weight set stream as seen in FIGS. **1–3**.

For example, a modeled neutral geometric representation of a character for an animated production such as a movies, video, cartoon, CD or the like, with six morph targets, and their delta sets determined. Their representations, for example, are as follows:

Delta Set	Visual Representation
1	"h"
2	"eh"
3	"1"
4	"oh"
5	exaggerated "oh"
6	special case "eh" used during a "snide laugh" sequences

In this example, the neutral model is used to represent silence. The following is an example of a set of rules, according to the present method, of course this is only an example of a set of rules which could be use for illustrative purposes, and many other rules could be specified according to the method of the invention.

Default Rules:

Default Correspondence Rules

Criteria: Encounter a "h" as in "house"

Function: Use morph weight set (1,0,0,0,0,0) as transition target.

Criteria: Encounter an "eh" as in "bet"

Function: Use morph weight set (0,1,0,0,0,0) as transition target.

Criteria: Encounter a "l" as in "old"

Function: Use morph weight set (0,0,1,0,0,0) as transition target.

Criteria: Encounter an "oh" as in "old"

Function: Use morph weight set (0,0,0,1,0,0) as transition target.

Criteria: encounter a "silence"

Function: use morph weight set (0,0,0,0,0,0) as transition target.

Default Transition Rule

Criteria: Encounter any phoneme

Function: Transition start time=(the outgoing phoneme's end time)−0.1*(the outgoing phoneme's duration); transition end time=(the incoming phoneme's start time)+0.1* (the incoming phoneme's duration)

Secondary Rules

Criteria: Encounter an "oh" with a duration greater than 1.2 seconds.

Function: Use morph weigh set (0,0,0,0,1,0)

Criteria: Encounter and "eh" followed by an "h" and preceded by an "h".

Function: Use morph weigh set (0,0,0,0,0,1) as transition target.

Criteria: Encounter any phoneme preceded by silence

Function: Transition start time=(the silence's end time)−0.1*(the incoming phoneme's duration) Transition end time=the incoming phoneme's start time

Criteria: Encounter silence preceded by any phoneme.

Function: Transition start time=the silence's start time−0.1* (the outgoing phoneme's duration)

Post Processing Rules

Criteria: Encounter a phoneme duration under 0.22 seconds.

Function: Scale the transition target determined by the default and secondary rules by 0.8 before interpolation.

Accordingly, using this example, if the user were to use these rules for the spoken word "Hello", at least four morph targets and a neutral target would be required, that is, one each for the sound of "h", "e", "l","oh " and their associated delta sets. For example, a TAPT representing the spoken word "hello" could be configured as,

Time	Phoneme
0.0	silence begins
0.8	silence ends, "h" begins
1.0	"h" ends, "eh" begins
1.37	"eh" ends, "1" begins
1.6	"1" ends, "oh" begins
2.1	"oh" ends, silence begins.

The method, for example embodied in computer software for operation with a computer or computer animation system would create an output morph weight set stream as follows:

Time	D.S.1("h")	D.S.2("eh")	D.S.3("l")	D.S.4("oh")	D.S.5(aux"oh")	D.S.6
0.0	0	0	0	0	0	0
0.78	0	0	0	0	0	0

-continued

Time	D.S.1("h")	D.S.2("eh")	D.S.3("l")	D.S.4("oh")	D.S.5(aux"oh")	D.S.6
0.8	1	0	0	0	0	0
0.98	1	0	0	0	0	0
1.037	0	1	0	0	0	0
1.333	0	1	0	0	0	0
1.403	0	0	1	0	0	0
1.667	0	0	1	0	0	0
1.74	0	0	0	1	0	0
2.1	0	0	0	1	0	0
2.14	0	0	0	0	0	0

Such morph weight sets act as keyframes, marking the transitionary points. A morph weight set can be obtained for any time within the duration of the TAPT by interpolating between the morph weight sets using conventional methods well known in the art. Accordingly, a morph weight set can be evaluated at every frame. However, the post processing rules can be applied to the keyframes before interpolation as in box **36** of FIG. **1**, or to the interpolated data as in box **40** of FIG. **1**. From such stream of morph weight sets, the neutral model is deformed as described above, and then sent to a conventional computer animation system for integration with other animation. Alternatively, the morph weight set stream can be used directly by an animation program or package, wither interpolated or not.

The rules of the present invention are extensible and freeform in the sense that they may be created as desired and adapted to a wide variety of animation characters, situations, and products. As each rule comprise a criteria and function, as in an "if . . . then . . . else" construct. The following are illustrative examples of other rules which may be used with the present methodology.

For example, use {0,0,0,0 . . . } as the morph weighs, set when a "m" is encountered. This is a type of default rule, where: Criteria: Encounter a "m" phoneme of any duration. Function: Use a morph weight set {0,0,0,0 . . . 0} as a transition target.

Another example would be creating several slightly different morph targets for each phoneme group, and using them randomly each time that phoneme is spoken. This would give a more random, or possibly comical or interesting look to the animation's. This is a secondary rule.

An example of post processing rule, before interpolation would be to add a small amount of random noise to all morph weight channels are all keyframes. This would slightly alter the look of each phoneme to create a more natural look.

Criteria: Encounter any keyframe

Function: Add a small random value to each member of the morph weight set prior to interpolation.

An example of a post processing rule, after interpolation would be to add a component of an auxiliary morph target (one which does not correspond directly to a phoneme) to the output stream in a cyclical manner over time, after interpolation. If the auxiliary morph target had the character's mouth moved to the left, for example, the output animation would have the character's mouth cycling between center to left as he spoke.

Criteria: Encounter any morph weight set generated by interpolation

Function: Add a value calculated through a mathematical expression to the morph weigh set's member that corresponds to the auxiliary morph target's delta set weight. The expression might be, for example: 0.2*sin (0.2*time*2*pi)+0.2. This rule would result in an oscillation of the animated character's mouth every five seconds.

Another example of a secondary rule is to use alternative weight sets (or morph weight set sequences) for certain contexts of phonemes, for example, in an "oh" is both preceded and followed by an "ee" then use an alternate "oh". This type of rule can make speech idiosyncrasies, as well as special sequences for specific words (which are a combination of certain phonemes in a certain context). This type of rule can take into consideration the differences in mouth positions for similar phonemes based on context. For example, the "l" in "hello" is shaped more widely than the "l" in "burly" due to it's proximity to an "eh" as opposed to a "r".

Criteria: Encounter an "l" preceded by an "r".

Function: Use a specified morph weight set as transition target.

Another secondary rule could be, by way of illustration, that if a phoneme is longer than a certain duration, substitute a different morph target. this can add expressiveness to extended vowel sounds, for instance, if a character says "HELLOOOOOOO!" a more exaggerated "oh" model would be used.

Criteria: Encounter an "oh" longer than 0.5 seconds and less than 1 second.

Function: Use a specified morph weight set as a transition target.

If a phoneme is longer than another phoneme of even longer duration, a secondary rule may be applied to create new transitions between alternate morph targets at certain intervals, which may be randomized, during the phoneme's duration. This will add some animation to extremely long held sounds, avoiding a rigid look. This is another example of a secondary rule

Criteria: Encounter an "oh" longer than 1 second long.

Function: Insert transitions between a defined group of morph weight sets at 0.5 second intervals, with transition duration's of 0.2 seconds until the next "normal" transition start time is encountered.

If a phoneme is shorter than a certain duration, its corresponding morph weight may be scaled by a factor smaller than 1. This would create very short phonemes not appear over articulated. Such a post processing rule, applied before interpolation would comprise:

Criteria: Encounter a phoneme duration shorter than 0.1 seconds.

Function: Multiply all members of the transition target (already determined by default and secondary rules by duration/0.1.

As is readily apparent a wide variety of other rules can be created to add individuality to the different characters.

A further extension of the present method is to make a parallel method or system, as depicted in box **14** of FIG. **1**, that uses time aligned emotional transcriptions (TAET) that correspond to facial models of those emotions. Using the same techniques as previously described additional morph

weight set streams can be created that control other aspects of the character that reflect facial display of emotional state. Such morph weight set streams can be concatenated with the lip synchronization stream. In addition, the TAET data can be used in conjunction with the lip synchronization secondary rules to alter the lip synchronization output stream. For example:

Criteria: An "L" is encountered in the TAPT and the nearest "emoteme" in the TAET is a "smile".

Function: Use a specified morph weight set as transition target.

As is evident from the above description, the automatic animation lip synchronization and facial expression method described may be used on a wide variety of animation products. The method described herein provides an extremely rapid, efficient, and cost effective means to provide automatic lip synchronization and facial expression in three dimensional animated characters. The method described herein provides, for the first time, a rapid, effective, expressive, and inexpensive means to automatically create animated lip synchronization and facial expression in animated characters. The method described herein can create the necessary morph weight set streams to create speech animation when given a time aligned phonetic transcription of spoken text and a set of user defined rules for determining appropriate morph weight sets for a given TAPT sequence. This method also defines rules describing a method of transitioning between these sets through time. The present method is extensible by adding new rules, and other timed data may be supplied, such as time "emotemes" that will effect the output data according to additional rules that take this data into account. In this manner, several parallel systems may be used on different types of timed data and the results concatenated, or used independently. Accordingly, additional advantages and modification will readily occur to those skilled in the art. The invention in its broader aspects is, therefore, not limited to the specific methodological details, representative apparatus and illustrative examples shown and described. Accordingly, departures from such details may be made without departing from the spirit or scope of the applicant's inventive concept.

What is claimed is:

1. A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:

obtaining a first set of rules that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence;

obtaining a plurality of sub-sequences of timed phonemes corresponding to a desired audio sequence for said three-dimensional characters;

generating an output morph weight set stream by applying said first set of rules to each sub-sequence of said plurality of sub-sequences of timed phonemes; and

applying said output morph weight set stream to an input sequence of animated characters to generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence.

2. The method of claim **1**, wherein said first set of rules comprises:

correspondence rules between all visual phoneme groups and morph weight sets; and

morph weight set transition rules specifying durational data between morph weight sets.

3. The method of claim **2**, wherein said durational data comprises transition start and transition end times.

4. The method of claim **1**, wherein said desired audio sequence is from a pre-recorded live performance.

5. The method of claim **1**, wherein said desired audio sequence is synthetically generated by a computer.

6. The method of claim **1**, wherein said plurality of subsequences of timed phonemes is obtained from a file.

7. The method of claim **1**, wherein said plurality of subsequences of timed phonemes is generated during animation.

8. The method of claim **1**, wherein said output sequence of animated characters is transmitted over a computer network.

9. The method of claim **1**, wherein said generating said output morph weight stream comprises:

generating an appropriate morph weight set corresponding to each subsequence of said timed phonemes; and

generating time parameters for transition of said appropriate morph weight set from a morph weight set of a prior sub-sequence of said timed data.

10. The method of claim **1**, wherein each of said first set of rules comprises a rule's criteria and a rule's function.

11. The method of claim **10**, wherein said generating an output morph weight set stream comprises:

checking each sub-sequence of said plurality of sub-sequences of timed data for compliance with said rule's criteria; and

generating an output morph weight set and transition parameters by applying said rule's function upon said compliance with said criteria.

12. The method of claim **1**, wherein said first set of rules comprises a default set of rules and an optional secondary set of rules, said secondary set of rules having priority over said default set of rules.

13. The method of claim **1**, wherein said plurality of subsequences of timed phonemes comprises a timed aligned phonetic transcriptions sequence.

14. The method of claim **1**, wherein said plurality of subsequences of timed phonemes comprises time aligned data.

15. The method of claim **13**, wherein said plurality of subsequences of timed phonemes further comprises time aligned emotional transcription data.

16. The method of claim **9**, wherein said transition parameters comprises:

transition start time; and

transition end time.

17. The method of claim **16**, further comprising:

generating said output morph weight set stream by interpolating between morph weight sets at said transition start time and said transition end time according to a desired frame rate of said output sequence of animated characters.

18. The method of claim **1**, further comprising:

applying a second set of rules to said output morph weight set prior to said generating of said output sequence of animated characters.

19. An apparatus for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:

a computer system;

computer code in said computer system, said computer code comprising:

a method for obtaining a first set of rules that defines a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence;

a method for obtaining a plurality of sub-sequences of timed phonemes corresponding to a desired audio sequence for said three-dimensional characters;

a method for generating an output morph weight set stream by applying said first set of rules to each sub-sequence of said plurality of subsequences of timed phonemes;

a method for applying said output morph weight set stream to an input sequence of animated characters to generate an output sequence of animated characters with lip and facial expression synchronized to said audio sequence.

20. The apparatus of claim **19**, wherein said first set of rules comprises:

correspondence rules between all visual phoneme groups and morph weight sets; and

morph weight set transition rules specifying durational data between morph weight sets.

21. The apparatus of claim **20**, wherein said durational data comprises transition start and transition end times.

22. The apparatus of claim **19**, wherein said desired audio sequence is from a pre-recorded live performance.

23. The apparatus of claim **19**, wherein said desired audio sequence is synthetically generated by a computer.

24. The apparatus of claim **19**, said plurality of subsequences of timed phonemes is obtained from a file.

25. The apparatus of claim **19**, wherein said plurality of subsequences of timed phonemes is generated during animation.

26. The apparatus of claim **19**, wherein said output sequence of animated characters is transmitted over a computer network.

27. The apparatus of claim **19**, wherein said generating said output morph weight stream comprises:

generating an appropriate morph weight set corresponding to each subsequence of said timed phonemes; and

generating time parameters for transition of said appropriate morph weight set from a morph weight set of a prior sub-sequence of said timed data.

28. The apparatus of claim **19**, wherein each of said first set of rules comprises a rule's criteria and a rule's function.

29. The apparatus of claim **28**, wherein said generating an output morph weight set stream comprises:

checking each sub-sequence of said plurality of subsequences of timed data for compliance with said rule's criteria; and

generating an output morph weight set and transition parameters by applying said rule's function upon said compliance with said criteria.

30. The apparatus of claim **19**, wherein said first set of rules comprises a default set of rules and an optional secondary set of rules, said secondary set of rules having priority over said default set of rules.

31. The apparatus of claim **19**, wherein said plurality of subsequences of timed phonemes comprises a timed aligned phonetic transcriptions sequence.

32. The apparatus of claim **19**, wherein said plurality of subsequences of timed phonemes comprises time aligned data.

33. The apparatus of claim **31**, wherein said plurality of subsequences of timed phonemes further comprises time aligned emotional transcription data.

34. The apparatus of claim **27**, wherein said transition parameters comprises:

transition start time; and

transition end time.

35. The apparatus of claim **34**, wherein said computer code further comprises:

a method for generating said output morph weight set stream by interpolating between morph weight sets at said transition start time and said transition end time according to a desired frame rate of said output sequence of animated characters.

36. The apparatus of claim **19**, wherein said computer code further comprises:

a method for applying a second set of rules to said output morph weight set prior to said generating of said output sequence of animated characters.

* * * * *

PROOF OF SERVICE

I, Robert A. Whitman, hereby certify that on May 31, 2019, I caused one copy of the documents listed below:

PLAINTIFF-APPELLANT MCRO, INC.'S OPENING BRIEF

to be electronically filed using the CM/ECF system, which sent a notice of electronic filing to all ECF registered participants.

Date: May 31, 2019

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CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS

1. This brief complies with the type-volume limitation of Federal Rule of Appellate Procedure 32(a)(7)(B) because this brief contains 13,882 words, excluding the parts of the brief exempted by Federal Rule of Appellate Procedure 32(a)(7)(B)(iii).
2. This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6) because this brief has been prepared in a proportionally spaced typeface using Microsoft Word version 2016 in 14-point, Garamond font.

Date: May 31, 2019

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