Nos. 15-1080, 15-1099

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

MCRO, INC., DBA PLANET BLUE,

Plaintiff-Appellant,

v.

BANDAI NAMCO GAMES AMERICA INC., et al.,

Defendants-Appellees.

Appeal from the United States District Court
for the Central District of California

BRIEF FOR PLAINTIFF-APPELLANT MCRO, INC.

[excerpted and adapted for 2016 Federal Judicial Center exercise]

ISSUE PRESENTED

Whether the district court erred in holding that the claimed "method for automatically animating lip synchronization and facial expression of three-dimensional characters," covers "abstract ideas" that are not patent-eligible under 35 U.S.C. § 101.

STATEMENT OF THE CASE

In 2012 and 2013, McRO, Inc., d/b/a Planet Blue ("Planet Blue"), commenced the instant actions under 35 U.S.C. § 271, alleging that defendants infringe U.S. Patent Nos. 6,307,576 and 6,611,278. The actions were ultimately consolidated. On July 10, 2014, all defendants moved for judgment on the pleadings, urging that the patents claim patent-ineligible subject matter under 35 U.S.C. § 101. On September 22, 2014, the district court granted the motion.

STATEMENT OF FACTS

Maury Rosenfeld is an award-winning animator and the founder of plaintiff-appellant Planet Blue, a visual effects company. The patents-in-suit are directed to the field of 3-D computer animation. They teach methods, embodied in computer software, for automatically manipulating the facial features of a computer-generated character to make a video of the character realistically speaking pre-recorded dialogue.

Defendants (video-game makers) began using the patented techniques without a license. In turn, Planet Blue sued for infringement. After claim construction and motions to dismiss, defendants moved for judgment on the pleadings, arguing that the patents cover "abstract ideas" that are not patent-eligible under 35 U.S.C. § 101.

The district court found that the claims "do ***not*** seem directed to an abstract idea." To the contrary, "[t]hey are ***tangible***, each covering an approach to

automated three-dimensional computer animation, which is a ***specific technological process***." However, the court believed it had to divide the claims up for § 101 analysis so that it could focus solely on the invention's "point of novelty." The court then created a claim chart (as in a § 103 obviousness analysis), identifying every step that existed in the prior art—*i.e.*, computer-animation techniques that the method was automating—and stripped those steps from the claims. According to the court, that left only "the idea of using rules, including timing rules, to automate the process of generating keyframes." The court held that that was an unpatentable abstract idea.

I. THE FIELD OF THE INVENTION: COMPUTER-GENERATED 3-D ANIMATION

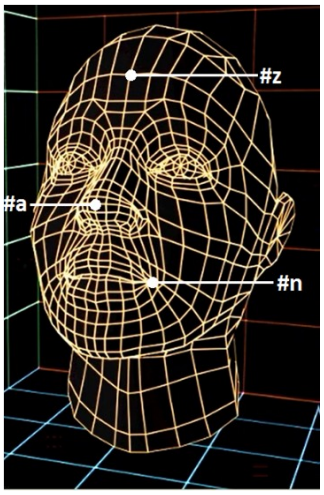
The patents-in-suit are addressed to the field of 3-D computer animation: They teach a rapid, cost-effective method for providing automated lip synchronization for animated characters. The method starts with a specialized transcript of pre-recorded dialogue and a model of the character's face. It then automatically moves the model's facial features, creating a series of images—essentially, a video—that realistically depicts the model speaking in sync with the dialogue. The patented method overcomes significant deficiencies of prior-art lip-synchronization methods, which were either time-consuming and expensive, or produced low-quality, unrealistic animation. Defendant Warner Brothers called Planet Blue's technique "revolutionary," explaining that the "process offers high-quality lip sync with a fast turnaround, compatible with a range of 3-D production software."

A. Background Principles of Computer-Generated Facial Animation

1. The Neutral Model

Computer-generated animation begins with an artist creating a character. The starting point is the "neutral model"—a reference model used to depict the

character's face with a neutral expression. One foundation of the neutral model is the "mesh" (shown below). The mesh is defined by "vertices"—points in three-dimensional space that outline the model's surface. In the image to the right, vertex #n corresponds with the left corner of the mouth. After the mesh is created, the animator adds details like skin, lips, and shading. Computers can easily manipulate models based on meshes.

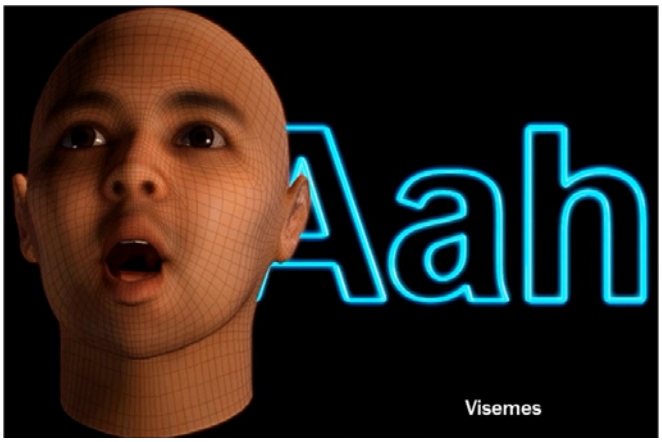


2. Phonemes and Visemes

The patents are directed to a method for depicting speech in 3-D computer animation. Two terms concerning speech are critical to understanding that process: "phonemes" and "visemes."

Phonemes: Phonemes are the "smallest units of speech." A phoneme "corresponds to a single sound," such as "th," "aah," "ee," or "oh." The goal of lip-synchronization animation is to match the character's facial expression to spoken dialogue. The claimed method uses a specialized transcript of that dialogue, which lists the phonemes that are spoken and the point in time that each phoneme occurs. This is called a "time aligned phonetic transcription" or "TAPT. " A TAPT can be generated by automatic speech-recognition programs.

Visemes: A viseme is an image of a face speaking a certain phoneme. In computer animation, the artist starts with the neutral model and then creates a library of visemes showing what that character looks like when speaking the various sounds. Below is a viseme showing the model speaking the "Aah" phoneme:



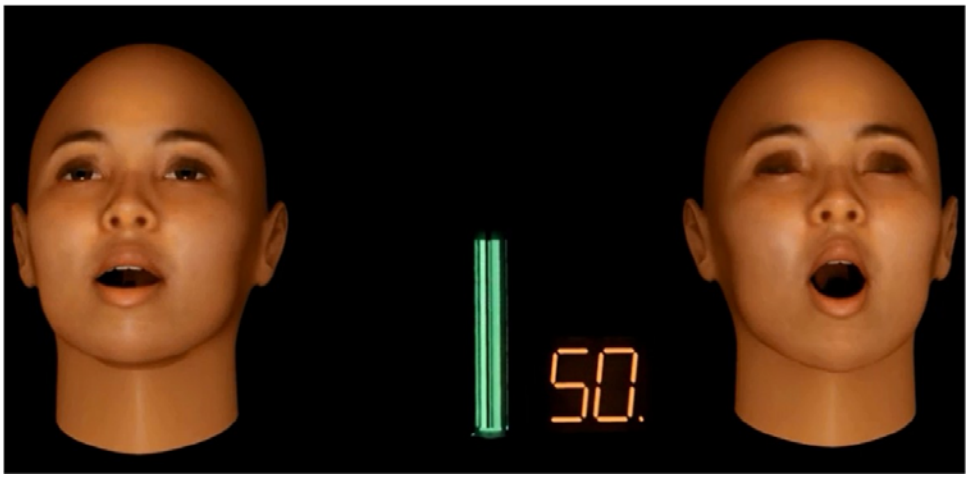
3. Transforming the Neutral Model Into "Morph Targets"

In computer animation, visemes are sometimes called "morph targets." A morph target is a model representing a specific state (e.g., a facial expression—that the animator will transform, or "morph," the neutral model into). A morph target is created by manipulating the vertices of the neutral model to form a different facial shape. Accordingly, 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.

Once a morph target has been defined, an animator can use "morph weights" to transform the neutral model only part-way toward that morph target. A morph weight is a value, between 0 (0%) and 1 (100%), that is applied to determine how far the neutral model's vertices should be moved toward the morph target.

A morph weight represents the degree to which the facial shape corresponding to the morph target is expressed. For example, if the morph target for the "oh" viseme is assigned a morph weight of 1, the neutral model would be modified to look exactly like the "oh" viseme. But if the "oh" viseme is assigned a morph weight of .5, the neutral model's vertices would be moved only halfway toward the "oh" viseme.

In the illustration below, the model on the right shows the “oh” viseme; the left is the “oh” viseme with a .5 morph weight. The mouth on the left is open halfway compared with the mouth on the right.



Several morph targets can be blended to create a model that exhibits characteristics of each. For example, an animator could simultaneously assign the “oh” viseme a .3 morph weight and the “ee” viseme a .7 morph weight. The result would be an expression that reflects some of the “oh” model’s “openness,” but more of the “ee” model’s characteristic of being stretched horizontally.

How much of each morph target the animator chooses to “mix in” a blended model can be represented as a “morph weight set.” A morph weight set is a set of values in which each entry represents the weight of one of the morph targets (visemes). As the district court explained, when a morph weight set is “applied” to the neutral model, it “transform[s]” the model to a particular facial expression. Assigning a morph weight set to a specific time in the animation is called “setting a keyframe.”

B. Prior-Art Methods of Lip Synchronization

There were two main prior-art methods of lip synchronization in 3-D computer-generated animation. Each had significant limitations.

1. The Manual Approach

The so-called "manual" approach begins with an artist creating a neutral model of the character and a library of visemes (*i.e.*, morph targets). The manual approach is not to be confused with hand-drawn animation—it uses a computer and animation software to create and manipulate the character models. What makes it "manual" is that a human artist sits at a computer and, relying on her own artistic judgment, manipulates the model to match the speech in the time-aligned transcript of the dialogue.

In this method, the artist creates a computer image of the model making a particular facial expression for each of the most important moments—these are the "keyframes." For each keyframe, the artist chooses morph targets (visemes) from the library and adjusts "sliders" that control how much each morph target is emphasized until the character model on the screen reflects the desired blend of facial expressions. The software derives a morph weight set that corresponds to the sliders' positions.

Keyframes depict only the important moments in the animation. While the artist is guided by the time-aligned phonetic transcript, the artist decides where in time to set keyframes—she does not simply enter a keyframe at each phoneme. An animator must create an extremely large number of keyframes to accurately depict speech. And creating the illusion of smooth movement requires even more images—30 images per second for standard television. Traditional animation software provides those additional images by "interpolat[ing]" between keyframes.

The manual process yields high-quality animation, because a skilled artist decides when in time to set keyframes, and tweaks the morph weight sets at each keyframe to achieve precisely the desired effect. But the process is also laborious, time-consuming, and expensive.

2. Prior Attempts at Automation

A second, more automated, method of lip synchronization also existed in the prior art. It, too, began with an artist creating a neutral model of the character and a library of visemes/morph targets. But from there, software takes over. It automatically sets a keyframe at each time a phoneme appears in the time-aligned transcript. That keyframe, however, is simply the viseme that corresponds to the phoneme—morph targets are not blended to create a nuanced expression. Because each viseme is given a morph weight of 1 or 0, with nothing in-between, the viseme is either fully expressed or not expressed at all. The software then uniformly interpolates between those keyframes to generate an image at each frame of the animation.

That automated process is much cheaper than manually setting keyframes, but it yields poor-quality animation. Mechanically applying visemes without blending gives the animation a "flappy" quality—the expression of the visemes appears artificial and over-articulated. And the faster the tempo of speech, the more pronounced the "flappy" effect. The quality of animation produced by this method is rarely acceptable even for time- and budget-sensitive projects, and often requires extensive after-the-fact "tuning" by an artist.

II. THE PATENTS-IN-SUIT: MAURY ROSENFELD'S AUTOMATED METHOD FOR HIGH-QUALITY 3-D LIP SYNCHRONIZATION AND FACIAL ANIMATION

Maury Rosenfeld has worked as a successful computer graphics and visual effects designer for over 30 years. He realized that prior efforts to automate lip synchronization failed to account for the fact that speakers do not express each viseme to an equal degree, and do not transition between visemes evenly. Rather, the extent to which any viseme is expressed is influenced by the context (surrounding visemes) and the pace (rate) of speech. For example, a face might

fully express the “l” viseme when it begins a word, as in “love.” But the extent to which the “l” viseme is expressed decreases in relation to how quickly it follows certain “closed mouth” visemes, such as the “b” viseme. Consider a person speaking the words “blob” and “Bob.” Because the “l” viseme comes right after the closed-mouth “b” viseme when saying “blob,” a person speaking at a normal pace may hardly express the “l” viseme at all. But when the same words are said slowly and deliberately, they look very different. In the manual approach, an artist will account for such things, manipulating the model until it looks “right.” But the automated method ignored such nuances and produced unnatural results.

Rosenfeld’s critical insight was that, if one could configure software to account for the context and pace of speech, one could produce high-quality animation automatically. His ’576 Patent and ’278 Patent teach a “method embodied in computer software” that automatically moves a model’s facial features to make a video of the character speaking in sync with pre-recorded dialogue. It begins with a phonetic transcript of recorded dialogue and a 3-D model of a character’s face, and applies rules that evaluate the transcript in terms of “phoneme sequence and time of said phoneme sequence.” The result is “lip synchronization and facial expression control of . . . animated characters,” such that the computer-generated video is synchronized with the audio dialogue.

While the patented invention represents a leap forward, it of course builds on prior-art principles and techniques of 3-D computer-generated animation. For example, it requires a time-aligned phonetic transcript of the recorded dialogue. It also requires an artist-created neutral model of the character and library of morph targets/visemes.

What sets the invention apart is how it determines the facial movements that will be synchronized with the audio dialogue. Among other things, it uses rules that evaluate the TAPT and ***automatically*** determines when to set keyframes, the

appropriate morph weight set at each keyframe, and how the animation should transition between keyframes. The patents' specification provides clear guidance on how the claimed rules are created, as well as extensive examples of each kind used. But the patents do not purport to list all such rules. That is because the morph weight set and transition times depend on the particular animation project; there is no single scientifically "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 4 values or 30. Mouth shapes and facial expressions will also vary depending on the character. The same phoneme sequence may look very different when spoken by a robot, a cat, or a swamp monster. Thus, as the patents explain, "[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."

Once the rules have been established and the character model and visemes created, computer software does the rest. An essentially unlimited amount of video animation can be generated with no significant additional labor.

III. THE DISTRICT COURT'S DECISION

On September 22, 2014, the district court granted defendants judgment on the pleadings, holding that the patents cover abstract ideas that are not patent-eligible under 35 U.S.C. § 101.

The district court initially acknowledged that the § 101 analysis is governed by the two-step framework the Supreme Court established in *Mayo Collaborative Services v. Prometheus Labs, Inc.*, 132 S. Ct. 1289 (2012), and *Alice Corp. Pty. Ltd. v. CLS Bank International*, 134 S. Ct. 2347 (2014). In the district court's view, however, "[d]escribing this as a two-step analysis may overstate the number of steps involved." Whether a claim is abstract, the court stated, "may be more like a

one step test"—a sort of "'I know it when I see it' " decision. (quoting *Jacobellis v. State of Ohio*, 378 U.S. 184, 197 (1964) (Stewart, J., concurring)).

After quoting Claim 1 of the '576 Patent and Claim 1 of the '278 Patent, the court stated that, "[f]acially, these claims do ***not*** seem directed to an abstract idea." To the contrary, "[t]hey are ***tangible***, each covering an approach to ***automated three-dimensional computer animation***, which is a ***specific technological process***." *Id.* (emphasis added). And the court rejected defendants' argument that the patents "claim a monopoly . . . on 'the idea that the human mouth looks a certain way while speaking particular sounds,' 'applied to the field of animation.'" *Id.* It noted that "the patents do ***not*** cover prior art methods of computer assisted, but non-automated, lip synchronization for three-dimensional computer animation." *Id.* (emphasis added). Indeed, defendants had urged that the patents "do not cover the automated methods of lip-synchronization for three-dimensional computer animation" that they use. The court thus stated that, "[a]t first blush, it is . . . difficult to see how the claims might implicate the 'basic underlying concern that these patents tie up too much future use of' any abstract idea they apply." *Id.* (quoting *Mayo*, 132 S. Ct. at 1302).

Applying its own mode of analysis, however, the court stated that "it is not enough to view the claims in isolation"; rather, "when determining whether a patent contains an adequate inventive concept, the Court must factor out conventional activity." In the court's view, "conventional activity" encompasses ***anything*** found "***in the prior art***." (emphasis added). The court thus created a claim chart, of the sort used in a § 103 obviousness analysis, listing each "Step" from the claims in one column, and supposedly "Admitted Prior Art" that corresponds to the step in the other column. The court found that, "while tangible, the steps of (1) using a timed phoneme transcript, (2) setting morph weight sets at keyframes, or (3) interpolating between keyframes" existed in the prior art, and

thus could not be considered when deciding whether the claim was unpatentably abstract.

Having read those "tangible" limitations out of the claims, the district court focused on what it considered the "point of novelty." According to the court, "the point of novelty here is the idea of using rules, including timing rules, to automate the process of generating keyframes." The court stated that the patents address the use of such rules "at the highest level of generality." While the specification provides examples of rules, the claims are not limited to those examples. The court therefore deemed the question before it as "whether the inclusion of that ***concept*** [of using rules] in the claims satisfies § 101 given (1) the prior art, and (2) the fact that the claims do not require any particular rules." The court held that it did not: "Because the claim purports to cover all such rules, in light of the prior art, the claim merely states 'an abstract idea while adding the words "apply it." '" "The invention here may have been novel," the court stated, "but the claims are directed to an abstract idea."

ARGUMENT

The claims at issue are directed to a "method for automatically animating lip synchronization and facial expression of three-dimensional characters" in computer animation. The claimed method overcomes the limitations of prior art methods and provides the best of both worlds—it automatically moves the face of a computer-generated model so that it produces realistic video of the character speaking pre-recorded dialogue.

The district court's holding that the claims do not cover patent-eligible subject matter under § 101 cannot stand. The district court admitted that, "[f]acially, ***these claims do not seem directed to an abstract idea***. ***They are tangible***, each covering an approach to automated three-dimensional computer animation, which is ***a specific technological process***." For that reason, the claims

independently satisfy each prong of the two-part test for patent-eligibility the Supreme Court adopted in *Alice* and *Mayo*. They likewise satisfy this Court's machine-or-transformation test, which remains "a useful and important clue" that the claims are patent-eligible. *See Bilski v. Kappos*, 561 U.S. 593, 604 (2010). And it is clear that the patents do not seek to monopolize anything remotely resembling the "building blocks of human ingenuity" or "the basic tools of scientific and technological work." *Alice*, 134 S. Ct. at 2354. There are numerous ways to perform lip-synchronization animation, automated lip synchronization, and even automated, rules-based lip synchronization, that do not infringe the patents.

The district court found the patents abstract only after applying a novel framework that resembled a § 103 obviousness analysis. Reading out of the claims any limitation with a basis in the prior art, the court attempted to locate the supposed "point of novelty." But the Supreme Court has expressly rejected that approach. And the district court made erroneous findings regarding the patented invention and the prior art, even within its own framework.

IV. THE CLAIMS ARE NOT UNPATENTABLY ABSTRACT UNDER § 101.

Section 101 defines patentable subject matter as "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." 35 U.S.C. § 101. But "laws of nature, natural phenomena, and abstract ideas" are not eligible. *Diamond v. Diehr*, 450 U.S. 175, 185 (1981).

To determine whether a patent covers an abstract idea outside § 101, the court first considers whether the claims are "directed to" an abstract idea. *Mayo*, 132 S. Ct. at 1296-97. If they are, the court considers whether the claims' elements "add ***enough*** to their statements of the [abstract idea] to allow the processes they describe to qualify as patent-eligible processes that ***apply*** [the abstract idea]." *Id.* at 1297. The Supreme Court has "described step two of this analysis as a search for

an 'inventive concept'—*i.e.*, an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.' " *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 132 S. Ct. at 1294) (alteration in original).

Alice clarified that the abstract-ideas exception does not apply if the invention "solve[s] a technological problem in 'conventional industry practice,'" "improve[s] an existing technological process," or otherwise "effect[s] an improvement in any other technology or technical field." 134 S. Ct. at 2358, 2359. While the Court did not hold that an invention ***must*** represent a technological advance to be patent-eligible under § 101, *Alice* indicates that a claim that ***does*** represent such an advance is patent-eligible.

The claims here independently satisfy ***each*** step of the *Alice/Mayo* test.

A. Step One: The Claims Are Not "Directed to" an Abstract Idea.

1. The Claims Are "Directed to" a Technological Process That Produces Tangible Results.

At the first *Alice/Mayo* step, the court must make a threshold determination "whether the claims at issue are directed to a patent-ineligible" abstract idea. *Alice*, 134 S. Ct. at 2355. Here, they are not.

Representative Claim 1 of the '576 Patent recites:

> A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:
>
> obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;
>
> obtaining a timed data file of phonemes having a plurality of subsequences;

> generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;
>
> generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and
>
> applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.

The claims expressly state their purpose: "automatically animating lip synchronization and facial expression of three-dimensional characters." And the claimed method generates a tangible product—"lip synchronization and facial expression control of . . . animated characters."

Every claim element is in service of, and necessary to, the recited method of automating lip synchronization and facial expression in 3-D computer animation. They do not merely recite "use rules in animation," or "use rules on a computer to produce animation." They require particular types of rules—those that analyze a phonetic transcript as a "function of ***phoneme sequence*** and ***time of said phoneme sequence***"—as part of a specific, "integrated method," for using "morph weight sets" to generate video of a character speaking. No limitation is "plainly . . . divisible" from the other elements as a stand-alone abstract concept. *DDR Holdings*, 773 F.3d at 1256. The district court thus was correct when it acknowledged that, "[f]acially, ***these claims do not seem directed to an abstract idea***," and that "***[t]hey are tangible***, each covering an approach to automated three-dimensional computer animation, which is ***a specific technological process***."

Indeed, the entire field of 3-D computer-generated animation is ***inherently*** technological and tangible. Even using prior-art methods, the critical steps—creating the neutral character model and morph targets; blending models and morph weight sets in determining the keyframes; and interpolating between keyframes—are performed using special animation software on computers. The method for performing that process "automatically" here,"embodied in computer software for use with a computer," is likewise inherently technological. It is no mere "idea, having no particular concrete or tangible form." *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715 (Fed. Cir. 2014).

The purpose of the claims, moreover, is to ***make something tangible***. The method produces a video of a 3-D character speaking the recorded audio—video you can see when watching a cartoon or playing a video game. That tangible output is an element of the claim ("applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters"). It is hard to see how anyone could watch video clips of animation produced by the patented method, and conclude that the claims are directed to a mere "abstraction," *Ultramercial*, 772 F.3d at 715.

2. Supreme Court Precedent Confirms That the Claims Are Not "Directed to" an Abstract Idea.

The Supreme Court has recognized two categories of claims that implicate the abstract-ideas exception. The first concerns claims covering algorithms, in the form of mathematical formulas, that are used for calculating numbers. In *Parker v. Flook*, 437 U.S. 584 (1978), for example, the Court held that a claim covering a formula for calculating "alarm limits"—which were simply "a number"—was an unpatentable abstract idea. *Id.* at 585. Similarly, in *Gottschalk v. Benson*, 409 U.S. 63 (1972), the Court held that a claim to a mathematical formula for converting

binary-coded decimals into pure binary numerals was unpatentably abstract. *Id.* at 64. Second, the Court has found so-called "business methods"—essentially ideas about "fundamental economic practice[s]" and "organizing human activity"—to be abstract. *Alice*, 134 S. Ct. at 2356-57. In *Alice*, the Court invalidated claims directed to the business method of "intermediated settlement." *Id.* And in *Bilski*, the Court held that claims directed to "hedging risk" were abstract ideas. 561 U.S. at 609. The claims here do not remotely fit within those categories.

Instead, they are like the claim in *Diehr*, 450 U.S. at 184, which the Supreme Court held was ***not*** directed to an abstract idea. The claim there was for a "method of operating a rubber-molding press for precision molded compounds with the aid of a digital computer." *Id.* at 179 n.5. It recited the use of a mathematical formula, the "Arrhenius equation," as part of a "step-by-step method" for curing rubber. *Id.* at 179 & n.5, 184. The Court explained that "Arrhenius' equation is not patentable in isolation." *Id.* at 188. But the claim was not directed to "patent[ing] [that] mathematical formula." *Id.* at 187. Instead, it sought "patent protection for a process of curing synthetic rubber." *Id.* The Court stated that "[i]ndustrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws." *Id.* at 184.

As in *Diehr*, the claims here do not seek to patent a "mathematical formula" or any other abstract concept. Instead, they cover a specific, step-by-step process—implemented through software—for automatically producing a video of a 3-D computer-generated character that speaks in sync with pre-recorded audio. No less than the rubber-curing method in *Diehr*, that is a specific technological process that produces a tangible result. It, too, should be "eligible to receive the protection of our patent laws." *Diehr*, 450 U.S. at 184.

3. The Claims Are Not "Directed to" an Abstract Idea Under This Court's Precedent.

This Court's post-*Alice* cases are to the same effect. In *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344 (Fed. Cir. 2014), the Court found claims directed to a "device profile," which was a formula for combining two data sets into one, to be ineligible under § 101. *Id.* at 1351. Like the claims in *Flook*, it was simply a means of calculating numbers. *Id.* And in *Ultramercial*, 772 F.3d at 715, and *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1355 (Fed. Cir. 2014), the Court invalidated patents directed to business methods—"using advertising as an exchange or currency," and creating a "transaction performance guaranty," respectively—that were not distinguishable from the claims the Supreme Court invalidated in *Alice* and *Bilski*. *See also Planet Bingo, LLC v. VKGS LLC*, 576 F. App'x 1005, 1008 (Fed. Cir. 2014) (invalidating claims for "managing a game of bingo" as "similar to the kind of 'organizing human activity' at issue in *Alice*").

The claims here are quite different. They more closely resemble the patent in *DDR Holdings*. The patent there addressed a problem "particular to the Internet"—how a host website can retain visitors when the visitor clicks on a link to a third-party merchant's advertisement. 773 F.3d at 1257. It claimed a system that generates a "hybrid" website that retains the "look and feel" of the host's website, while allowing the visitor to buy products from the third-party merchant without actually entering the merchant's website. *Id.* at 1257-58.

Rejecting the contention that the claims sought to patent abstract ideas, the Court observed that the claims did not fall within the categories previously found to implicate the abstract-ideas exception: "[The] claims do not recite a mathematical algorithm. Nor do they recite a fundamental economic or longstanding commercial practice." 773 F.3d at 1257. While the claims implicated

commerce, the Court found, "the claimed solution is necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks." *Id.* And while the claims at issue were not "technologically complex," they were nevertheless technological: They "specify how interactions with the Internet are manipulated to yield a desired result" when clicking a hyperlink. *Id.* at 1258-59. The claims were "different enough in substance" from claims in prior cases that "broadly and generically claim[ed] 'use of the Internet' to perform an abstract business practice" to be patent-eligible. *Id.* at 1258.

As in *DDR Holdings*, the claims here are "necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer[s]." 773 F.3d at 1257. They provide a method for getting a computer to automatically generate video of a 3-D animated character speaking in sync with pre-recorded dialogue—without requiring an artist's constant intermediation, or yielding the unrealistic results of prior automated methods. Like the claims in *DDR Holdings*, they are patent-eligible because they constitute a technological advance that is sufficiently "unlike the claims in *Alice*" and other cases "that were found to be 'directed to' little more than an abstract concept." 773 F.3d at 1259. Indeed, the claims here are more clearly patent-eligible than those in *DDR Holdings*. Unlike *DDR Holdings*, there is no conceivable argument that the claims are merely "entrepreneurial" rather than "technological."

B. Step Two: The Claims Recite a Patent-Eligible *Application* of Any Idea.

Step two of the *Alice/Mayo* framework assumes the court has found that the patent claims are directed to an abstract idea at step one. Because the claims here are not directed to an abstract idea at all, the Court need go no further. But even if the Court were to assume the patent ***is*** directed to an abstract idea, the

implementation here "add[s] ***enough*** . . . to allow the [claimed] processes . . . to qualify as patent-eligible processes that ***apply***" any putative abstract idea. *Mayo*, 132 S. Ct. at 1297.

1. The Claims Are a Patent-Eligible Improvement to a Technological Process.

Defendants urged that the claims here are directed to "the abstract idea of rules-based synchronization of animated mouth movement." In *Alice*, however, the Supreme Court indicated that a claim represents a patent-eligible ***application*** of an idea if it "effect[s] an improvement in any other technology or technical field." 134 S. Ct. at 2359. The invention here provides just such an improvement in the technological field of 3-D computer-generated lip-synchronization animation.

As explained above, the field of the invention—3-D animation—is inherently technological. All of the character models are created and manipulated using special software on computers. The problem the patents solve is also a technological one: How can one improve animation software so that it can analyze a phonetic transcript of spoken dialogue and automatically manipulate a computer-generated facial model to create a video of the character that realistically looks like it is speaking the audio dialogue?

In the prior art, realistic animation was achievable only if a human sat at a computer and painstakingly set the morph weight set at each keyframe, manually manipulating sliders in animation software. That process was laborious, lengthy, and expensive. Other prior-art methods utilized software to automatically produce lip-synchronization animation, but the results were unrealistic.

Here, the patents teach Rosenfeld's critical insight about how a computer can automatically produce realistic lip-synchronization from a phonetic transcript if it is programmed to take into account not just phonemes, but also ***context*** and ***pace*** of speech. The claims' implementation of that insight—programming

animation software with "rules that define output morph weight set stream as a ***function of phoneme sequence and time of said phoneme sequence***"—is technological. It is also clearly a "functional and palpable" improvement, *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 868 (Fed. Cir. 2010), because it enables a computer to do something it could not do before: automatically produce high-quality lip synchronization animation from a phonetic transcript.

2. The Inventive Concepts Recited in the Claims Represent a Specific Application.

Even apart from meeting *Alice*'s "technological improvement" standard, the claims satisfy step two of the *Alice/Mayo* analysis because they reflect an "'inventive concept'—*i.e.*, an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon'" any purported abstract idea "'itself.'" *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 132 S. Ct. at 1294). Indeed, the claims contain several such inventive concepts. They recite a method that employs specific ***types*** of rules to produce high-quality, computer-generated facial animation. And the claims provide a specific technological ***way*** of using those rules to generate the animation.

The claims cover ***only*** the use of "rules that define output morph weight set stream ***as a function of phoneme sequence and time of said phoneme sequence***." That reflects a central "inventive concept"—Rosenfeld's insight that, to create high-quality animation automatically, one needs ***only*** to set rules enabling the animation software to account for ***those specific parameters***. The rules adjust for the fact that a phoneme may look different when spoken depending on the phonemes preceding and/or following it, and for the fact that a viseme's expression is affected by how quickly the character speaks. That drastically limits the claims' scope. It renders the invention a specific "application" of the use of computer-implemented rules that is "deserving of patent protection." *Diehr*, 450 U.S. at 187.

The claims do not recite individual rules regarding "the phoneme sequence" and "time of said phoneme sequence." But that is immaterial. The appropriate rules in a given instance will vary depending on the taste of the animator and the particular character she has created. It is settled law that the patentee may write claims at a level that encompasses the genus of the invention, rather than reciting every species. *See AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1299 (Fed. Cir. 2014). If the claims as drafted sweep more broadly than the patents' teachings can justify (and they do not), that would be an issue under § 112's "written description" requirement, not § 101. *See Research Corp.*, 627 F.3d at 869; *AbbVie*, 759 F.3d at 1299. Or, if the claims are overly broad, they risk being anticipated under § 102 or being obvious under § 103. But claiming the category of rules based on "phoneme sequence" and "timing of phoneme sequence," as opposed to separately claiming every specific example of such rules, does not render the claims "so manifestly abstract as to override the statutory language of section 101." *Research Corp.*, 627 F.3d at 869. The better way to view the claims is to see that the claims' recitation of "morph weight sets" serves to limit the claims to one specific, technological process for producing lip-synchronization animation.

C. The Claims Do Not Preempt the Idea of Using Rules in Lip-Synchronization Animation.

For the reasons above, the claims do not implicate the fundamental "preemption concern that undergirds" the abstract-ideas exception. *Alice*, 134 S. Ct. at 2358. The claims do not seek to patent the abstract idea of using rules itself, and thus "wholly pre-empt the use of ***any*** rules" relating to lip-synchronization animation. To the contrary, an animator may use any rules he wishes. He infringes only if he uses software that defines an output morph weight set stream as ***a function of phoneme sequence*** and ***time of said phoneme sequence***. One example

of a non-infringing rules-based method is a prior-art automated method that used the following "rule" to generate facial animation: Whenever a phoneme appeared in the TAPT, the corresponding viseme was used (*i.e.*, 100% of that viseme) to the exclusion of all others. That rule is not within the scope of the claims because it does not take into account ***context*** and ***timing*** of a phoneme sequence.

The additional limitations requiring that the method "automatically" produce "streams" of "morph weight sets" from a TAPT further limit the claims' preemptive scope. They exclude a vast swath of animation techniques, ***even if*** they were to employ rules based on "function of phoneme sequence and time of said phoneme sequence." Rules could guide an artist when producing hand-drawn, two-dimensional animation for movies like *The Lion King* and cartoons like *Dora the Explorer*. But that would not infringe because the process does not utilize morph weight sets. Likewise, it is possible to define rules that an artist would use in prior-art techniques for manually producing 3D computer-generated animation features, such as Pixar's *Toy Story* movies. But that process does not automatically produce morph weight sets from a TAPT. And defendants have argued that the methods they use to automate animation in their video games do not use morph weight sets. As the district court recognized, given the many "noninfringing ways" to use rules in lip-synchronization animation, it is "difficult to see how the claims might implicate the 'basic underlying concern that these patents tie up too much future use of' any abstract idea they apply." (quoting *Mayo*, 132 S. Ct. at 1302). Thus the patents thus in no way "impede innovation." *Alice*, 134 S. Ct. at 2354. The "building blocks of human ingenuity" and "basic tools of scientific and technological work" remain free to all. *Id.* The patents' scope is no larger than "the underlying discovery could reasonably justify." *Mayo*, 132 S. Ct. at 1301.

V. THE DISTRICT COURT'S § 101 ANALYSIS VIOLATES SUPREME COURT PRECEDENT.

The district court erred by improvising a new analytical framework, stating that, "the claims must be evaluated in the context of the prior art." Using a claim chart, the district court disregarded every element with a basis in the prior art. It therefore read admittedly "tangible" steps out of the claims, and focused on what it considered the "point of novelty"—"the idea of using rules, including timing rules, to automate the process of generating keyframes."

But, in *Diehr*, the Supreme Court expressly rejected the "point of novelty" approach the district court applied here. The Court stated that, in "determining the eligibility of [the patentees'] claimed process for patent protection under § 101, their claims must be considered as a whole." 450 U.S. at 188. "It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis." *Id.* The Court explained that "[t]he ***'novelty' of any element or steps*** in a process . . . ***is of no relevance*** in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter." *Id.* at 188-89 (emphasis added). The district court here did precisely what *Diehr* prohibits—it dissected the claims "into old and new elements" and focused ***solely*** on the "point of novelty" in determining whether the claims' subject matter is patent-eligible in the first instance. It is true that *Mayo* stated that "well-understood, routine, conventional activity . . . is normally not sufficient to transform an unpatentable law of nature into a patent-eligible application of such a law." 132 S. Ct. at 1298. But this is a consideration for step two, not step one.

As this Court has explained, "any novelty in implementation of the idea is a factor to be considered ***only in the second step*** of the *Alice* analysis." *Ultramercial*, 772 F.3d at 715 (emphasis added). If a court finds that claims are

directed to an abstract idea in the first instance, the presence of merely routine or conventional activity may not "add ***enough*** to their statements of the [abstract idea] to allow the processes they describe to qualify as patent-eligible processes that ***apply*** [the abstract idea]." *Mayo*, 132 S. Ct. at 1297. But if a claim is, as the district court found here, directed to a "tangible," "specific technological process" in the first instance, neither *Mayo* nor any other case suggests that a court should then strip the claims down to the "point of novelty" to invalidate it under § 101. Indeed, *Diehr* expressly prohibits that.

The district court also fatally misconstrued the ***scope*** of the "conventional activity" exclusion. *Mayo* explains that "well-understood, routine, conventional activity" may not suffice to "transform an unpatentable law of nature into a patent-eligible application of such a law." 132 S. Ct. at 1298. The district court, however, interpreted that to mean that ***any step with a basis in the prior art*** must be disregarded. That was error.

The point of the "conventional activity" rule is that, where a practice is ubiquitous among those "who work in the field," reciting that activity will not meaningfully narrow the scope of the claim. *Mayo*, 132 S. Ct. at 1298. Put differently, where a court determines that a claim recites an abstract idea accompanied solely by steps so "conventional" that any practitioner would assume them necessary, that amounts to nothing more than "simply stat[ing] the [abstract idea] while adding the words 'apply it.'" *Id.* at 1294.

Rather than evaluate whether the claims merely recite an idea along with purely "conventional" activity, the district court created a claim chart of the sort that would be used in a § 103 obviousness analysis and disregarded every step of the claims that, in its view, was "admitted" to be in the prior art. It never asked the fundamental question whether the steps were so "conventional" that their recitation failed to meaningfully limit the claims' scope to a particular "application."

Stripping out every claim element with a supposed basis in prior art—as opposed to disregarding truly "conventional" activity—distorted the outcome. For example, the district court considered "setting morph weight sets at keyframes" to be a "tangible" step in the claims. It did not consider that step in the § 101 analysis, however, because it had a basis in the prior art. But even if that step was in the prior art, it was not so "conventional" that it failed to limit the scope of the claims or should be summarily disregarded under *Mayo*. Especially when considered as part of the "ordered combination" that makes up the claims here—a combination that requires morph weight sets and specified rule parameters—it helps "transform" any "idea" of using rules into a "patent-eligible application." *Alice*, 134 S. Ct. at 2355, 2357.

CONCLUSION

The district court's judgment should be reversed.

Nos. 15-1080, 15-1099

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

MCRO, INC., DBA PLANET BLUE,

Plaintiff-Appellant,

v.

BANDAI NAMCO GAMES AMERICA INC., et al.,

Defendants-Appellees.

Appeal from the United States District Court
for the Central District of California

BRIEF FOR DEFENDANT-APPELLEE BANDAI NAMCO GAMES AMERICA INC.

[excerpted and adapted for 2016 Federal Judicial Center exercise]

PRELIMINARY STATEMENT

The Patents-in-Suit seek to claim a concept that is inherent to human speech—that a human mouth will look a certain way when speaking a certain sound. Yet, the Patents-in-Suit explicitly acknowledge their purpose is simply to speed up a long-practiced, conventional method of synchronizing mouth movement with speech by automating it on a general-purpose computer. And the only claim requirement McRo purports to be novel and unconventional—the use of unlimited and undefined computer-programmed "rules" to be executed automatically—would capture all such rules, including those the inventor never conceived. Analyzed in light of the Supreme Court's and this Court's Section 101 jurisprudence, the claimed method is shown to be unpatentably abstract.

STATEMENT OF THE ISSUE

Did the District Court correctly determine that Appellant's claims directed to the abstract idea of synchronizing animated mouth movement to speech, using a generic computer to automate a conventional process, are directed to unpatentable subject matter under Section 101? The answer is "Yes."

STATEMENT OF FACTS

I. THE PATENTS: AUTOMATING THE PRIOR ART

The Patents-in-Suit share an identical specification. Both purport to claim the exclusive right to perform rules-based lip-synchronized animation on a computer, by automating well-known and long-practiced steps that can be performed in the human mind or with pencil and paper.

A. The Claimed Method Reflects Conventional Animation Practices.

As the Patents-in-Suit admit, animators were creating animations with lip synchronization using a manual process substantially identical to the claimed computer-aided process at the time of the claimed invention.

First, the prior art animator would obtain a timed transcript of the sounds and phonemes the animated character is supposed to speak (called a "time aligned phonetic transcription" or "TAPT"). According to the Patents-in-Suit, the TAPT "can be created by hand, as they currently are in the traditional animation industry" or by automatic speech recognition programs.

Next, the prior art animator would follow a "morph target" approach and manually create a number of different mouth models, known as "morph targets," showing what the animated character looks like when speaking various sounds.

Next, using the TAPT, the prior art animator would decide what the animated face should look like at key points in time, and then "draw" the face at those times. To do this, the animator would manually give certain "weights" to each morph target at each such time, based on, for example, the current phoneme and what phonemes come earlier or later in the TAPT. The animator weights the morph targets based on an internal set of rules developed from her experience and skills. For example, an animator might know that, at a particular time, a character is halfway between a "tee" and "ooh" sound, and thus assign weights of .5 to "tee" and "ooh," and a weight of 0 to all other morph targets. Each frame of animation created at such a key point in time is called a "keyframe."

Finally, the prior art animator would "fill in" the animation for the frames in between these keyframes to produce animation at a desired frame rate—a standard practice at the time of the Patents-in-Suit called "interpolation."

B. The Claims Simply Automate Conventional Techniques.

The asserted claims merely automate the foregoing process using a generic computer, without disclosing any specialized, new, or improved hardware or software. Worse, the claims omit important steps in the overall animation process. First, the claimed method requires the user to supply a TAPT using known methods. Second, the claimed method requires the user to supply mouth models

(morph targets) of her own creation. Third, the claimed method does not define what rules will be used to determine which morph weight set to apply based on the phonemes in the TAPT. Instead, the user must provide rules that specify which weightings should be used at certain key times. The user of the claimed method would then apply these ***user-supplied*** rules to the ***user-supplied*** TAPT using a computer.

Importantly, the Patents-in-Suit are entirely agnostic as to what rules are used, so long as they meet certain basic requirements. The patented claims merely require "a first set of rules that define output morph weight set stream as a function of ***phoneme sequence*** and ***time of said phoneme sequence***." But these features must be present in ***any*** lip-synchronization method. The claims simply do not include any limitation on or even complexity to the "rules" claimed therein. Any "rules" will do.

Thus, just as in the prior art, the claims contemplate that these ***user-supplied*** "rules" will be applied to the ***user-supplied*** TAPT, and, using the ***user-supplied*** morph targets, generate output morph weight sets. And, just as in the prior art, these morph weight sets are used to animate the character.

Critically, the Patents-in-Suit acknowledge that, aside from the preamble of the independent claims (requiring automation), each step of the claimed method was well-known in the prior art and performed just as it had been conventionally:

'576 Patent, claim 1	**Previously Done Manually**	**Automating Step**
A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:		A32 at 2:38-54
obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;	A32 at 1:63-2:28	

'576 Patent, claim 1	Previously Done Manually	Automating Step
obtaining a timed data file of phonemes having a plurality of sub-sequences;	A32 at 1:32-34	
generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;	A32 at 1:45-2:30	
generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and	A32 at 2:29-37	
applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.	A32 at 2:29-37	

The *only* aspect of the claims that the Patents-in-Suit suggest is novel is performing the conventional method "automatically" using a general-purpose computer.

ARGUMENT

II. APPLICABLE LEGAL PRINCIPLES: ABSTRACT IDEAS ARE NOT ELIGIBLE FOR PATENT PROTECTION.

Section 101 contains an important exception: laws of nature, natural phenomena, and abstract ideas are not patentable. *Alice* 134 S. Ct. at 2354. These principles cannot be patented because "they are the basic tools of scientific and technological work" and are "free to all men and reserved exclusively to none." *Mayo*, 132 S. Ct. at 1293 (quoting *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) and *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980)).

The Supreme Court has established a two-part test for patent eligibility, including for computer-implemented methods. *See Alice*, 134 S. Ct. at 2355.

A. Step One

A patent on an abstract idea effectively preempts the idea itself, attempting to claim ownership of inventions that a patentee never conceived of and did not contribute to the state of the art by way of his patent application. *See Bilski* 561 U.S. at 610-11; *Mayo*, 132 S. Ct. at 1294.

Where a patent claim attempts to preempt a mathematical formula or algorithm, the Supreme Court has consistently found that claim to be directed to an abstract idea and therefore unpatentable subject matter.

In *Bilski*, the Supreme Court looked to precedent—namely *Benson* and *Flook*—to clarify what is an "abstract idea." The *Benson* Court found that "converting … numerals to pure binary numerals" was an abstract idea because "[a] contrary holding 'would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.'" *Bilski*, 561 U.S. at 610 (quoting *Benson*, 409 U.S. at 71, 72). The *Flook* Court held as abstract "a procedure for monitoring the conditions during the catalytic conversion process in the petrochemical and oil-refining industries." *Id.* (discussing *Flook*, 437 U.S. at 594). Notably, if the underlying mathematical algorithm was "assumed to be within the prior art, the application, considered as a whole, contain[ed] no patentable invention," and "the prohibition against patenting abstract ideas 'cannot be circumvented by attempting to limit the use of the formula to a particular technological environment' or adding 'insignificant postsolution activity.'" *Id.* (quoting *Flook*, 437 U.S. at 594 and *Diehr*, 450 U.S. at 191-192). Accordingly, the *Bilski* Court held that the concept of hedging "is an unpatentable abstract idea, just like the algorithms at issue in *Benson* and *Flook*." *Id*. at 611-12.

Alice reinforced that a concept may be abstract even though it does not "exist[] in principle apart from any human action." 134 S. Ct. at 2356. An "abstract idea" need not be a fundamental natural truth: "[t]he concept of risk hedging [it] identified as an abstract idea in [*Bilski*] cannot be described as a preexisting fundamental truth," but was nonetheless an abstract idea. *Id.*

This Court has similarly held "that methods which can be performed mentally, or which are the equivalent of human mental work, are unpatentable abstract ideas—the 'basic tools of scientific and technological work' that are open to all." *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011) (holding that a "mental process" is "a subcategory of unpatentable abstract ideas") (quoting *Benson*, 409 U.S. at 67). When a patent's claimed steps "could still 'be made [using a] pencil and paper,'" the claims are directed to an unpatentable mental process. *Id.* (quoting *Flook*, 437 U.S. at 586).

B. Step Two

Where, as here, the claims are directed to an abstract idea, courts must at Step Two "consider the elements of each claim both individually and 'as an ordered combination' to determine whether additional elements 'transform the nature of the claim' into a patent-eligible application." *Alice*, 134 S. Ct. at 2355.

Transformation "into a patent-eligible application requires more than simply stating the abstract idea while adding the words 'apply it.'" *Id.* at 2357 (quoting *Mayo*, 132 S. Ct. at 1294). A particular application of an abstract idea must "contain[] an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Id.* (quoting *Mayo*, 132 S. Ct. at 1294). Merely taking an abstract idea and adding steps (or breaking the idea into steps) involving "well-understood," "routine," or "conventional" activities does nothing to add an inventive concept to the abstract idea. *Mayo*, 132 S. Ct. at 1294; *Flook*, 437 U.S. at 590. Similarly, limiting the application of an abstract idea to a particular "field of

use" or "adding token postsolution components" does not transform the idea into a patent-eligible invention. *Bilski*, 561 U.S. at 612. Important here, "the mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention." *Alice*, 134 S. Ct. at 2358.

III. STEP ONE: THE CLAIMS OF MCRO'S PATENTS ARE DIRECTED TO AN ABSTRACT IDEA.

A. The Claims at Issue Are Directed to the Abstract Idea of Rules-Based Synchronization of Animated Mouth Movement with Speech Using a Computer.

The claimed methods are directed to a fundamental, abstract concept: the synchronization of animated mouth movement to speech based on undefined "rules" automated on a computer. Indeed, there can be little question that the idea that the human mouth looks a certain way while speaking particular sounds is a "pre-existing fundamental truth" that "exists in principle apart from any human action." *Alice*, 134 S. Ct. at 2356. This concept is not only conventional, but is fundamental to human speech. And even when applied to the more particularized field of animation—where animators apply mathematical rules reflecting the intrinsic correlation between mouth movement and speech—the concept remains equally abstract.

The claims bear this out. The claims require that the user supply her own phonetic transcript of the speech and her own rules reflecting the correlation of that speech to mouth shape to convert that transcript into a series of morph weight sets that will be applied to the animation. The claims then simply instruct the user to use a computer to apply those rules to the transcript—a simple mathematical operation that can be performed in a person's head or using a pencil and paper, but is admittedly faster using a computer. The claimed method does not represent any concrete improvement in the technology used to perform animation or even the

process of performing the animation itself. It simply sets forth the abstract concept of synchronizing mouth shape with speech, using a series of mathematical rules that the user must determine for herself, and then instructs the user to perform those steps "automatically" on a computer. Under controlling precedent, the claimed method cannot pass muster under Section 101.

B. Supreme Court Precedent Confirms the Abstractness of the Underlying Concept.

1. Parker v. Flook *Is Directly on Point*

In *Flook*, the Supreme Court determined that "a mathematical formula for computing 'alarm limits' in a catalytic conversion process was … a patent-ineligible abstract idea," even though the patents implemented the fundamental concept in a specific way and directed it toward a specific field. *Alice*, 134 S. Ct. at 2355 (discussing *Flook*, 437 U.S. at 594-95). The *Flook* Court recognized that, although the patent there involved a specific algorithm, the claims were at bottom directed to the abstract concept of computing alarm limits using well-known math.

Here, too, the Patents-in-Suit claim no more than the use of a basic algorithm (comprising undefined "rules") that implements fundamental mathematical formulae and relationships in a particular field. If anything, the underlying concept of the claims here is ***more*** abstract than those found unpatentable in *Flook* because the claims here do not even specify the algorithm to be applied. The patent claims here are as abstract as if the *Flook* claims claimed "extensible and freeform" algorithms for computing "alarm limits" in "a catalytic conversion process," without specifying or claiming any specific algorithm at all.

As in *Flook*, the claimed method can be performed solely with pencil and paper. Indeed, the Patents-in-Suit provide a pencil-and-paper example of animating the word "hello." This example begins with a group of delta sets, a set of rules, and a TAPT. By simply applying the set of rules to the TAPT, one may (in one's mind

or by using only pencil and paper) confirm that the appropriate output morph weight set stream is given. This output morph weight set stream is to be interpolated "using conventional methods well known in the art." But patents that merely claim the performance of such computations—which could be done solely in one's mind or using pencil and paper—are unpatentable. *Flook*, 437 U.S. at 594-95; *see also CyberSource*, 654 F.3d at 1371.

2. Appellant's Heavy Reliance on Diamond v. Diehr *Is Misplaced*

While *Flook* (and *Benson*) provide important guidance on claims that ***are*** directed to an abstract idea (including those at bar), the Supreme Court's decision in *Diamond v. Diehr* also provides useful guidance on claims that are ***not***. Unsurprisingly, in the post-*Mayo* world, patent-holders like McRo have retreated to *Diehr* as a last resort in defending against unpatentability determinations. But such heavy reliance on *Diehr* is unfounded.

The question in *Diehr* was "whether a process for curing synthetic rubber which includes in several of its steps the use of a mathematical formula" is patentable subject matter. 450 U.S. at 177. The Court determined that "[t]ransformation and reduction of an article 'to a different state or thing' is the clue to the patentability of a process claim that does not include particular machines." *Id.* at 184. On that basis, the Court concluded that "a physical and chemical process for molding precision synthetic rubber products falls within the § 101 categories of possibly patentable subject matter." *Id.* Importantly, that "conclusion … is not altered by the fact that in several steps of the process a mathematical equation and a programmed digital computer are used." *Id.* at 185.

While McRo would have this Court focus on the ***outcome*** of *Diehr*, it is the Supreme Court's ***analysis*** that is important here. *Diehr* confirms that the Supreme Court's Section 101 holding was driven by the fact that the claimed process

involved a ***physical*** transformation. *See id.* at 183 ("a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing"); *see also id.* at 184 ("Industrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws"); *id.* ("transformation of an article, in this case raw, uncured synthetic rubber, into a different state or thing").

Diehr is thus in stark contrast to the claims at issue here. The question presented in *Diehr* was not whether the use of a computer can make an unpatentable process patentable, but whether the use of a ***computer to help perform an (otherwise patentable) physical process*** rendered the "process as a whole … unpatentable subject matter." *Id.* at 187; *see id.* at 185. Here, the claimed methods do not involve a physical process or transformation at all—they are directed only to the processing of data on a general- purpose computer. That is, of course, not enough. *See Alice*, 134 S. Ct. at 2358 (explaining that claims in *Diehr* were patent eligible "not because [they] involved a computer" but because they used an equation to improve a "process for curing rubber").

C. This Court's Post-*Alice* Jurisprudence Confirms the Abstractness of the Claims.

1. Ultramercial *Demonstrates that Claims with "Concrete" Steps May Nonetheless Be Directed to an Abstract Idea.*

In *Ultramercial*, this Court held unpatentable "a method for distributing copyrighted media products over the Internet where the consumer receives a copyrighted media product at no cost in exchange for viewing an advertisement, and the advertiser pays for the copyrighted content." 772 F.3d at 712. The *Ultramercial* Court found that the claimed method "recites an abstraction—an idea, having no particular concrete or tangible form." *Id.* at 715. Even though the *Ultramercial* claims necessarily implicated at least a network, a computer, a log,

and a display (though not explicitly claiming them), the Court looked to the claims at issue and found the underlying idea was abstract. *Id.* at 714 (analyzing only the claims "because claims are the definition of what a patent is intended to cover").

McRo attempts to distinguish *Ultramercial* by arguing that its method for "performing [a] process automatically," "embodied in computer software for use with a computer," is "no mere 'idea, having no particular concrete or tangible form.'" But McRo's claimed method is no more "concrete" or "tangible" than that in *Ultramercial*. Indeed, *Ultramercial*'s claims could similarly be described as "performing [a] process automatically … embodied in computer software for use with a computer."

2. Digitech *Holds that a Method Using Mathematical Algorithms to Manipulate and Create New Information, Without More, Is Directed to an Abstract Idea.*

In *Digitech*, this Court confirmed that "[w]ithout additional limitations, a process that employs mathematical algorithms to manipulate ***existing information*** to generate ***additional information*** is not patent eligible." 758 F.3d at 1351. This is true "even if the solution is for a specific purpose." *Id.* (quoting *Flook*, 437 U.S. at 595). Under *Digitech*, even McRo agrees that a patent claiming "simply a means of calculating numbers" is ineligible under Section 101.

But this is precisely what the Patents-in-Suit attempt to claim: a process that does no more than "employ[] mathematical algorithms to manipulate existing information to generate additional information." *Digitech*, 758 F.3d at 1351. The claimed method requires the user to supply a TAPT and a set of rules—*Digitech*'s "existing information." Next, the claimed method requires that a generic computer should apply the existing rules to the existing TAPT, and then apply the resulting morph weight sets to a sequence of animated characters. These "apply" steps are nothing more than simple mathematical calculations. Thus, a general-purpose

computer simply performs mathematical steps to "apply" the set of rules to the TAPT, resulting in a stream of morph weight sets—*Digitech*'s "additional information." Just as in *Digitech*, the Patents-in-Suit attempt to claim nothing more than the mathematical processing of "existing information" to create "additional information," leaving them unpatentably abstract.

3. McRo's Attempt to Analogize these Claims to Those in DDR *Is Unpersuasive.*

McRo next strains to analogize its claims to those in *DDR*—this Court's only post-*Alice* decision upholding subject matter patentability to date.

The claims here are nothing like those in *DDR*. The claims in *DDR* "do not recite a mathematical algorithm" or a "fundamental economic or longstanding commercial practice." *DDR*, 773 F.3d at 1257. Instead, those claims "address a business challenge … particular to the Internet." *Id.* Importantly, the *DDR* Court found that the claims "do not merely recite the performance of some business practice known from the pre-Internet world along with the requirement to perform it on the Internet." *Id.* But McRo's claims do precisely that—they "recite the performance of some [animation] practice known from the pre-[automation] world along with the requirement to [automate it on a computer.]"

What would the claimed method in this case look like in a pre-automation world? The Patents-in-Suit answer that question: it would look like the process described in the "background" of the specification or the pencil-and-paper example of animating "hello." In fact, it is undisputed that the claimed process can be done by pencil and paper. The claimed method is not "necessarily rooted" in automation technology, or even in computer technology. It is a simple, mathematical process that can be performed by hand and is thus unpatentably abstract.

IV. STEP TWO: THERE IS NO INVENTIVE CONCEPT THAT RENDERS THE CLAIMS PATENTABLE.

To be patentable, "[a] claim that recites an abstract idea must include additional features to ensure that the claim is more than a drafting effort designed to monopolize the abstract idea." *Alice*, 134 S. Ct. at 2357. "Simply appending conventional steps, specified at a high level of generality, [is] not ***enough*** to supply an inventive concept." *Id.* (original emphasis); *see also Mayo*, 132 S. Ct. at 1294.

Importantly, "[t]he introduction of a computer into the claims does not alter the analysis at *Mayo* step two." *Alice*, 134 S. Ct. at 2357. "[R]elying on a computer to perform routine tasks more quickly or more accurately is insufficient to render a claim patent eligible." *OIP Techs. Inc. v. Amazon.com, Inc.*, No. 2012-1696, slip op. at 8 (Fed. Cir. June 11, 2015). Where, as here, a patent "emphasize[s] that the key distinguishing feature of the claims is the ability to automate or otherwise make more efficient traditional [] methods," that computer- implemented automation is not enough. *Id.* Instead, "the relevant question is whether the claims here do more than simply instruct the practitioner to implement the abstract idea … on a generic computer." *Alice*, 134 S. Ct. at 2359. Here, the answer is no.

A. The Patents-in-Suit Admit That All Additional Limitations Were Conventional, Well-Understood, and Routine.

Limitations that are conventional, well-understood, and routine cannot provide the "something more" required at Step Two. *Mayo*, 132 S. Ct. at 1294. Here, each limitation of the claimed method—except "automatically"—was acknowledged as precisely that. Indeed, the Patents-in- Suit specifically admit that manual animation based on phonemes and morph weights was "traditional."

McRo attempts to side-step these admissions by arguing that these elements merely have some "supposed basis in prior art," and are not "ubiquitous among those who work in the field." But the Patents'-in-Suit admission that this was

"[t]he current practice," shows this is precisely the type of "well-understood, routine, conventional activit[y] previously known in the industry" that persons of skill were already doing and is thus insufficient to confer patentability at Step Two. *Alice*, 134 S. Ct. at 2359; *cf. Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, No. 2014-1139, 2014-1144, concurring slip op. at 3 (Fed. Cir. June 12, 2015) (Linn, J., concurring) (noting that *Mayo* related to conventional activities that were the very steps that persons of skill were already doing in practice). A patent-holder is bound by a patent's admissions about what was known in the art. *See PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1362 (Fed. Cir. 2007); *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988).

B. The "Rules" Limitation Adds Nothing to the Claims.

In an effort to confer patentability, McRo focuses on the "obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence" limitation to try and make the claims concrete. McRo emphasized these claimed "rules" as "the crux of the invention" during claim construction. Yet, McRo was forced to admit that the Patents-in-Suit do not actually claim any particular rules.

Indeed, neither the claims nor the specification place any additional limitations on these rules. To be sure, the specifications provide ***examples*** of such rules. But the Patents-in-Suit do not limit themselves to only these types of rules. Instead, the claims purport to cover ***any*** rules that "define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence." In other words, while the specification may provide examples of rules, the patents make clear that the claims apply to any rules that can be executed by the computer and not some specific subset. *See OIP*, No. 2012-1696, slip op. at 7. Just as in *OIP*, "the claims are exceptionally broad and the computer implementation limitations do little to limit their scope." *Id.*

It is of course the ***claims*** that matter to the Section 101 analysis. *See Accenture Global Servs., GMBH v. Guidewire Software, Inc.*, 728 F.3d 1336, 1345 (Fed. Cir. 2013) (explaining that "the important inquiry for a § 101 analysis is to look to the claim" and "the level of detail in the specification does not transform a claim reciting only an abstract concept into a patent-eligible system or method"); *Planet Bingo, LLC v. VKGS LLC*, 576 F. App'x 1005, 1008-09 (Fed. Cir. 2014) (nonprecedential).

C. McRo's Argument that the Patents-in-Suit Represent a "Technological Improvement" Is Unavailing.

McRo's argument that the Patents-in-Suit provide some kind of "technological improvement" in the field of 3-D computer-generated lip-synchronization animation is premised on a basic misreading of the Patents-in-Suit. The Patents-in-Suit do not claim any improvement to any computer or computer-related hardware or other technology. The alleged invention simply does not make the computer itself operate faster or better. Rather, the ***only improvement*** the Patents-in-Suit purport to claim over conventional prior art methods is that they make the process of creating lip-synchronized animation faster by automating the process on a general-purpose computer.

Ultimately, that the claimed method might "aid in [a] technological goal" cannot be enough to show the necessary "something more" at Step Two. If it were, *Alice*, *Bilski*, and numerous other cases would have been decided differently. *See, e.g.*, *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1345 (Fed. Cir. 2014) (finding claims patent-ineligible even where they aided in the technological goal of "extracting data from hard copy documents using an automated digitizing unit … recognizing specific information from the extracted data, and [] storing that information in a memory"); *Digitech*, 758 F.3d at 1344

(holding claims patent-ineligible even where they aided in the technological goal of correcting colors in digital images).

V. MCRO'S PREEMPTION ARGUMENT MISSES THE MARK.

As McRo's opening brief acknowledges, preemption is the fundamental concern that underlies Section 101 jurisprudence. Yet, in arguing patentability, McRo argues that the scope of its claims are "no larger than 'the underlying discovery could reasonably justify,'" and thus do not risk disproportionately tying up an abstract idea. The argument fails.

The claims in fact preempt the use of rules relating to lip-synchronization animation because the claim requirement of "rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence" is so broad as to cover ***any*** lip-synchronization process—because ***any*** intelligible lip-synchronization process must take into account in what order the phonemes appear in the transcript and at what time.

McRo also argues that a finding of no preemption is supported by the existence of examples in which certain lip synchronization systems are alleged not to meet the limitations of the claimed method. Even if McRo's interpretation of the "rules" requirement were correct—and it is not—the problem with the argument is that it relies on a patent-holder being permitted to read the claims broadly for infringement but narrowly in the context of Section 101. Using Appellees' noninfringement position to argue against preemption is ridiculous. No determination regarding infringement has been made—and Appellees' denial of liability says nothing about Section 101's requirements.

VI. MCRO'S CRITICISM OF THE DISTRICT COURT'S ANALYSIS IS MISPLACED.

Although this Court considers the Section 101 determination *de novo*, the District Court correctly applied Supreme Court precedent in finding the Patents-in-

Suit unpatentably abstract. McRo's arguments to the contrary are based on out-of-context reading of the District Court's analysis, perhaps aimed at raising the specter of procedural anomalies that simply do not exist.

At Step Two, the District Court properly considered the specific limitations of the claims and properly discarded conventional and routine activity. The District Court did not use a "point of novelty" test rejected in *Diehr*, the District Court's analysis at Step Two properly discarded conventional and routine activity. Instead, the District Court looked to the Patents'-in-Suit express acknowledgement of limitations that were both conventional and well-known in the industry, and rightly determined that those limitations do not contain an "inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application." *Alice*, 134 S. Ct. at 2357. In so doing, the District Court followed controlling precedent. *See Ultramercial*, 772 F.3d at 715. The District Court explained that, "where a claim recites tangible steps, but the only new part of the claim is an abstract idea, that may constitute a claim to an abstract idea." (citing *Alice*, 134 S. Ct. at 2358 as disregarding the presence of a computer in Step Two analysis); *Mayo*, 132 S. Ct. at 1297-98 (disregarding step of administration of the drug in Step Two analysis).) Thus, the District Court did not import a Section 103 obviousness analysis into its Section 101 patentability analysis; instead, it correctly looked to the patents' own discussion of conventional and routine animation techniques to determine that those elements were "well- understood, routine, conventional activities previously known in the industry" for purposes of Section 101. *Alice*, 134 S. Ct. at 2359.

CONCLUSION

The judgment should be affirmed.

Nos. 15-1080, 15-1099

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

MCRO, INC., DBA PLANET BLUE,

Plaintiff-Appellant,

v.

BANDAI NAMCO GAMES AMERICA INC., et al.,

Defendants-Appellees.

Appeal from the United States District Court
for the Central District of California

REPLY BRIEF FOR PLAINTIFF-APPELLANT MCRO, INC.

[excerpted and adapted for 2016 Federal Judicial Center exercise]

INTRODUCTION

The patented invention does something, as one defendant put it, "revolutionary." For decades, creating realistic, computer-generated 3-D lip-sync animation required constant and labor-intensive human intervention. Prior-art methods to automate lip-synching without that human intervention produced unrealistic "flappy" lips and other unacceptable results.

The invention here enabled a computer to produce quality 3-D animation automatically, without the keyframe-by-keyframe exercise of human artistic judgment. The invention does not perform the same process that human artists used to—subjectively manipulating an image of the character, using sliders, until the keyframe "looks right"—and simply use a computer to do that faster. Instead, the invention uses pre-defined rules that vary how the character expresses a particular viseme based on two factors: phoneme sequence (the sounds surrounding the one being articulated) and timing (the pace of speech).

The claims thus recite "a method for automatically animating lip synchronization and facial expression of three-dimensional characters." Like most software, the invention uses algorithms. But the claim is not a method for calculating numbers. It is a method for producing a tangible result—"lip synchronization and facial expression control of . . . animated characters." That is, it creates moving images of a character speaking in sync with pre-recorded dialogue. The method is precisely the sort of "improve[ment to] an existing technological process" that meets the Supreme Court's test for patent-eligibility under § 101. *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2358 (2014). Like the claims in *Diamond v. Diehr*, 450 U.S. 175 (1981), they are "eligible to receive the protection of our patent laws." *Id.* at 184.

ARGUMENT

I. THE CLAIMS ARE A PATENT-ELIGIBLE IMPROVEMENT TO A TECHNOLOGICAL ANIMATION PROCESS.

Under *Alice*, a claim is not an unpatentable abstract idea if it "improve[s] an existing technological process." 134 S. Ct. at 2358. That precisely describes the invention: For the first time, it allows a computer to produce ***realistic*** 3-D lip synchronization ***automatically***, without the need for keyframe-by-keyframe human artistic judgment. In replacing human artistic judgment, the invention does ***not*** simply use computer processing power to do faster what artists previously did. It uses an entirely different process. It is a patent-eligible technological advance under *Alice*.

A. The Claimed Invention Is Fundamentally Different from Prior-Art Methods of 3-D Computer Animation.

Defendants do not dispute that prior-art efforts to ***automate*** 3-D lip-synchronization produced unrealistic and unacceptable "flappy-lipped" outputs. Defendants wholly ignore that prior art.

Instead, defendants focus on the prior-art "manual" method, which—like the invention—produced more realistic results. An artist would sit at a computer screen showing a neutral model of the character to be animated, along with a set of "morph targets" (or visemes), depicting the character articulating various phonemes. The artist would go through a transcript of the pre-recorded dialogue and, using software, manually set "keyframes" at important moments. For each keyframe, the artist would look at the screen and, relying on her judgment, manipulate the character model until it ***looked right***—a visual and subjective process. The artist would repeat that process for thousands of keyframes. The software would in turn derive morph weight sets from the artist's visual

manipulation of the sliders, and then use those morph weight sets to generate animation of the character model.

But the claimed method is much more than the automation of this process. The claimed method eliminates the need for a human to go through the transcript and apply artistic judgment at every keyframe. It eliminates manual selection of keyframes, the manipulation of sliders, and human judgment about what those thousands of keyframes should look like. Instead, the computer uses "rules that define output morph weight set stream as a function of" two key parameters—"phoneme sequence and time of said phoneme sequence"—that have been established ***in advance, independent of any dialogue transcript***. The software (not a human) applies those rules (not subjective judgment) to the transcript to determine when to set keyframes, what the appropriate morph weight sets and transition parameters should be, and thus ultimately how to manipulate the character's facial expressions.

Defendants' assertion that the method here just uses a computer to "automate" a pre-existing process thus is like saying that a method for using autopilot software to land an airplane simply "automates" a pre-existing process. Skilled pilots use their senses to take into account certain factors—what they see, altitude, speed, location, wind, etc.—and apply their training, judgment, and experience when deciding how to move the plane's yoke to land it. Autopilot software that effects a suitably smooth landing by evaluating another mix of information, and by processing it using rules and calculations pilots cannot perform, to manipulate flaps and ailerons might be said to "automate" the landing process. But it does so in a fundamentally different way. It does not "automate" judgments that were being made inside the pilot's brain, just as the invention here does not automate the animator's artistic process. Defendants' contention that the claims "recite a previously-known method and instruct the user to 'do it on a

computer'" is thus false. The claims enable software to perform a function in 3-D computer animation that previously required the exercise of subjective, artistic judgment through a "laborious," "lengthy," and expensive process. Indeed, once the rules are set for a given character, the invention can "rapidly," "cost effectively," and consistently produce a virtually unlimited amount of animation—such as animating a character throughout a series of video games—without further human intervention. The patented method thus significantly "improve[s] an existing technological process." *Alice*, 134 S. Ct. at 2358, 2359. It is a tremendous advance over both the so-called prior-art "manual" method and the undisputedly crude prior-art automated methods.

B. Defendants' Contentions about the Prior Art Are Unsupported and Unsupportable.

Defendants contend that "each step of the claimed method," other than "automation," was "well-known in the prior art." Defendants' argument is more appropriately addressed to § 103 obviousness than § 101, but fails in any event. Their sole support is a claim chart with citations to Planet Blue's patent specification. But they offer ***no*** explanation of how the citations support their position—and with reason. The Court need only review the citations to see that the patent ***never*** suggests that each of the method's claimed steps was already in the prior art and is "performed just as it had been conventionally."

As Planet Blue explained, one key advance over the prior art is the use of "rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence." Defendants' argument that such rules were utilized in the prior art consists of a single citation to the specification: "A32 at 1:63-2:28." But that portion of the specification says only that ***morph weight sets*** can be used to manipulate ***morph targets***. The passage says nothing about how morph weight sets can be generated automatically without artists setting

keyframes. Nor does the passage on which defendants rely mention "rules," "phoneme sequence," or "tim[ing]" at all. It certainly does not say that, in the prior art, artists did what the claims require—establish pre-defined "rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence" and apply the rules to the transcript. But the fatal blow to defendants' argument is that the district court specifically found that "[r]ules for defining morph weight sets as a function of timing" were ***not*** in the prior art. So it cannot be true that "each step of the claimed method," other than "automation," was "well-known in the prior art."

II. DEFENDANTS' ARGUMENTS IGNORE AND MISCONSTRUE WHAT IS ACTUALLY CLAIMED

Defendants correctly assert that it is "the ***claims*** that matter to the Section 101 analysis." But their arguments ignore or affirmatively misconstrue the text of the claims. Properly read, the claims are neither directed to, nor fail to add sufficiently concrete context to, an abstract idea.

A. The Claimed Method Is Directed to "Automatically Animating Lip Synchronization and Facial Expression of Three-Dimensional Characters," Not an Algorithm for Calculating Numbers.

Invoking a now-commonplace attack on software patents, defendants urge that the patents "claim no more than the use of some basic mathematical algorithm that can be performed solely with pencil and paper." Defendants' arguments, however, ignore virtually all of the claims' steps and their specific requirements.

The Preamble of Claim 1 of the '576 Patent makes clear that the patents are not directed to a "mathematical algorithm." They are directed to a method "for automatically animating lip synchronization and facial expression of three-dimensional characters." The claim's final clause is equally clear: the method must "produce lip synchronization and facial expression control of said animated characters." That is, the claims require a tangible output—alteration of a computer-

generated character's facial features to produce a moving image of the character speaking.

Defendants' assertion that the patents merely "perform[] mathematical operations . . . on data to generate new data," reads these limitations out of the claims, focusing solely on the intermediate step of generating morph weight sets and transition parameters. But the Supreme Court has rejected that type of analysis: When determining patent-eligibility "under § 101, the[] claims must be considered ***as a whole***." *Diehr*, 450 U.S. at 188 (emphasis added); *see also Alice*, 134 S. Ct. at 2355. The question is not whether one step is "patentable in isolation." *Diehr*, 450 U.S. at 188. It is whether the entire claimed "process" is patent-eligible. *Id.* Defendants cannot ignore the claim limitations that contradict their position.

In passing, defendants argue that the "animated characters" recited in the Preamble and final clause are "simply information." That too defies the claim. The claim requires "***lip synchronization*** and ***facial expression control*** of said animated characters." Disembodied "information" has no "lips" to "synchronize" or "facial expressions" to "control." Rather, the patent makes clear that the claimed "animated characters" are visual "models" of a face: "three dimensional characters for films, videos, cartoons, and other animation products." Indeed, defendants concede that the claim requires using morph weight sets to deform a neutral model into different states to depict speech. And the district court found that the claim's output is "tangible." The claim requires much more than mathematical calculations.

Defendants' assertion that the method could be performed using pencil and paper fails for similar reasons. The patents do not cover classic, Disney-style, 2-D hand-drawn cels that are combined to make animation. Rather, as the district court observed, the field of the invention is "three-dimensional ***computer animation***, which is a specific technological process." The prior-art methods of animated 3-D

lip-synchronization also required a computer and software—no one contends they could be performed with pencil and paper either.

The specification does provide a simplistic example of how, under the claimed method, rules might specify the morph weight sets and transition parameters that would apply to certain phoneme sub-sequences and their durations when the sounds for "hello" are encountered in the transcript. But that describes one set of rules for a single step; it does not perform the method. The claimed method generates "lip synchronization and facial expression of animated characters." It does that in part by evaluating the transcript to generate "stream[s] of output morph weight sets and a plurality of transition parameters." As Planet Blue's expert attested, urging that a human could or would sit down, evaluate the transcript sequence-by-sequence, and write down the hundreds of thousands of morph weight sets and transition parameters necessary for "an entire facial sequence" is "comical."

But even if a human with limitless time, paper, and pencils might jot down countless morph weight sets and transition parameters corresponding to the transcript of dialogue for a video game using the sort of rules required by the patent, that does ***not*** perform the method. The claims require that those morph weight sets and transition parameters "produce lip synchronization and facial expression control of said animated characters." Defendants nowhere explain how a person, holding reams of paper containing a handwritten list of output morph weight sets and transition parameters, could "apply" that to an "animated character" to "produce lip synchronization" and "control" its "facial expression." Because animating a 3-D character involves more than calculating numbers, one cannot computer ***animate*** a character speaking "the word 'hello'"—or anything else—with a pencil and paper.

In *Caltech*, Judge Pfaelzer rejected a § 101 argument just like defendants'. *Cal. Inst. of Tech. v. Hughes Commc'ns, Inc.*, 59 F. Supp. 3d 974, 977-78 (C.D. Cal. 2014). That case concerned a method for error correction during data transmission in electronic systems. The claims recited "mathematical algorithms," *id.* at 994, used to create "parity bits," *id.* at 978. Judge Pfaelzer rejected the defendant's assertion that the claims "can be performed by a person with pencil and paper" as being "theoretically correct," but "literally wrong." *Id.* at 994, 995. "It states the obvious to say that a pencil and paper cannot actually produce parity bits." *Id.* at 995. A human calculating the algorithms would end up with "paper," not actual parity bits that could prevent data corruption. *Id.* at 994. The "pencil-and-paper" argument "ignore[d] the fact" that the patent at issue "create[d] an algorithmic solution for a computing problem—the corruption of data during transmission." *Id.* at 995.

Judge Pfaelzer's analysis is on point. As in *Caltech*, these patents provide a "solution for a computing problem"—automatically producing 3-D computer animation. "[A] human could spend months or years" analyzing a transcript of dialogue and "writing on paper" the morph weight sets and transition parameters corresponding to the rules that are but one step in the method. 59 F. Supp. 3d at 994. But "[a]t the end of the effort, he would be left with a lot of paper that obviously would not produce the same result as the software," *id.*—he would not have automatically manipulated the facial features of a computer-generated character so that it appears to speak dialogue. Far from showing that the patent claims an abstract idea, pencil-and-paper analysis shows why this is a concrete invention. The invention takes a technological field—3-D computer animation—and improves it using techniques that have no pre-computer analogue.

B. Claims May Properly Recite Specific Categories of Rules, Rather Than Individual Rules.

To the extent the district court addressed the scope of the rules and their content during claim construction, it found that the "function of phoneme sequence and times associated with said phoneme sequence" limitations "set out ***meaningful requirements*** for the first set of rules." The district court, however, held that the claims were unpatentably abstract because, other than specifying the ***types*** of rules, the claims do not set forth the ***specific*** rules (presumably for specific characters).

This was error. The fact that the patent does not claim specific rules that operate as a function of "phoneme sequence" and "time of said phoneme sequence" is immaterial for § 101 purposes. The law allows a patentee to write claims that encompass the genus of the invention, rather than reciting every species. *See AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1299 (Fed. Cir. 2014). Whether the patent "sufficiently . . . describe[s] representative species to support the entire genus" is a concern addressed by § 112's "written description" requirement. *Id.* The patentee's decision here to claim the categories of rules based on "phoneme sequence" and "timing of phoneme sequence" (together with specified "generating" steps) rather than reciting every example of those rules does not render the claims "so manifestly abstract as to override the statutory language of section 101." *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 869 (Fed. Cir. 2010). Here, one of ordinary skill in the art reading the claims would readily understand how to write individual rules and utilize them within the context of the method (particularly given the disclosure in the specification).

While defendants make the absence of individual rules a cornerstone of their brief, they ignore Planet Blue's arguments (at 46-47, 61) on why that does not affect patent-eligibility under § 101. It may be that users tailor a patented method

to individual purposes. But that does not render the underlying invention unpatentably abstract.

III. THE CASE LAW DEMONSTRATES THAT THE CLAIMS ARE PATENT-ELIGIBLE.

Once the claims and prior art are properly understood, defendants' arguments under the two-step *Alice/Mayo* framework and *Alice*'s "technological improvement" standard collapse. The claims are "directed to" a specific and concrete technological process, not an abstract idea. *Alice*, 134 S. Ct. at 2355; *see* Br. 36-42. And the claim limitations clearly "add ***enough*** . . . to allow the processes they describe to qualify as patent-eligible processes that ***apply***" whatever ideas may be at issue. *Mayo*, 132 S. Ct. at 129. The patents do not monopolize "basic tools of scientific and technological work," *Alice*, 134 S. Ct. at 2354. There are myriad non-infringing ways to perform 3-D computer lip-sync animation. The patents thus do not implicate the purposes of the abstract-ideas exception.

These are not claims about "business methods"—ideas about "fundamental economic practice[s]" and "organizing human activity"—which the Supreme Court and this Court have deemed abstract ideas under § 101. *Alice*, 134 S. Ct. at 2356-57. There is a huge difference between the "financial solutions" in those cases and the "animation solution" at issue here. Patents covering business methods generally implicate the "abstract ideas" exception to § 101. *See Alice*, 134 S. Ct. at 2356-57; *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1257 (Fed. Cir. 2014). The novel animation method here, by contrast, is technological, not entrepreneurial. It is precisely the type of invention the Supreme Court identified as patent-eligible in *Alice*. *See* 134 S. Ct. at 2359.

Defendants' reliance on *Parker v. Flook*, 437 U.S. 584 (1978), is wholly misplaced. The *Flook* claim was not patent-eligible because it sought to cover an abstract idea—"[a]ll that it provide[d]" was the mathematical formula for updating

the value of an alarm limit, rather than a sufficiently particularized application of that idea to the catalytic chemical conversion of hydrocarbons. *Id.* at 585-86. The claim did not "purport to contain any disclosure relating to the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system." *Id.* at 586.

Defendants' insistence that, "[a]s in *Flook*, the claimed method [here] can be performed solely with pencil and paper," and encompasses only "some basic algorithm . . . that implements fundamental mathematical formulae," Def. Br. 28, reveals the flaw in their arguments. Defendants can so characterize the invention only by ignoring virtually every step of the claims. And here, the output is not a "value" or a "number." It is animated, lip-synched images, as the claims expressly recite. *supra*. The method here provides what was lacking in *Flook*: a specific technological application that produces a concrete output, not just a "number."

Far from resembling the claims in *Flook*, the claims here more closely resemble those held patent-eligible by the Supreme Court in *Diehr*, and this Court in *DDR Holdings*. *See* Br. 39-42. In *Diehr*, the Supreme Court made clear that it did not matter whether the formula used there (the "Arrhenius equation") was "patentable in isolation." 450 U.S. at 188. The claims, the Supreme Court explained, did not seek to "patent a mathematical formula," but rather "describe[d] in detail a step-by-step method" for accomplishing a technological process, *id.* at 187, 184—*i.e.*, "operating a rubber-molding press for precision molded compounds," *id.* at 179 n.5. Similarly, the patents here claim a step-by-step process, including using morph weight sets and transition parameters generated by specific means to "produce lip synchronization and facial expression control of . . . animated characters." Indeed, *Diehr* makes this an *a fortiori* case. *Diehr* involved a well-known equation already used when curing rubber. Here, the specific rule parameters identified in the claim were the inventor's creation.

Moreover, as with the claims in *DDR Holdings*, the inventor's innovative method for automating 3-D computer animation is "necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer[s]." 773 F.3d at 1257. In the prior art, computers could not automatically generate realistic animation without ongoing human intervention. The invention solved that problem, automatically generating lip-sync usable for a variety of applications. As a result, it is patent-eligible.

Finally, defendants attempt to distinguish *Diehr* on the grounds that the claimed rubber-curing process involved a "***physical*** transformation." But the same is true here. The claims move the facial expressions of an animated character. Defendants concede that the claims use morph weight sets "to deform the neutral model" of the character into different states to depict speech. Defendants nowhere explain why that transformation of a static model into a moving image that appears to speak dialogue is not "physical." And *Diehr* did ***not*** hold that a "physical" transformation is required. Rather, it held that a process will be patent-eligible under § 101 where it comprises "a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing." 450 U.S. at 183 (quotation marks omitted). Here, the claimed method "transform[s]" a static model of an "animated character" to a "different state," 450 U.S. at 183—a moving image with full "lip synchronization and facial expression control."

Whether viewed at step 1 or step 2 of the *Alice/Mayo* analysis, the claims here are not abstract. Unless software used to affect transformation is to be deemed patent-ineligible across the board, the judgment should be reversed.

CONCLUSION

The district court's judgment should be reversed.

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UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

McRO, Inc., d.b.a. Planet Blue, Plaintiffs, v. **Codemasters Inc., et al.**, Defendants.	No. CV 14-439-GW(FFMx) **RULING ON DEFENDANTS' MOTION FOR JUDGMENT ON THE PLEADINGS BASED ON UNPATENTABILITY UNDER 35 U.S.C. § 101**

I. Background

The Court is presiding over two sets of consolidated patent infringement cases filed by Plaintiff McRO, Inc., d.b.a. Planet Blue ("Plaintiff" or "Planet Blue"): the "Track 1" cases, consolidated under Case No. CV-12-10322,[1] and the "Track 2" cases, consolidated under Case No. CV 13-1872.[2] The cases all involve Plaintiff's

[1] The current Track 1 cases are: *McRO, Inc. v. Namco Bandai Games America, Inc.*, CV-12-10322; *McRO, Inc. v. Konami Digital Entertainment, Inc.*, CV-12-10323; *McRO, Inc. v. Sega of America, Inc.*, CV-12-10327; *McRO, Inc. v. Electronics Arts, Inc.*, CV-12-10329; *McRO, Inc. v. Obsidian Entertainment, Inc.*, CV-12-10331; *McRO, Inc. v. Disney Interactive Studios, Inc.*, CV-12-10333; *McRO, Inc. v. Naughty Dog, Inc.*, CV-12-10335; *McRO, Inc. v. Capcom USA, Inc.*, CV-12-10337; *McRO, Inc. v. Square Enix, Inc.*, CV-12-10338; *McRO, Inc. v. Neversoft Entertainment, Inc.*, CV-12-10341; *McRO, Inc. v. Treyarch Corporation*, CV-12-10342; *McRO, Inc. v. Atlus U.S.A., et al.*, CV-13-1870; McRO, *Inc. v. Sucker Punch Productions, LLC*, CV-14-0332; *McRO, Inc. v. Activision Blizzard, Inc.*, CV-14-0336; *McRO, Inc. v. Infinity Ward, Inc.*, CV-14-0352; *McRO, Inc. v. LucasArts Entertainment Company LLC*, CV-14-358; *McRO, Inc. v. Sony Computer Entertainment America, LLC, et al.*, CV-14-0383; *McRO, Inc. v. Warner Bros. Interactive Entertainment Inc.*, CV-14-0417.

[2] The current Track 2 cases are: *McRO, Inc. v. Valve Corporation*, CV-13-1874; *McRO, Inc. v. Codemasters USA Group, Inc. et al*, CV-14-0389; *McRO, Inc. v. Codemasters, Inc., et al*, CV-14-0439.

allegation that Defendants directly or indirectly infringed two patents for automatically animating the lip synchronization and facial expressions of 3D characters. The cases are proceeding on different tracks due to the filing or transfer dates of the cases, although various later-filed cases have been consolidated into Track 1 due to corporate or counsel relationships.

This Motion for Judgment on the Pleadings Based on Unpatentability under 35 U.S.C. § 101 ("Motion") was jointly filed by all defendants in both Tracks: Namco Bandai Games America, Inc.; Sega of America, Inc.; Electronic Arts, Inc.; Disney Interactive Studios, Inc.; Capcom USA, Inc.; Neversoft Entertainment, Inc.; Treyarch Corporation; Warner Bros. Interactive Entertainment, Inc.; LucasArts Entertainment Co. LLC; Activision Publishing, Inc.; Blizzard Entertainment, Inc.; Infinity Ward, Inc.; Atlus U.S.A., Inc.; Konami Digital Entertainment, Inc.; Square Enix, Inc.; Obsidian Entertainment, Inc.; Naughty Dog, Inc.; Sony Computer Entertainment America, LLC; Sucker Punch Productions, LLC; The Codemasters Software Company Limited; Codemasters, Inc.; Codemasters USA Group, Inc.; and Valve Corp. (collectively, "Defendants"). Notice of Mot., Docket No. 338 at 2. Plaintiff filed its Opposition on July 24, 2014. Docket No. 344. Defendants filed their Reply on July 31, 2014. Docket No. 350.

At issue are United States Patent Nos. 6,307,576 ("'576 Patent"), issued October 23, 2001, and 6,611,278 ("'278 Patent"), issued August 26, 2003, both to Maury Rosenfeld, and both titled "Method for Automatically Animating Lip Synchronization and Facial Expression of Animated Characters." The '278 Patent resulted from a continuation of the application that resulted in the '576 Patent, meaning the patents share the same disclosure. *See PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1304, n.3 (Fed. Cir. 2008).

The patents explain that prior methods of animating lip synchronization and facial expressions were laborious and uneconomical. '576 Patent 1:14-31. The

patents address that problem with an automated method of using "weighted morph targets and time aligned phonetic transcriptions of recorded text, and other time aligned data." '576 Patent 2:64-3:12. The patents explain that in the relevant art, "'phonemes [are] defined as the smallest unit of speech, and correspond[] to a single sound." '576 Patent 1:34-36. A sound recording can be transcribed into a "time aligned phonetic transcription" in which the timing of each phoneme is noted. '576 Patent 1:32-34. Such transcriptions can be created by hand or by automatic speech recognition programs. '576 Patent 1:39-43.

The patents explain that the prior art practice for 3-D computer generated speech animation was by manual techniques using a "morph target" approach. '576 Patent 1:44-46. That approach uses a reference model of a neutral mouth position in conjunction with "morph targets," which are models of the mouth in non-neutral positions corresponding to different phonemes. '576 Patent 1:46-49. The reference model and morph targets all share the same "topology" of the mouth, defined by the same number and placement of "vertices" that designate specific points on the mouth. For example, vertex "n" on the neutral mouth and all of the morph targets may represent the left corner of the mouth. '576 Patent 1:51-54.

The "deltas," or changes, of each vertex on each morph target relative to the corresponding vertex on the neutral model are computed as a vector to produce an individual "delta set" of vectors for each morph target. '576 Patent 1:58-62. From the neutral model, the animator need not move the mouth position all the way to a morph target. Instead, the animator can apply a value between 0 and 1, called the "morph weight," to a delta set to move the mouth just a percentage of the way to the corresponding morph target. '576 Patent 1:63-2:1. For example, if the sound (morph target) is "oh," and the morph weight is 0.5, the mouth only moves halfway between the neutral position and the "oh" morph target. '576 Patent 2:16-22. It is also possible to blend the morph targets, for example, 0.3 "oh" and 0.7 "ee," resulting in

a mouth position exhibiting a combination of the "oh" and "ee" sound characteristics. '576 Patent 2:23-28.

According to the patents, applying the appropriate morph weights in the prior art was usually done using a "keyframe" approach. In the keyframe approach, an artist sets the morph weights at certain important times, and a computer program then interpolates each of the channels at each frame between the keyframes. '576 Patent 2:29-34. The patents state that this method requires the artist to manually set a large number of keyframes, which is tedious, time consuming, and inaccurate. '576 Patent 2:34-37. Therefore, an object of the invention is to provide "an extremely rapid and cost effective means to automatically create lip synchronization and facial expression in three dimensional animated characters." '576 Patent 2:50-54.

The invention "utilizes a set of rules that determine the system[']s output comprising a stream or streams of morph weight sets when a sequence of timed phonemes or other timed data is encountered." '576 Patent 3:3-7. The invention includes:

> [C]onfiguring 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 weight sets to be processed by a computer animation system . . . .

'576 Patent 3:23-30.

Defendants argue that the claims of both patents in suit are patent ineligible under 35 U.S.C. § 101 because they merely "set[] forth the previously-known animation method as a series of mathematical steps, and instruct[] the user to perform those steps on a computer." Mot., Docket No. 338 at 12.

II. Legal Standard

A. Motion for Judgment on the Pleadings

Rule 12(c) of the Federal Rules of Civil Procedure permits a party to move to dismiss a suit "[a]fter the pleadings are closed . . . but early enough not to delay trial."

Fed. R. Civ. P. 12(c). "Judgment on the pleadings is proper when, taking all allegations in the pleading as true, the moving party is entitled to judgment as a matter of law." *Stanley v. Trustees of Cal. State Univ.*, 433 F.3d 1129, 1133 (9th Cir. 2006); *see also Fleming v. Pickard*, 581 F.3d 922, 925 (9th Cir. 2009). Because a motion for judgment on the pleadings is "functionally identical" to a motion to dismiss, the standard for a Rule 12(c) motion is the same as for a Rule 12(b)(6) motion. *See Platt Elec. Supply, Inc. v. EOFF Elec., Inc.*, 522 F.3d 1049, 1052 n.1 (9th Cir. 2008).

A complaint may be dismissed for failure to state a claim upon which relief can be granted for one of two reasons: (1) lack of a cognizable legal theory or (2) insufficient facts under a cognizable legal theory. *Bell Atlantic Corp. v. Twombly*, 550 U.S. 544, 555 (2007). *See also Mendiondo v. Centinela Hosp. Med. Ctr.,* 521 F.3d 1097, 1104 (9th Cir. 2008) ("Dismissal under Rule 12(b)(6) is appropriate only where the complaint lacks a cognizable legal theory or sufficient facts to support a cognizable legal theory."). A motion to dismiss should be granted if the complaint does not proffer enough facts to state a claim for relief that is plausible on its face. *See Twombly*, 550 U.S. at 558-59, 570; *see also William O. Gilley Enters., Inc. v. Atlantic Richfield Co.*, 588 F.3d 659, 667 (9th Cir. 2009) (confirming that *Twombly* pleading requirements "apply in all civil cases"). "[W]here the well-pleaded facts do not permit the court to infer more than the mere possibility of misconduct, the complaint has alleged – but it has not 'show[n]' – 'that the pleader is entitled to relief.'" *Ashcroft v. Iqbal*, 556 U.S. 662, 679 (2009) (quoting Fed. R. Civ. P. 8(a)(2)).

In deciding a 12(b)(6) or 12(c) motion, the court is limited to the allegations on the face of the complaint (including documents attached thereto), matters which are properly judicially noticeable and other extrinsic documents when "the plaintiff's claim depends on the contents of a document, the defendant attaches the document to its motion to dismiss, and the parties do not dispute the authenticity of the document, even though the plaintiff does not explicitly allege the contents of that

document in the complaint." *Knievel v. ESPN*, 393 F.3d 1068, 1076 (9th Cir. 2005). The court must construe the complaint in the light most favorable to the plaintiff and must accept all factual allegations as true. *Cahill v. Liberty Mutual Ins. Co.*, 80 F.3d 336, 337-38 (9th Cir. 1996). The court must also accept as true all reasonable inferences to be drawn from the material allegations in the complaint. *See Brown v. Elec. Arts, Inc.*, 724 F.3d 1235, 1247-48 (9th Cir. 2013); *Pareto v. F.D.I.C.*, 139 F.3d 696, 699 (9th Cir. 1998). Conclusory statements, unlike proper factual allegations, are not entitled to a presumption of truth. *See Iqbal*, 556 U.S. at 681; *Moss v. U.S. Secret Serv.*, 572 F.3d 962, 969 (9th Cir. 2009).

B. Patentable Subject Matter Under 35 U.S.C. § 101[3]

35 U.S.C. § 101 "defines the subject matter that may be patented under the Patent Act." *Bilski v. Kappos*, 561 U.S. 593, ___, 130 S.Ct. 3218, 3225 (2010). It provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Id. "In choosing such expansive terms . . . modified by the comprehensive 'any,' Congress plainly contemplated that the patent laws would be given wide scope" "to ensure that 'ingenuity should receive a liberal encouragement.'" *Id*. (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (quoting 5 Writings of Thomas Jefferson 75–76 (H. Washington ed. 1871)) (some internal quotation marks omitted).

The "wide scope" of patent eligibility is not unlimited. Instead, the Supreme Court has invented or discovered "three specific exceptions to § 101's broad patent-eligibility principles: 'laws of nature, physical phenomena, and abstract ideas.'" *Bilski*, 130 S.Ct. at 3225 (quoting *Chakrabarty*, 447 U.S. at 309). Although "the exceptions have defined the statute's reach as a matter of statutory *stare decisis*

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[3] This section concerning the applicable legal standard is the same as the corresponding section in this Court's recent decision in *Eclipse IP LLC v. McKinley Equip. Corp.*, CV-14-154-GW (AJWx), 2014 WL 4407592 (C.D. Cal. Sept. 4, 2014), except for minor changes.

going back 150 years,"[4] *id*., they have not been enumerated consistently during that time. Forty years ago, the list of unpatentable "basic tools of scientific and technological work" was: "[p]henomena of nature . . . , mental processes, and abstract intellectual concepts." *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

In *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289 (2012), the Supreme Court "set forth a framework for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of those concepts." *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014). That framework is as follows:

> First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts. If so, we then ask, "[w]hat else is there in the claims before us?" To answer that question, we consider the elements of each claim both individually and "as an ordered combination" to determine whether the additional elements "transform the nature of the claim" into a patent-eligible application. We have described step two of this analysis as a search for an "'inventive concept'" – *i.e.*, an element or combination of elements that is "sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself."

Id. at 2355 (citations omitted).

Describing this as a two-step test may overstate the number of steps involved. If the claim is not "directed" to a patent-ineligible concept, then the test stops at step one. If the claim is so directed, but we find in step two that the claim contains an "inventive concept" that "transforms" the nature of the claim into something patent eligible, then it seems that there was a categorization error in finding the claim – which is considered "as an ordered combination" – "directed to an abstract idea" in step one.

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[4] "Statutory *stare decisis*" is a recent coinage, apparently used for the first time by Justice Scalia concurring in part in *Rita v. United States*, 551 U.S. 338, 368 (2007). Justice Ginsburg was the next to use the phrase: "Although I joined Justice SCALIA in *Rita* accepting the *Booker* remedial opinion as a matter of 'statutory *stare decisis*' . . . ." *Kimbrough v. United States*, 552 U.S. 85, 116 (2007). Justice Ginsburg's use of quotation marks could have been a comment on the novelty of the phrase, but might have simply indicated a quotation. In any event, Justice Ginsburg later used the phrase without quotation marks in *CSX Transp., Inc. v. McBride*, 131 S. Ct. 2630, 2641 (2011). The context there makes clear that the phrase refers to the principle that "[c]onsiderations of *stare decisis* have special force in the area of statutory interpretation, for here, unlike in the context of constitutional interpretation, the legislative power is implicated, and Congress remains free to alter what we have done." *Patterson v. McLean Credit Union*, 491 U.S. 164, 172-73 (1989).

So, the two-step test may be more like a one step test evocative of Justice Stewart's most famous phrase. *See Jacobellis v. State of Ohio*, 378 U.S. 184, 197 (1964) (Stewart, J. concurring) ("I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description; and perhaps I could never succeed in intelligibly doing so. But I know it when I see it . . . ."); *cf. Alice*, 134 S.Ct. at 2357 ("In any event, we need not labor to delimit the precise contours of the 'abstract ideas' category in this case.").

Rest and relaxation prevailed in *Alice* because it was "enough to recognize that there is no meaningful distinction between the concept of risk hedging in *Bilski* and the concept of intermediated settlement at issue [in *Alice*]. Both are squarely within the realm of 'abstract ideas' . . . ." *Id*. at 2357 (citing to *Bilski*, 130 S.Ct. 3218). Thus, so far, the two-part test for identifying an abstract idea appears to be of limited utility, while comparisons to previously adjudicated patents – or more precisely, to past cases' characterizations of those patents[5] – have done the heavy lifting. *See also Bilski*, 130 S. Ct. at 3229 ("Rather than adopting categorical rules that might have wide-ranging and unforeseen impacts, the Court resolves this case narrowly on the basis of this Court's decisions in *Benson*, *Flook*, and *Diehr* . . . .").[6] It remains true that "[t]he life of the law has not been logic: it has been experience." Oliver Wendell Holmes, Jr., *The Common Law* 1 (1881).

But despite its narrow holding, *Alice* did categorically establish a clear rule that had previously been subject to debate: "mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention." 134 S.Ct. at 2358. And before *Alice*, it was unclear to some, including the USPTO,

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[5] *Mayo* noted that, as to the patent-ineligible approach of simply instructing artisans "to apply" unpatentable subject matter, "[t]he process in *Diehr* was not so **characterized**; that in *Flook* was **characterized** in roughly this way." 132 S. Ct. at 1299-1300 (emphasis added).

[6] Scholars have argued that "the *Mayo* decision has revived the *Flook* approach, although without displacing *Diehr* or explaining how the two apparently contradictory decisions can be reconciled." Brief of Professors Peter S. Menell and Jeffrey A. Lefstin as Amici Curiae in Support of Respondents, *Alice Corp. Pty, Ltd. v. CLS Bank Int'l*, No. 13-298, 2014 U.S. Briefs LEXIS 784 at 10 (Feb. 27, 2014).

that the framework set forth in *Mayo* applied to abstract ideas as well as to the law of nature/natural phenomena at issue in *Mayo*. *See* Memo to Patent Examining Corps from Andrew H. Hirschfeld, Deputy Commissioner for Patent Examination Policy, Preliminary Examination Instructions in view of the Supreme Court Decision in *Alice Corporation Pty. Ltd. v. CLS Bank International, et al.* (June 25, 2014), *available at* http://www.uspto.gov/patents/announce/alice_pec_25jun2014.pdf.[7]

And, while the boundaries of the judicial exceptions remain subject to further development, the Supreme Court has clearly stated the policy underlying those exceptions, i.e. avoiding patents that "too broadly preempt the use of a natural law [or abstract idea]." *Mayo*, 132 S.Ct. at 1294. Thus, patent law should "not inhibit further discovery by improperly tying up the future use of laws of nature [or abstract ideas]." *Id*. at 1301.

Mayo discussed the Supreme Court's 1854 decision upholding many of Samuel Morse's telegraph patent claims, but invalidating the most general claim, which covered "the use of the motive power of the electric or galvanic current . . . however developed, for making or printing intelligible characters, letters, or signs, at any distances." *Id*. The Supreme Court presciently explained that such a claim would inhibit, rather than promote, the progress of the useful arts:

> For aught that we now know some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated – less liable to get out of order – less expensive in construction, and in its operation. But yet if it is covered by this patent the inventor could not use it, nor the public have the benefit of it without the permission of this patentee.

Id. (quoting *O'Reilly v. Morse*, 15 How. 62, 113 (1854).) True, patents always

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[7] Indeed, in the USPTO's view, *Alice*'s embrace of the *Mayo* framework for abstract idea cases was such a significant change or clarification that it has withdrawn issued notices of allowance – that is, stopped patents that had made it all the way through examination and were about to issue – "due to the presence of at least one claim having an abstract idea and no more than a generic computer to perform generic computer functions." USPTO Commissioner for Patents Peggy Focarino, Update on USPTO's Implementation of 'Alice v. CLS Bank' (Aug. 4, 2014), available at http://www.uspto.gov/blog/director/entry/update_on_uspto_s_implementation.

present some impediment to follow-on innovation. The principle is one of balance: patents should not "foreclose[] more future invention than the underlying discovery could reasonably justify." *Mayo*, 132 S.Ct. at 1301.

Of course, § 101 is not the sole, or even primary, tool to ensure that balance. Every condition of patentability set forth in the Patent Act acts to ensure that patents promote, rather than retard, the progress of science and useful arts. For example, in a manner quite similar to recent § 101 jurisprudence, "[t]he written description requirement guards against claims that 'merely recite a description of the problem to be solved while claiming all solutions to it and . . . cover any compound later actually invented and determined to fall within the claim's functional boundaries.'" *Abbvie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, __ F.3d __, 2013-1338, 2014 WL 2937477, 11 (Fed. Cir. July 1, 2014) (quoting *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1353 (Fed. Cir. 2010)).

However, scholars have argued that the written description and enablement doctrines of § 112, as currently applied, do not adequately prevent unwarranted obstructions to follow-on innovation, and have urged that § 101 can and should do so. *See, e.g.*, Lemley et al., *Life After Bilski*, 63 Stan. L. Rev. 1315, 1330 (2011) (cited in *Mayo*, 132 S.Ct. at 1301-03, 1304); *but see* Lemley, *Point of Novelty*, 105 Nw. U. L. Rev. 1253, 1279 (2011) ("[T]here is good reason to worry about overbroad patent claims that lock up a wide swath of potential future applications. But the enablement and written description doctrines largely address that concern.").

In any event, the Supreme Court has spoken, and § 101 now plays an important limiting role. But District Courts and the Federal Circuit are now left with the task of figuring out when the "two-part" test is satisfied. Perhaps something like the function-way-result test used to evaluate infringement under the doctrine of equivalents might be useful. Thus, in one long-standing formulation, an accused instrumentality infringes "if it performs substantially the same function in

substantially the same way to obtain the same result." *Union Paper-Bag Mach. Co. v. Murphy*, 97 U.S. 120, 125 (1877); *InTouch Technologies, Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1343 (Fed. Cir. 2014).

The test in practice often focuses on the "way" aspect of the test, because function and result are often identical in the patent and accused product, and the question is whether the accused infringer uses the same "way." Laura A. Handley, *Refining the Graver Tank Analysis with Hypothetical Claims: A Biotechnology Exemplar*, 5 Harv. J.L. & Tech. 36 (1991) ("In practice, the second prong of the test – 'substantially the same way' is often emphasized, since most infringement suits result from competition for a given market niche which dictates the 'function' and 'result' prongs.") (citing *Perkin-Elmer Corp. v. Westinghouse Elec. Corp.*, 822 F.2d 1528, 1531 (Fed. Cir. 1987)).[8]

Similarly, the question in the abstract idea context is whether there are other *ways* to use the abstract idea in the same field. If so, the Supreme Court has expressly encouraged others to find those other ways, without being held back by patents that preempt the whole concept. *Mayo*, 132 S.Ct. at 1294 (citing *O'Reilly*, 15 How. at 113); *Alice*, 134 S.Ct. at 3258 (noting "the pre-emption concern that undergirds our § 101 jurisprudence.").

Concomitantly, we must be wary of facile arguments that a patent preempts all applications of an idea. It may often be easier for an infringer to argue that a patent fails § 101 than to figure out a different way to implement an idea, especially a way that is "less complicated – less liable to get out of order – less expensive in construction, and in its operation." *O'Reilly*, 15 How. at 113. But the patent law does not privilege the leisure of an infringer over the labors of an inventor. Patents

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[8] *Perkin-Elmer* held that "repeated assertions that the claimed and accused devices perform substantially the same function and achieve substantially the same end result are not helpful. That circumstance is commonplace when the devices are sold in competition. That a claimed invention and an accused device may perform substantially the same function and may achieve the same result will not make the latter an infringement under the doctrine of equivalents where it performs the function and achieves the result in a substantially different way." 822 F.2d at 1532 n.6.

should not be casually discarded as failing § 101 just because the infringer would prefer to avoid the work required to develop non-infringing uses of the abstract idea at the heart of an appropriately circumscribed invention.

III. Analysis

A. Defendants' Patents Are Irrelevant

Plaintiff argues that Defendants' own patents for lip-synchronization, some of which issued very recently, undermine Defendants' argument that the patents-in-suit are directed to unpatentable subject matter. Opp'n, Docket No. 344 at 20-22. The validity of Defendants' patents is not before the Court, and Plaintiff has cited no authority for the proposition that Defendants' obtaining them operates as an estoppel in this case. There may be numerous factual differences between Defendants' patents and those at issue here. And even if Defendants' patents rise and fall with Plaintiff's, it is hard to fault anyone for seeking patents that may turn out to be invalid where the applicable standards are shifting and uncertain. "A change in the weather has known to be extreme." Bob Dylan, *You're a Big Girl Now*, Blood on the Tracks (Columbia Records 1974).

B. The Patents-in-Suit Fail § 101

1. The Claims, In Isolation, Appear Tangible and Specific

Defendants argue that the patents-in-suit are directed to a "fundamental, abstract animation practice," namely, "the abstract idea of rules-based synchronization of animated mouth movement." Mot., Docket No. 338 at 12. That is, Defendants argue that the patents cover the mere idea of using rules for three-dimensional lip synchronization, without requiring specific content for those rules. *Id*. at 12-13. But considered standing alone, the asserted claims do not seem to cover any and all use of rules for three-dimensional lip synchronization. The independent claims of each of the patents in suit are:

'576 Patent claim 1:

A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:
obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;
obtaining a timed data file of phonemes having a plurality of sub-sequences;
generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;
generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and
applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.

'278 Patent claim 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.

Facially, these claims do not seem directed to an abstract idea. They are tangible, each covering an approach to automated three-dimensional computer animation, which is a specific technological process. They do not claim a monopoly, as Defendants argue, on "the idea that the human mouth looks a certain way while speaking particular sounds," "applied to the field of animation." Mot., Docket No. 338 at 12, n.9. Further, the patents do not cover the prior art methods of computer assisted, but non-automated, lip synchronization for three-dimensional computer animation.

And according to Defendants, they do not cover the automated methods of lip synchronization for three-dimensional computer animation that Defendants employ. It is hard to show that an abstract idea has been preempted if there are noninfringing ways to use it in the same field. Section 101 motions can place parties in unfamiliar and uncomfortable positions: here it is to the patentee's advantage to identify noninfringing alternatives, and it is the accused infringer's advantage to posit the lack of any; the reverse of their positions at the infringement and damages stages of the case.

At first blush, it is therefore difficult to see how the claims might implicate the "basic underlying concern that these patents tie up too much future use of" any abstract idea they apply. *Mayo*, 132 S. Ct. at 1302; *Alice*, 134 S.Ct. at 2358 (noting "the pre-emption concern that undergirds our § 101 jurisprudence").

2. The Claims Must Be Evaluated in the Context of the Prior Art

However, for purposes of the § 101 analysis, it is not enough to view the claims in isolation. Instead, when determining whether a patent contains an adequate inventive concept, the Court must factor out conventional activity. That is because the inclusion of "well-understood, routine, conventional activity" previously used in the field "is normally not sufficient to transform an unpatentable law of nature [or abstract idea] into a patent-eligible application . . . ." *Mayo*, 132 S.Ct. at 1298.[9] Further, in addition to evaluating each step of the claim, the claims must be considered as "an ordered combination." *Alice*, 132 S.Ct. at 2355.

This dual analysis tracks the law's long-standing concern with patents that

[9] In a forthcoming paper, Jeffrey Lefstin argues that for more than a hundred years, the lesson drawn from the English *Neilson* case (relied upon by the Supreme Court in *Mayo*) was that any practical application of a new discovery was patentable, even if the application was entirely conventional. Jeffrey Lefstin, *Inventive Application: A History*, Fla. L. Rev. & Hastings Research, Paper No. 94 (Mar. 2014), *available at* http://ssrn.com/abstract =2398696. This is contrary to the current law that "appending conventional steps, specified at a high level of generality, to laws of nature, natural phenomena, and abstract ideas cannot make those laws, phenomena, and ideas patentable." *Mayo*, 132 S.Ct. at 1300. What the Supreme Court says about prior cases is often more important than what the cases themselves said. *See, e.g., Daimler AG v. Bauman*, 134 S. Ct. 746, 756 n.8 (2014) (eight-member majority chiding Justice Sotomayor for relying in her concurrence on the facts recited in *Perkins v. Benguet Consol. Mining Co.*, 342 U.S. 437 (1952) and in the intermediate appellate opinion in that case, rather than acquiescing to the characterization of *Perkins* in a recent decision, *Goodyear Dunlop Tires Operations, S.A. v. Brown*, 131 S.Ct. 2846 (2011)) (which Justice Sotomayor had joined).)

consist of old material with the addition of a new, but abstract, idea: "the vice of a functional claim exists not only when a claim is 'wholly' functional, if that is ever true, but also when the inventor is painstaking when he recites what has already been seen, and then uses conveniently functional language at the exact point of novelty." *Gen. Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 371, 58 S. Ct. 899, 903 (1938). An abstract idea is the extreme case of functional language.

Thus, where a claim recites tangible steps, but the only new part of the claim is an abstract idea, that may constitute a claim to an abstract idea. *See Alice*, 134 S. Ct. at 2358. (disregarding the presence of a computer in the claim given "the ubiquity of computers"); *Mayo*, 132 S.Ct. at 1297-98 (claim step calling for administration of drug only disregarded because it "refers to the relevant audience, namely doctors who treat patients with certain diseases with thiopurine drugs"; claim step of determining the level of the relevant metabolites disregarded because it was "well known in the art").

Here, the patents teach that in the prior art, three-dimensional character lip synchronization was performed using a "timed data file of phonemes having a plurality of sub-sequences," as recited in the claims. '576 Patent 1:32-43. But the prior art did not, according to the patents, involve obtaining rules that define output morph weight sets as a function of the phonemes, or using those rules to generate the morph weight sets. Instead, an artist manually set the morph weights at certain important keyframes, and a computer program then interpolated the frames between the keyframes. '576 Patent 2:29-37. Therefore, while tangible, the steps of (1) using a timed phoneme transcript, (2) setting morph weight sets at keyframes, or (3) interpolating between keyframes, are not "inventive steps" that could transform the claims herein into patent eligible subject matter, if those claims are directed to an abstract idea.

In attacking the claims as simply drawn to the abstract idea of "rules-based lip-

synchronized animation on a computer," Mot., Docket No. 338 at 3, Defendants' argument does not account for the presence in the claims, or the Court's construction, of "morph weight set." The 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." Rulings on Claim Constr., Docket No. 298-1 at 9.

However, the patents themselves teach that the prior art includes using morph targets that correspond to phonemes and calculating delta sets that contain the vectors from each vertex on the neutral model to the morph target. '576 Patent at 1:44-62. So, while Defendant's characterization is overly broad, it would be fair to characterize the claims as drawn to the idea of automated rules-based use of morph targets and delta sets for lip-synchronized three-dimensional animation. Indeed, Plaintiff's expert opines that:

> A central part of the creative insight of the patents is the realization to use the specific approach of using morph weight set representations of the facial shape coupled with rules, including explicit and distinct timing rules, to generate keyframes. This approach uniquely provides the automation required to produce animation in a cost-effective way, yet provided the necessary artistic control required to produce commercial grade animation.

Declaration of Michael Gleicher, Ph.D. in Supp. of Opp'n, Docket No. 345, ¶ 20. Defendants object to this testimony, because "[t]he Court may not consider declarations in opposition to a Rule 12(c) motion without converting the motion to a motion for summary judgment." Defs.' Objections to Declarations Filed in Connection with Motion for Judgment on the Pleadings, Docket No. 351 at 2.[10] It is unclear how that response helps Defendants. Certainly, one option is for the Court to deny the Motion as presenting an issue that turns on the facts.

However, nothing in the Declaration affects the analysis. In the paragraph

[10] Plaintiff submitted a response to Defendant's Objections, which also included an unauthorized five-page sur-reply, which the Court would not consider. Planet Blue's Response to Defs.' Objections to Declarations Filed in Opposition to Motion for Judgment on the Pleadings, Docket No. 355. Neither would the Court consider Defendants' Reply to that Response, Docket No. 356.

quoted above, Plaintiff's expert opines 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." Everyone appears to agree with that characterization, except that Defendants point out that no particular "explicit and distinct" rules are required by the claims. The question is therefore whether the inclusion of that *concept* in the claims satisfies § 101 given (1) the prior art, and (2) the fact that the claims do not require any particular rules.

A consideration of the prior art recited in the patents shows that the point of novelty here is the idea of using rules, including timing rules, to automate the process of generating keyframes. The following chart compares the '576 Patent's claim elements to the prior art described in that patent.

'576 Patent, Claim 1	
Step	**Admitted Prior Art**
A method for automatically animating lip synchronization and facial expression of three-dimensional characters comprising:	Automating the process is the focus of the invention. However, the patent teaches that in the prior art, the use of computerized interpolation partially automated the process by allowing animators to set mouth shapes only at keyframes, rather than at every frame, as would be the case in hand-drawn animation. '576 Patent 2:31-34.
obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;	Rules for defining morph weight sets as a function of phoneme sequence are disclosed as within the prior art. '576 Patent 1:44-2:28. Rules for defining morph weight sets as a function of timing are not; instead, the timing results from the artist's choice of keyframes. '576 Patent 2:29-34. Note, however, that no particular timing rules are required by any claim.

Step	Admitted Prior Art
generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;	An intermediate stream of morph weight sets is disclosed as being part of the prior art through the keyframes manually set by the artist. '576 Patent 2:29-34. The transition parameters are not. Those parameters flow from the timing rules.
generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and	The patent teaches that the prior art generated the final stream by interpolating between the keyframes. '576 Patent 2:29-34. Again, transition parameters are not disclosed as being within the prior art.
applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.	Both the final set of output morph weight sets and applying those sets are covered by the interpolation process of the prior art. '576 Patent 2:29-34.

So, what the claim adds to the prior art is the use of rules, rather than artists, to set the morph weights and transitions between phonemes. However, both of these concepts are specified at the highest level of generality. At the hearing on the Motion, Plaintiff emphasized that the rules inventively take into account the timing of the phoneme sequence. But the specification states clearly that "[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." '576 Patent 6:46-54. Thus, the user, not the patent, provides the rules. And 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." '576 Patent 7:36-9:23. Because the claim purports to cover all such rules, in light of the prior art, the claim merely states "an abstract idea while adding the words 'apply it.'" *Alice*, 134 S. Ct. at 2358 (quoting *Mayo*, 132 S.Ct. at 1294)

(some quotation marks omitted). The same is true for claim 1 of the '278 Patent, which does not differ in a manner relevant to this analysis.

Here, while the patents do not preempt the field of automatic lip synchronization for computer-generated 3D animation, they do preempt the field of such lip synchronization using a rules-based morph target approach. And if, as Plaintiff suggests, the inventive step is the use of timing rules, given the state of the prior art, that still leaves an abstract idea at the point of novelty, and preventing the development of any additional ways to use that abstract idea in the relevant field. *See Alice*, 134 S. Ct. at 2360 ("the claims at issue amount to 'nothing significantly more' than an instruction to apply the abstract idea of intermediated settlement using some unspecified, generic computer").

3. The Failure of the Claims Is Not Inconsistent with the Inventor Having Developed an Innovative Process

Defendants argue that a "patentee simpl[y] does not waste the time, money and effort to prosecute a patent application for an invention they casually indicate was known in the art." Opp'n, Docket No. 344 at 10-11. But a § 101 defect does not mean that the invention was in the prior art. The invention here may have been novel, but the claims are directed to an abstract idea. And the patent's casual – and honest – description of the prior art was made at a time when, under the then-prevalent interpretation of the law, such admissions were unlikely to be harmful. One unintended consequence of *Alice*, and perhaps of this and other decisions to come, is an incentive for patent applicants to say as little as possible about the prior art in their applications.[11]

Plaintiff points to one Defendant's contemporaneous characterization of Plaintiff's system as "revolutionary." Opp'n, Docket No. 344 at 1 (quoting Decl. of John Petrsoric In Opp'n to Mot., Docket No. 346, Ex. 2, January 27, 1999 Warner

[11]However, that strategy is limited by the doctrine of inequitable conduct.

Bros. Memorandum (inviting colleagues to a demonstration of Plaintiff's "revolutionary lip synch technique" that "utilizes proprietary software.")).

This argument is unpersuasive in this context for two reasons. First, for purposes of the § 101 inquiry, which is different from the § 103 inquiry, the revolutionary nature of an abstract idea does not weigh in favor of patentability. *See Mayo*, 132 S. Ct. at 1293 ("Einstein could not patent his celebrated law that $E=mc^2$ . . . . Such discoveries are 'manifestations of . . . nature, free to all men and reserved exclusively to none.'") (quoting *Chakrabarty*, 100 S.Ct. at 2204). Second, there has been no showing that the cited praise relates to the claims in all their breadth, rather than to a particular implementation that is not specified by the claims. Thus, the inventor's specific implementation of the abstract idea represented by the claim may have been of significant value beyond that of the abstract idea itself.

4. None of the Additional Content in the Asserted Dependent Claims Yields a Different Result

Plaintiff has asserted '576 Patent claims 1, 7-9, and 13, and '278 Patent, claims 1-4, 6, 9, 13, 15-17. Mot., Docket No. 338 at 2. The additional content of the dependent claims is addressed in the following chart:

Claim	Language	Analysis
'576 Patent claim 7	The method of claim 1 wherein said timed data is a time[] aligned phonetic transcriptions data.	Because "time aligned phonetic transcriptions" were used in the prior art ('576 Patent 1:32-37), the additional limitation of this claim does not affect the § 101 analysis.
'576 Patent claim 8	The method of claim 7 wherein said timed data further comprises time aligned data.	This adds nothing to claim 7, and so does not affect the § 101 analysis.

Claim	Language	Analysis
'576 Patent claim 9	The method of claim 7 wherein said timed data further comprises time aligned emotional transcription data.	Not specifically referenced in the patent's description of the prior art. However, this is just another idea of a factor that could be taken into account by the rules; the patent claims no specific method of doing so.
'576 Patent claim 13	The method of claim 1 wherein said first set of rules comprises: correspondence rules between a plurality of visual phoneme groups and a plurality of morph weight sets; and morph weight set transition rules specifying durational data for generating transitionary curves between morph weight sets.	Claim 1 already includes "obtaining a first set of rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence." The specific content of claim 13 is not meaningfully different from that from a § 101 perspective.
'278 Patent claim 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.	These elements have already been discussed in the context of the '576 Patent.
'278 Patent claim 3	The method of claim 2, wherein said durational data comprises transition start and transition end times.	Transition start and end times are inherent in "transition rules specifying durational data between morph weight sets," which is an element of '278 Patent claim 2.
'278 Patent claim 4	The method of claim 1, wherein said desired audio sequence is from a pre-recorded live performance.	This is merely limiting the claim to a particular field of use. "[T]he prohibition against patenting abstract ideas 'cannot be circumvented by attempting to limit the use of the formula to a particular technological environment' . . . ." *Bilski*, 130 S.Ct. at 3230 (quoting *Diehr*, 450 U.S. at 191).
'278 Patent claim 6	The method of claim 1, wherein said plurality of subsequences of timed phonemes is obtained from a file.	This presents the same issue as '278 Patent claim 4. *See* discussion above.

Claim	Language	Analysis
'278 Patent claim 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.	This presents the same issue as '278 Patent claim 2. *See* discussion above.
'278 Patent claim 13	The method of claim 1, wherein said plurality of subsequences of timed phonemes comprises a time[] aligned phonetic transcriptions sequence.	This is a basic feature of the prior art. '278 Patent 1:35-47.
'278 Patent claim 15	The method of claim 13, wherein said plurality of subsequences of timed phonemes further comprises time aligned emotional transcription data.	Not specifically referenced in the patent's description of the prior art. However, this is just another idea of a factor that could be taken into account by the rules; the patent claims no specific method of doing so.
'278 Patent claim 16	The method of claim 9, wherein said transition parameters comprises: transition start time; and transition end time.	This presents the same issue as '278 Patent claim 2. *See* discussion above.
'278 Patent claim 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	Such interpolation was used in the prior art. '278 Patent 2:29-32.

5. The Draftsman's Art

This case illustrates the danger that exists when the novel portions of an invention are claimed too broadly. As noted above, the claims here are drafted to give the impression of tangibility, but the Supreme Court has "long warn[ed] . . .

against interpreting § 101 in ways that make patent eligibility depend simply on the draftsman's art. " *Alice*, 134 S. Ct. at 2351 (citing *Mayo*, 132 S.Ct. at 1294). When examined in light of the prior art, the claims are directed to an abstract idea, and lack an "inventive concept" "sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [abstract idea] itself." *Id*. at 2355 (citations omitted).

IV. Conclusion

For the foregoing reasons, the Court would GRANT the Motion, and hold '576 Patent claims 1, 7-9, and 13, and '278 Patent claims 1-4, 6, 9, 13, and 15-17 invalid under 35 U.S.C. § 101.

Dated: This 22nd day of September, 2014.

GEORGE H. WU
United States District Judge

US006307576B1

(12) **United States Patent**
Rosenfeld

(10) **Patent No.: US 6,307,576 B1**
(45) **Date of Patent: *Oct. 23, 2001**

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

(76) Inventor: **Maury Rosenfeld**, 1040 N. Las Palmas Ave. No. 25, Los Angeles, CA (US) 90038

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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

(21) Appl. No.: **08/942,987**

(22) Filed: **Oct. 2, 1997**

(51) **Int. Cl.**[7] **G06T 15/70**

(52) **U.S. Cl.** **345/956**; 345/951; 345/955; 345/473

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

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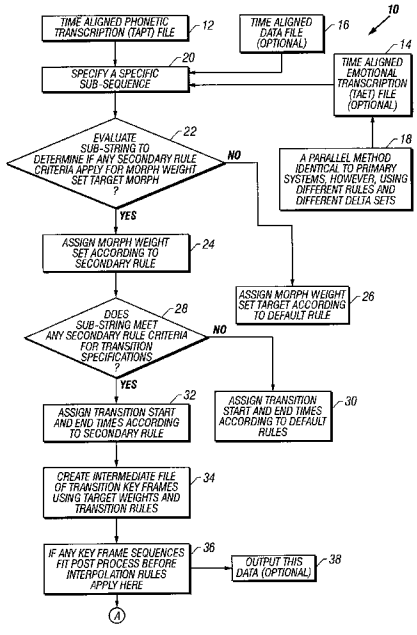
(57) **ABSTRACT**

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.

26 Claims, 4 Drawing Sheets



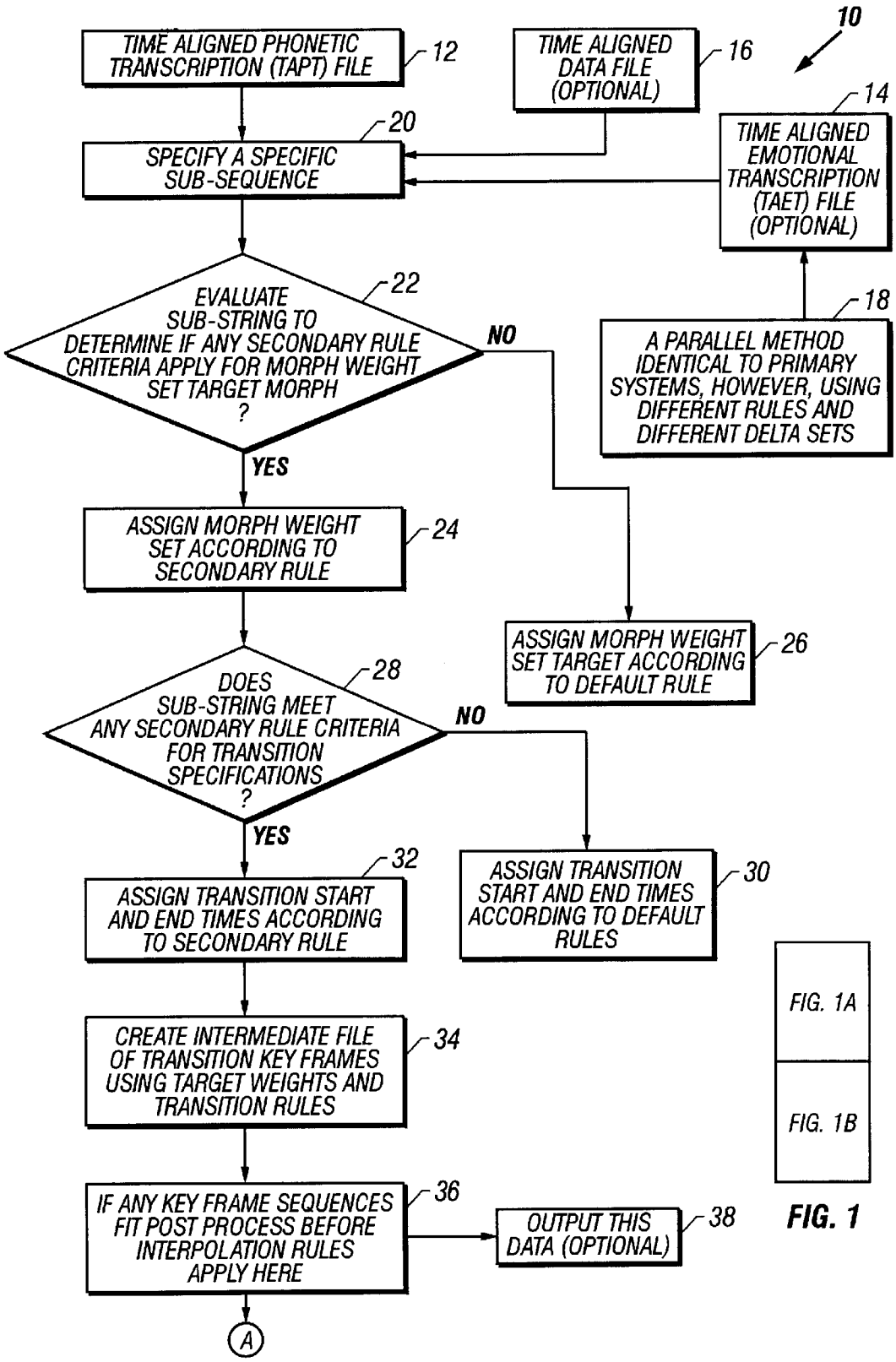


FIG. 1A

FIG. 1B

FIG. 1

FIG. 1A

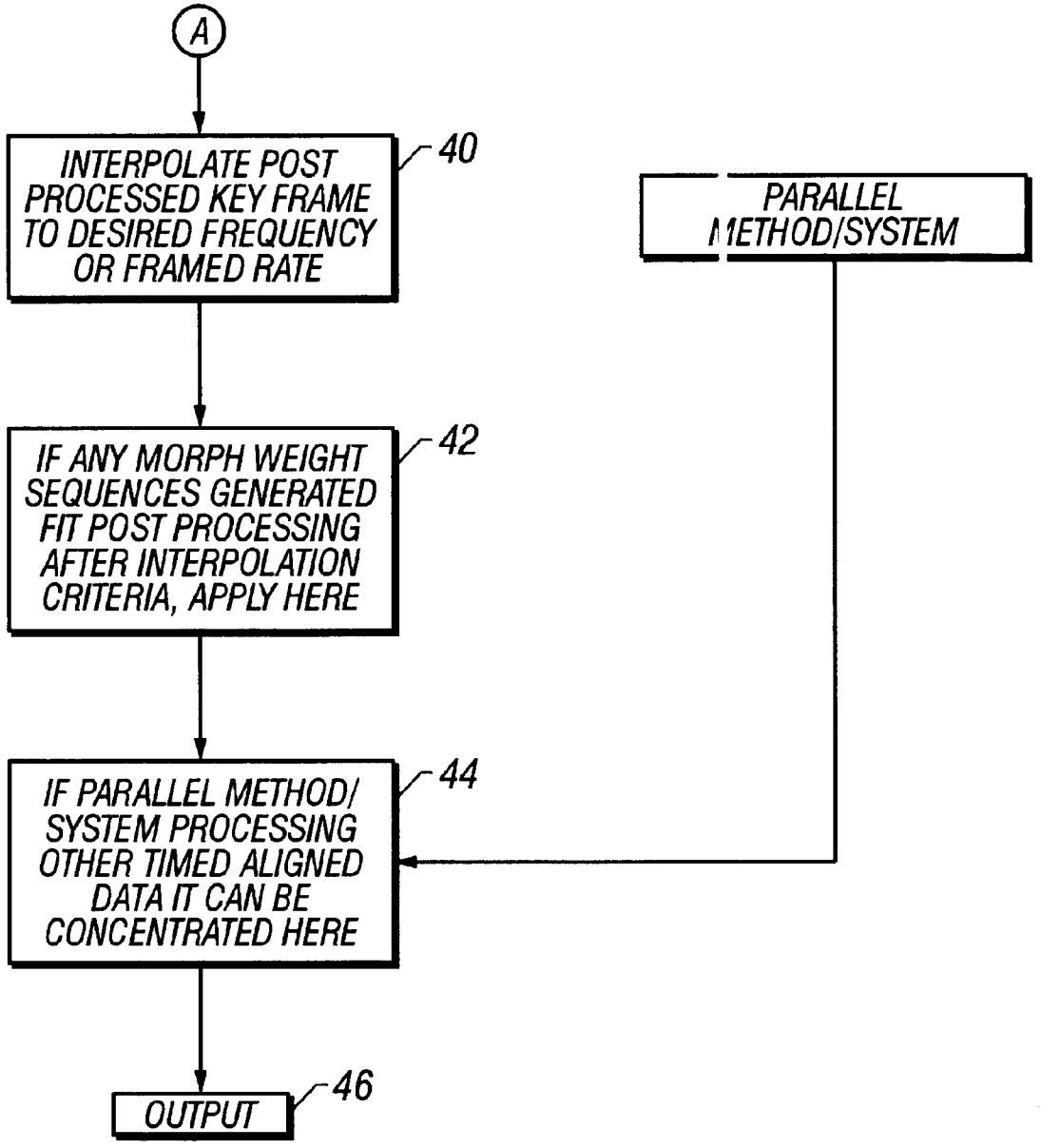

A
INTERPOLATE POST PROCESSED KEY FRAME TO DESIRED FREQUENCY OR FRAMED RATE
40
PARALLEL METHOD/SYSTEM
IF ANY MORPH WEIGHT SEQUENCES GENERATED FIT POST PROCESSING AFTER INTERPOLATION CRITERIA, APPLY HERE
42
IF PARALLEL METHOD/ SYSTEM PROCESSING OTHER TIMED ALIGNED DATA IT CAN BE CONCENTRATED HERE
44
OUTPUT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

FIG. 1B

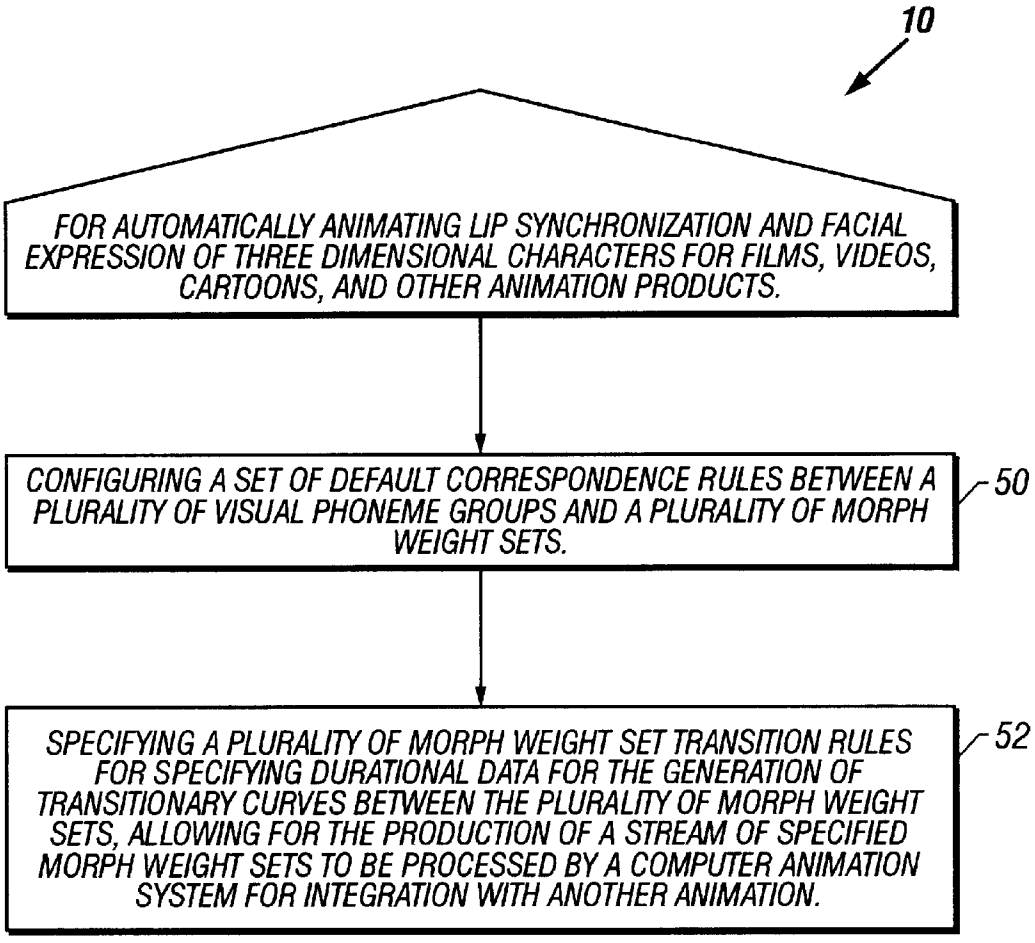

10
FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF THREE DIMENSIONAL CHARACTERS FOR FILMS, VIDEOS, CARTOONS, AND OTHER ANIMATION PRODUCTS.
CONFIGURING A SET OF DEFAULT CORRESPONDENCE RULES BETWEEN A PLURALITY OF VISUAL PHONEME GROUPS AND A PLURALITY OF MORPH WEIGHT SETS.
50
SPECIFYING 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

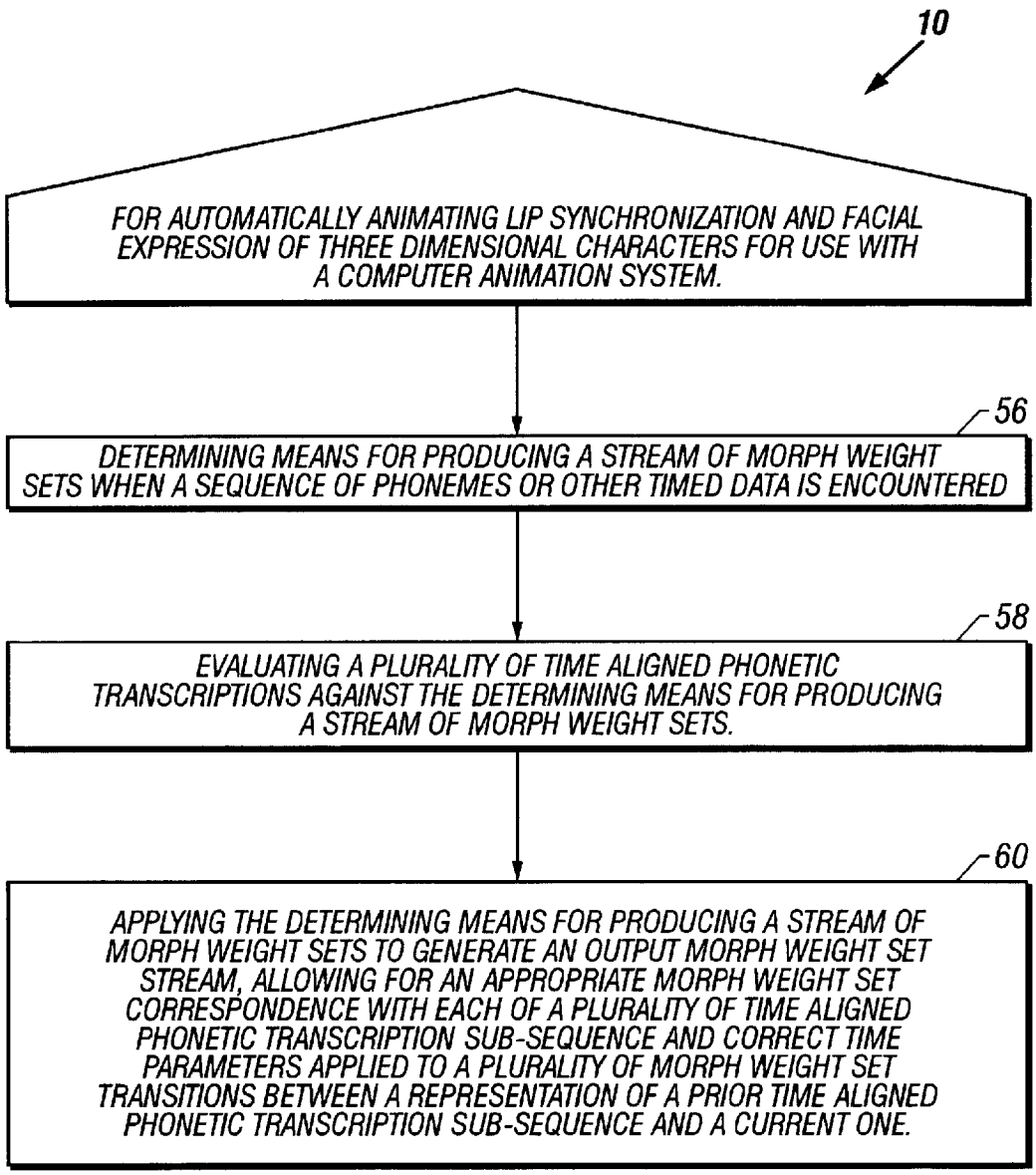

10
FOR AUTOMATICALLY ANIMATING LIP SYNCHRONIZATION AND FACIAL EXPRESSION OF THREE DIMENSIONAL CHARACTERS FOR USE WITH A COMPUTER ANIMATION SYSTEM.
56
DETERMINING MEANS FOR PRODUCING A STREAM OF MORPH WEIGHT SETS WHEN A SEQUENCE OF PHONEMES OR OTHER TIMED DATA IS ENCOUNTERED
58
EVALUATING A PLURALITY 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

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 limitations 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 "phonemes" 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. 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.

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:

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

|delta setx|*morph weightx

where the symbol |xxx| is used to indicate the corresponding vector in each referenced set. For example, Iresult 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 transcriptions 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 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 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 smilen", 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 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.

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 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.

The method preferably comprises a set of rules that determine what the output morph weight set steam will be when any sequence of 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 model 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, a specific TAPT sub-sequence 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 durations 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** for automatically animating lip synchronization and facial expression of three dimensional animated characters of the present invention. A specific sub-sequence **20** is selected form 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 **58**, showing the step of evaluating a plurality of time aligned phonetic transcriptions or other timed at 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. A "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 specified. 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 of 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 "1" 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 an "eh" followed by an "oh" 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","1","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 ("1")	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
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

-continued

Time	D.S.1 ("h")	D.S.2 ("eh")	D.S.3 ("1")	D.S.4 ("oh")	D.S.5 (aux"oh")	D.S.6
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 . . . 0} as the morph weight 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, if 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 "1" in "hello" is shaped more widely than the "1" in "burly" due to it's proximity to an "eh" as opposed tp a "r".

Criteria: Encounter an "1" 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 define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;

obtaining a timed data file of phonemes having a plurality of sub-sequences;

generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;

generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and

applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.

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

3. The method of claim **2** wherein said evaluating comprises:

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

applying said rule's function upon said compliance.

4. 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.

5. The method of claim **4** wherein said default set of rules is adequate to create said intermediate stream of output morph weight sets and said plurality of transition parameters between two adjacent morph weight sets for all sub-sequences of phonemes in said timed data file.

6. The method of claim **4** wherein said secondary set of rules are used in special cases to substitute alternate output morph weight sets and/or transition parameters between two adjacent morph weight sets.

7. The method of claim **1** wherein said timed data is a timed aligned phonetic transcriptions data.

8. The method of claim **7** wherein said timed data further comprises time aligned data.

9. The method of claim **7** wherein said timed data further comprises time aligned emotional transcription data.

10. The method of claim **1** wherein each of said plurality of transition parameters comprises a transition start time and a transition end time; and said intermediate stream of output morph weight sets having entries at said transition start time and said transition end time.

11. The method of claim **10** wherein said generating a final stream of output morph weight sets comprises:

obtaining the output morph weight set at a desired time by interpolating between said intermediate stream of morph weight sets at said transition start time and said transition end time, said desired time representing a frame of said final stream of output.

12. The method of claim **11**, further comprising:

applying a second set of rules to said output morph weight set for post processing.

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

correspondence rules between a plurality of visual phoneme groups and a plurality of morph weight sets; and

morph weight set transition rules specifying durational data for generating transitionary curves between morph weight sets.

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

a computer system;

a first set of rules in said computer system, said first set of rules defining output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence;

a timed data file readable by said computer system, said timed data file having phonemes with a plurality of sub-sequences;

means, in said computer system, for generating an intermediate stream of output morph weight sets and a plurality of transition parameters between two adjacent morph weight sets by evaluating said plurality of sub-sequences against said first set of rules;

means, in said computer system, for generating a final stream of output morph weight sets at a desired frame rate from said intermediate stream of output morph weight sets and said plurality of transition parameters; and

means, in said computer system, for applying said final stream of output morph weight sets to a sequence of animated characters to produce lip synchronization and facial expression control of said animated characters.

15. The apparatus of claim **14** wherein each of said first set of rules comprises a rule's criteria and a rule's function.

16. The apparatus of claim **15** wherein said evaluating comprises:

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

applying said rule's function upon said compliance.

17. The apparatus of claim **14** 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.

18. The apparatus of claim **17** wherein said default set of rules is adequate to create said intermediate stream of output

morph weight sets and said plurality of transition parameters between two adjacent morph weight sets for all sub-sequences of phonemes in said timed data file.

19. The apparatus of claim **17** wherein said secondary set of rules are used in special cases to substitute alternate output morph weight sets and/or transition parameters between two adjacent morph weight sets.

20. The apparatus of claim **14** wherein said timed data is a timed aligned phonetic transcriptions data.

21. The apparatus of claim **20** wherein said timed data further comprises time aligned data.

22. The apparatus of claim **20** wherein said timed data further comprises time aligned emotional transcription data.

23. The apparatus of claim **14** wherein each of said plurality of transition parameters comprises a transition start time and a transition end time; and said intermediate stream of output morph weight sets having entries at said transition start time and said transition end time.

24. The apparatus of claim **23** wherein said generating a final stream of output morph weight sets comprises:

obtaining the output morph weight set at a desired time by interpolating between said intermediate stream of morph weight sets at said transition start time and said transition end time, said desired time representing a frame of said final stream of output.

25. The apparatus of claim **24**, further comprising:

means for applying a second set of rules to said output morph weight set for post processing.

26. The apparatus of claim **14** wherein said first set of rules comprises:

correspondence rules between a plurality of visual phoneme groups and a plurality of morph weight sets; and

morph weight set transition rules specifying durational data for generating transitionary curves between morph weight sets.

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