United States Court of Appeals for the Federal Circuit

MCRO, INC., DBA PLANET BLUE,
Plaintiff-Appellant

v.

BANDAI NAMCO GAMES AMERICA INC., NAUGHTY DOG, INC., KONAMI DIGITAL ENTERTAINMENT, INC., SEGA OF AMERICA, INC., ELECTRONIC ARTS INC., OBSIDIAN ENTERTAINMENT, INC., DISNEY INTERACTIVE STUDIOS, INC., SQUARE ENIX, INC., NEVERSOFT ENTERTAINMENT, INC., TREYARCH CORPORATION, CAPCOM USA, INC., SONY COMPUTER ENTERTAINMENT AMERICA LLC, ATLUS U.S.A., INC., SUCKER PUNCH PRODUCTIONS, LLC, INFINITY WARD, INC., LUCASARTS, A DIVISION OF LUCASFILM ENTERTAINMENT COMPANY LTD. LLC, WARNER BROS. INTERACTIVE ENTERTAINMENT, A DIVISION OF WARNER BROS. HOME ENTERTAINMENT INC., ACTIVISION PUBLISHING, INC., BLIZZARD ENTERTAINMENT, INC., VALVE CORPORATION, CODEMASTERS USA GROUP, INC., CODEMASTERS SOFTWARE INC., CODEMASTERS, INC., THE CODEMASTERS SOFTWARE COMPANY LIMITED,
Defendants-Appellees

2015-1080, -1081, -1082, -1083, -1084, -1085, -1086, -1087, -1088, -1089, -1090, -1092, -1093, -1094, -1095, -1096, -1097, -1098, -1099, -1100, -1101

Appeals from the United States District Court for the Central District of California in Nos. 2:12-cv-10322-GW-FFM, 2:12-cv-10323-GW-FFM, 2:12-cv-10327-GW-FFM, 2:12-cv-10329-GW-FFM, 2:12-cv-10331-GW-FFM, 2:12-cv-10333-GW-FFM, 2:12-cv-10335-GW-FFM, 2:12-cv-10337-GW-FFM, 2:12-cv-10338-GW-FFM, 2:12-cv-10341-GW-FFM, 2:12-cv-10342-GW-FFM, 8:13-cv-01870-GW-FFM, 2:14-cv-00332-GW-FFM, 2:14-cv-00336-GW-FFM, 2:14-cv-00358-GW-FFM, 2:14-cv-00383-GW-FFM, 2:14-cv-00352-GW-FFM, 2:14-cv-00417-GW-FFM, 8:13-cv-01874-GW-FFM, 2:14-cv-00389-GW-FFM, 2:14-cv-00439-GW-FFM, Judge George H. Wu.

Decided: September 13, 2016

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Before REYNA, TARANTO, and STOLL, *Circuit Judges.*

REYNA, *Circuit Judge.*

This appeal is from a grant of judgment on the pleadings under Fed. R. Civ. P. 12(c) that the asserted claims of U.S. Patent Nos. 6,307,576 ("the '576 patent") and 6,611,278 ("the '278 patent") are invalid. The United States District Court for the Central District of California found that the asserted claims are directed to patent-ineligible subject matter and are therefore invalid under 35 U.S.C. § 101 ("§ 101"). *McRO, Inc. v. Sony Computer Entm't Am., LLC*, 55 F. Supp. 3d 1214 (C.D. Cal. 2014) ("*Patentability Op.*"). We hold that the ordered combination of claimed steps, using unconventional rules that relate sub-sequences of phonemes, timings, and morph weight sets, is not directed to an abstract idea and is therefore patent-eligible subject matter under § 101. Accordingly, we *reverse*.

I. BACKGROUND

A. Factual Background

The '576 patent and the '278 patent were both issued to Maury Rosenfeld and are both titled "Method for Automatically Animating Lip Synchronization and Facial Expression of Animated Characters." The '278 patent is a continuation of the '576 patent and shares the same written description.

1. Admitted Prior Art

The patents relate to automating part of a preexisting 3-D animation method. As explained in the background of the patents, the admitted prior art method uses multi-

ple 3-D models of a character's face to depict various facial expressions made during speech. *See generally* '576 patent col. 1 l. 14 to col. 2 l. 37. To animate the character as it speaks, the method morphs the character's expression between the models. The "neutral model" is the 3-D representation of the resting, neutral facial expression of an animated character. The other models of the character's face are known as "morph targets," and each one represents that face as it pronounces a phoneme, i.e., makes a certain sound. This visual representation of the character's face making a sound is also called a "viseme." McRO Br. 7. An example morph target for the "ahh" phoneme is shown below. Each of these morph targets and the neutral model has identified points, called "vertices," in certain places on the face. The set of differences in the location of these vertices (and the corresponding point on the face) between the neutral model and the morph target form a "delta set" of vectors representing the change in location of the vertices between the two models. For each morph target, there is a corresponding delta set consisting of the vectors by which the vertices on that morph target differ from the neutral model.

Defs.' Br. 8.[1]

Facial expressions are described as a function of the amount each morph target, and its corresponding delta set, is applied to modify the character model. "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.'" '576 patent col. 1 ll. 63–65. The set of morph weights for all the delta sets is called a "morph weight set." The neutral model is represented by a morph weight set with all morph weights of 0. A desired morph target is represented by the morph weight of 1 for that morph target's delta set and a morph weight of 0 for all other delta sets.

The power of this prior art animation method is in generating intermediate faces by using morph weights between 0 and 1 to blend together multiple morph targets. For example, the face halfway between the neutral model and the "oh" face can be expressed simply by setting the "oh" morph weight to 0.5, i.e., 50%, as shown below at the left. The model halfway to the next syllable, in turn, could be expressed by setting both the "oh" morph weight and that for the next syllable each to 0.5, creating a blend of those two delta sets. McRO Br. 11; *see also* Defs.' Br. 8–11. For each morph weight set, the resulting facial expression is calculated by determining the displacement of each vertex from the neutral model as the product of the morph weights in the morph weight set and the

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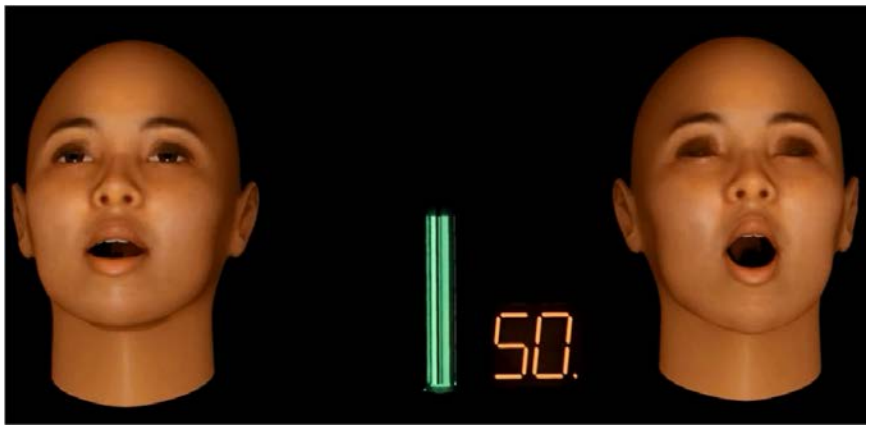
[1] The images in this opinion are drawn from McRO's claim construction tutorial presented to the district court, J.A. 3573, excerpts of which are used by both parties to explain the prior art method. Defendants dispute McRO's depiction of the claimed method in that tutorial and we do not rely on any of those depictions. *See* Defs.' Br. 46.

corresponding delta sets for the morph targets. '576 patent col. 2 ll. 2–15.[2]



McRO Br. 11.

Animation of the character and lip synchronization preexisting the invention was generally accomplished by an animator with the assistance of a computer. Animators used "a 'keyframe' approach, where the artist set[] the appropriate [morph] weights at certain important times ('keyframes')" instead of at every frame. '576 patent col. 2 ll. 31–33. Animators knew what phoneme a character pronounced at a given time from a "time aligned phonetic transcription" ("timed transcript"). This listed the "occurrence in time" of each phoneme the character pronounced, as shown in the example below. *Id*. at col. 1 ll. 32–34.

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

time (sec)	phoneme	word
0		Sil
1.895	h	hello
1.965	eh	
1.995	l	
2.105	o	
2.137	w	
2.165	dh	there
2.235	eh	
2.335	r	
2.435	sil	
2.475	h	how
2.545	a	
2.601	w	
2.635	AA	are
2.66	r	
2.695	y	you
2.835	uw	
2.885	t	today
2.945	ah	
2.985	d	
3.045	e	
3.16	y	
3.225	sil	

McRO Br. 7.

Animators, using a computer, manually determined the appropriate morph weight sets for each keyframe based on the phoneme timings in the timed transcript. "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." McRO Reply Br. 4 (emphasis removed); Defs.' Br. 10 ("Using the [timed transcript], the animator would decide what the animated face should look like at key points in time between the start and end times, and then 'draw' the face at those times."). Because the pronounced phoneme and drawn keyframe corresponded in time, this prior art process synchronized the lips and facial expression of the 3-D character. A computer program would then interpolate between the keyframes set by the anima-

tor, creating the intermediate frames by determining the appropriate morph weight sets at intermediate points in time simply based on continuously transitioning between the keyframes. '576 patent col. 2 ll. 32–36.

2. Claimed Invention

The patents criticize the preexisting keyframe approach as "very tedious and time consuming, as well as inaccurate due to the large number of keyframes necessary to depict speech." '576 patent col. 2 ll. 35–37. They suggest 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.

Id. at col. 2 ll. 38–44. "Accordingly, it is the primary object of this invention to provide a method for automatically . . . producing accurate and realistic lip synchronization and facial expressions in animated characters." *Id.* at col. 2 ll. 45–50.

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

positions for similar phonemes based on context." *Id.* at col. 10 ll. 6–7.

One exemplary set of rules provided and applied in the specification of the '576 patent is for a character transitioning from silence through saying "hello." *See* '576 patent col. 7 l. 36 to col. 9 l. 22. This exemplary set of rules provides for inserting a transition starting shortly before the first syllable after a silence. *Id.* at col. 8 ll. 24–28. The transition marks when the character begins to transition from silence, shown by the closed-mouthed neutral model, to the morph target for the first syllable, with its open-mouthed shape. *Id.* at col. 8 ll. 61–63. That is, the rule automates a character's facial expressions so the character will wait until shortly before it starts speaking to begin opening its mouth. In terms of the prior art method, the effect of this rule is to automatically create a keyframe at a point that no phoneme is being pronounced. *Id.* at col. 9 ll. 10–11. If instead no transition were placed at that position, the resulting animation would have an unrealistic quality. The character would open its mouth gradually from the beginning of the sequence through its first utterance as a result of the computer interpolating a continuous transition between those two points. In the prior art system, an animator would have to subjectively identify the problematic sequence and manually fix it by adding an appropriate keyframe. The invention, however, uses rules to automatically set a keyframe at the correct point to depict more realistic speech, achieving results similar to those previously achieved manually by animators.

Claim 1 of the '576 patent is representative and dispositive of the asserted claims[3] for the purposes of appeal:

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[3] McRO has asserted claims 1, 7–9, and 13 of the '576 patent and claims 1–4, 6, 9, 13, and 15–17 of the '278

> 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.

'576 patent, cl. 1, col. 11 ll. 27–47.

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patent. The district court focused its analysis on claim 1 of the '576 patent as representative. It held that neither the different text of the other independent claims nor the added limitations of the dependent claims in either patent affected the result regarding patentability. *Patentability Op.*, 55 F. Supp. 3d at 1228–29. The parties do not dispute this conclusion or separately argue any other claims. *See* McRO Br. 19; Defs.' Br. 40 n.12. We agree and focus our discussion on this claim.

B. Procedural History

In 2012 and 2013, Plaintiff-Appellant McRO, Inc., d/b/a Planet Blue ("McRO") filed lawsuits in the U.S. District Courts for the Central District of California and for the District of Delaware. The defendants are generally video game developers and publishers. On January 15, 2014, eight of the lawsuits originally filed in Delaware were transferred to the Central District of California. The five cases remaining in Delaware are not part of this appeal, but are stayed pending the resolution of this appeal.[4]

The Central District of California ("district court") consolidated the proceedings there for pre-trial purposes on two tracks.[5] It held a claim construction hearing in the

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[4] *McRO, Inc. v. Bethesda Softworks LLC*, No. 12-cv-1509 (D. Del.); *McRO, Inc. v. Harmonix Music Sys. Inc.*, No. 12-cv-1510 (D. Del.); *McRO, Inc. v. Rockstar Games, Inc., No.* 12-cv-1513 (D. Del.); *McRO, Inc. v. Take-Two Interactive Software, Inc.*, No. 12-cv-1517 (D. Del.); *McRO, Inc. v. 2K Games, Inc.*, No. 12-cv-1519 (D. Del.).

[5] The Track 1 cases at the time the district court issued its Judgment on Pleadings were: *McRO, Inc. v. Namco Bandai Games Am., Inc.*, CV-12-10322; *McRO, Inc. v. Konami Digital Entm't, Inc.*, CV-12-10323; *McRO, Inc. v. Sega of Am., Inc.*, CV-12-10327; *McRO, Inc. v. Elec. Arts, Inc.*, CV-12-10329; *McRO, Inc. v. Obsidian Entm't, 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 Entm't, Inc.,* CV-12-10341; *McRO, Inc. v. Treyarch Corp.*, CV-12-10342; *McRO, Inc. v. Atlus U.S.A., et al.*, CV-13-1870; *McRO, Inc. v. Sucker Punch Prod.s, LLC*, CV-14-0332; *McRO, Inc. v. Activision Blizzard, Inc.*, CV-14-0336; *McRO, Inc. v. Infinity Ward, Inc.*,

Track 1 cases on April 29, 2014, and issued its Rulings on Claim Construction on May 1, 2014. J.A. 4009, 4155–73.[6]

C. District Court's § 101 Ruling

On July 10, 2014, all Central District of California defendants from both tracks ("Defendants") jointly filed a motion for judgment on the pleadings that the asserted claims were directed to patent ineligible subject matter under § 101. *Patentability Op.*, 55 F. Supp. 3d at 1216. After a hearing, the district court granted the motion on September 22, 2014, finding the asserted claims unpatentable. *Id.* at 1230.

The district court's analysis loosely tracks the two-step framework laid out by the Supreme Court in *Alice Corp. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014) ("*Alice*"). First, the district court discussed the claims generally: "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." *Patentability Op.*, 55 F. Supp. 3d at 1224. "At first blush, it is therefore difficult to see how the claims might impli-

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CV-14-0352; *McRO, Inc. v. LucasArts Entm't Co.*, CV-14-358*; McRO, Inc. v. Sony Comput. Entm't Am., LLC*, CV-14-0383; *McRO, Inc. v. Warner Bros. Interactive Entm't Inc.*, CV-14-0417.

The Track 2 cases were: *McRO, Inc. v. Valve Corp.*, CV-13-1874; *McRO, Inc. v. Codemasters USA Grp., Inc.*, CV-14-0389; *McRO, Inc. v. Codemasters, Inc.*, CV-14-0439. *Patentability Op.*, 55 F. Supp. 3d at 1216 n.1.

[6] The parties do not argue that any of the district court's constructions affect patent eligibility or contest the constructions arrived at by the district court. The parties raise two unrelated claim interpretation issues on appeal, discussed below.

cate the basic underlying concern that these patents tie up too much future use of any abstract idea they apply." *Id.* (quotation marks omitted).

Second, the district court attempted to "factor out conventional activity" by comparing the claims to the admitted prior art process that the patent sought to improve. *Id.* at 1224. The court accepted as undisputed that "a central part of the patents is 'using morph weight set representations of the facial shape coupled with rules . . . to generate keyframes.'" *Id.* at 1226. The court then looked to "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." *Id.*

After looking at each claim element in turn, the district court concluded, "the claim adds to the prior art . . . the use of rules, rather than artists, to set the morph weights and transitions between phonemes." *Id.* at 1227. Nonetheless, the district court found the claims too broadly preemptive to satisfy § 101. In the district court's view, because the claims were not limited to specific rules,[7] but rather "purport to cover all such rules," the claims merely call for application of the abstract idea of using rules. *Id.* at 1227 (citing *Alice*, 134 S. Ct. at 2358). The district court found that, "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." *Id.* at 1227. The court concluded that the claims were unpatentable because "the novel portions of [the] invention are claimed too broadly." *Id.* at 1230.

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[7] The claim term is "first set of rules," but we will follow the shorthand adopted by the district court and parties of referring to the "rules" or "claimed rules."

The district court entered judgment against McRO on October 31, 2014. J.A. 24–26. McRO appeals. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

II. PARTIES' ARGUMENTS

The parties' principal dispute is over the meaning and application of two Supreme Court cases in light of *Alice*: *Parker v. Flook*, 437 U.S. 584 (1978) ("*Flook*") and *Diamond v. Diehr*, 450 U.S. 175 (1981) ("*Diehr*"). Both cases addressed the patentability of process claims that include steps requiring calculation.

A. McRO's Position

McRO argues that *Diehr* controls the outcome here and dictates that the claims are not directed to an abstract idea. Specifically, McRO argues that the claims are not directed to an abstract idea because they generate a tangible product, namely "a video of a 3-D character speaking the recorded audio." McRO Br. 38. According to McRO, the claimed process is technological because it provides "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." McRO Br. 42.

McRO argues that even if we find the claims are directed to an abstract idea, they are nonetheless patent eligible because they "effect an improvement in [a] technology or technical field," specifically 3-D computer generated lip-synchronization. McRO Br. 43 (quoting *Alice*, 134 S. Ct. at 2359 (citing *Diehr*, 450 U.S. at 177–78)). This improvement, McRO argues, results from its method that "employs specific ***types*** of rules" and uses those rules in "a specific technological ***way.***" McRO Br. 45 (emphasis in original). The claimed type of rules are only those "rules that define output morph weight set stream as a function of phoneme sequence and time of said phoneme sequence." *Id.* at 46 (quoting '576 patent, cl. 1, col. 11 ll.

30–32). When applied, in McRO's interpretation, these rules must "adjust for the fact that a phoneme may look different when spoken depending on the phonemes preceding and/or following it." McRO Br. 46.

These limitations are specific enough in McRO's view because the rules will necessarily vary by character as, for example, "a swamp monster will use different rules than a tight-lipped cat." *Id.* at 46. McRO argues that its claims cannot preempt the field because other techniques exist that automate facial synchronization by capturing actors' facial motions and applying those motions to 3-D animated characters. McRO Br. 50 (citing Barbara Robertson, *Big Moves*, Computer Graphics World (Nov. 2006), available at http://www.cgw.com/Publications/CGW/2006/Volume-29-Issue-11-Nov-2006-/Big-Moves.aspx).[8]

B. Defendants' Position

Defendants argue that *Flook* controls because the claims are unpatentable algorithms that "can be performed solely with pencil and paper." Defs.' Br. 28. The claims, in Defendants' view, "merely purport to take a preexisting process and make it faster by automating it on a general-purpose computer." Defs.' Br. 19. Defendants argue that these claims fail even under *Diehr* because they do not result in any tangible product, instead only producing a "stream of output morph weight sets" that are applied "to produce lip synchronization" without requiring the production of anything tangible like a video. '576 patent, claim 1, col. 11 ll. 44–47; Defs.' Br. 30. Even if specific processing steps are required, Defendants argue

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[8] Defendants do not dispute this is an alternative method for automatic lip synchronization of 3-D animated characters; instead, they argue that "this technology is not remotely similar to the patented technology." Defs.' Br. 53.

the claims remain directed to an abstract idea because they only require using "mathematical algorithms to manipulate existing information to generate additional information." Defs.' Br. 34 (quoting *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014)).

Echoing the district court, Defendants fault the claims for not specifically claiming particular rules, and instead requiring that the user provide the rules. Defs.' Br. 40–42; *see also Patentability Op.*, 55 F. Supp. 3d at 1227, 1230. Defendants dispute that the claimed rules depend on the preceding or succeeding phonemes, i.e., subsequences of phonemes, and fault McRO for failing to raise this interpretation as a claim construction issue before the district court. Defs.' Br. 43–44. Defendants claim broad preemption occurs because the rules only reflect relationships "that ***any*** intelligible lip-synchronization process must consider." *Id.* at 50 (emphasis original). The relationships expressed by these rules, Defendants argue, inevitably capture "a pre-existing fundamental truth" about how a human mouth looks while speaking certain sounds over time, preempting all possible rules-based methods. *Alice*, 134 S. Ct. at 2356; *see* Defs.' Br. 16, 49–51.[9]

III. STANDARD OF REVIEW

We review procedural aspects of the grant of judgment on the pleadings under the law of the regional circuit, in this case the Ninth Circuit. *Allergan, Inc. v. Athena Cosmetics, Inc.*, 640 F.3d 1377, 1380 (Fed. Cir.

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[9] Amicus similarly argues that the claims are directed to a natural phenomenon instead of an abstract idea, specifically "the movement of the mouth to articulate sounds." Amicus Public Knowledge Br. 11; *see also* Defs.' Br. 26.

2011). The Ninth Circuit reviews the grant or denial of judgment on the pleadings under Rule 12(c) de novo. *Kotrous v. Goss-Jewett Co.*, 523 F.3d 924, 929 (9th Cir. 2008). We also review de novo whether a claim is invalid under the judicially created exceptions to § 101. *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1375 (Fed. Cir. 2015).

IV. DISCUSSION

A. Claim Interpretation

As an initial matter, we note that, in this case, claim construction is helpful to resolve the question of patentability under § 101. Specifically, the parties' dispute about whether the "first set of rules" must evaluate sequential phonemes or can evaluate individual phonemes is resolved by the claim language. We agree with McRO that the claims are limited to rules that evaluate subsequences consisting of multiple sequential phonemes. This limitation is apparent on the face of the claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc). In particular, the intermediate morph weight sets and transition parameters are generated "by evaluating said plurality of sub-sequences against said first set of rules." '576 patent, cl. 1, col. 11 ll. 36–39.[10] This limitation could not be satisfied by rules that only evaluate individual phonemes. Instead, the claimed "first set of rules" must be formulated to evaluate subsequences of phonemes.[11]

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[10] The limitation with the same effect in independent claim 1 of the '278 patent is "applying said first set of rules to each sub-sequence" at column 11 lines 53–54.

[11] The parties also dispute whether the rules must take into account the pacing of speech based on the "and time of said phoneme sequence" limitation. Resolution of this question is neither necessary to resolve of the issues

B. Patentability Under § 101

Section 101 defines patent eligible subject matter as "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof," subject to the other limitations of the Patent Act. Apart from the Patent Act, the courts have created exceptions to the literal scope of § 101. "Laws of nature, natural phenomena, and abstract ideas are not patentable." *Alice*, 134 S. Ct. at 2354 (quoting *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S. Ct. 2107, 2116 (2013) ("*Myriad*")). This appeal involves the abstract idea exception.

In *Alice*, the Court applied a two-step framework for analyzing whether claims are patent eligible. First, we determine whether the claim at issue is "directed to" a judicial exception, such as an abstract idea. *Alice*, 134 S. Ct. at 2355. Mathematical formulas are a type of abstract idea. *Gottschalk v. Benson*, 409 U.S. 63, 64 (1972) ("*Benson*"). The abstract idea exception prevents patenting a result where "it matters not by what process or machinery the result is accomplished." *O'Reilly v. Morse*, 56 U.S. 62, 113 (1854). We do not assume that such claims are directed to patent ineligible subject matter because "all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." *Mayo Collaborative Servs. v. Prometheus Labs., Inc.,* 132 S. Ct. 1289, 1293 (2012) ("*Mayo*"); *see also In re TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016) ("*TLI Commc'ns*"). Instead, "the claims are considered in their entirety to ascertain whether their

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on appeal nor indisputably resolved by the claim language. We therefore decline to address this issue in the first instance and express no opinion on whether McRO has waived these arguments or is bound by them for purposes of infringement.

character as a whole is directed to excluded subject matter." *Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1346 (Fed. Cir. 2015). If the claims are not directed to an abstract idea, the inquiry ends. If the claims are "directed to" an abstract idea, then the inquiry proceeds to the second step of the *Alice* framework.

In step two we consider whether the claims contain an "inventive concept" sufficient to "transform the nature of the claim into a patent-eligible application." *Alice*, 134 S. Ct. at 2355 (quotation omitted). To do so we look to both the claim as a whole and the individual claim elements to determine whether the claims contain "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.* (quoting *Mayo*, 132 S. Ct. at 1294) (alteration in original).

In *Alice*, the Court applied some of its § 101 jurisprudence that preceded the two-step framework, including *Flook* and *Diehr*. In *Flook*, claims requiring the use of a specific equation were unpatentable because they "simply provide[d] a new and presumably better method of calculating alarm limit values." *Flook*, 437 U.S. at 594–95. The mathematical "formula itself was an abstract idea" and "the computer implementation was purely conventional" because "the 'use of computers for "automatic monitoring-alarming"' was 'well known'." *Alice*, 134 S. Ct. at 2358 (quoting *Flook*, 437 U.S. at 594). "*Flook* stands for the proposition that the prohibition against patenting abstract ideas cannot be circumvented by attempting to limit the use of [the idea] to a particular technological environment." *Alice*, 134 S. Ct. at 2358 (quoting *Bilski v. Kappos*, 561 U.S. 593, 610–611 (2010) ("*Bilski*")) (internal quotation marks omitted).

The claims in *Diehr*, in contrast, were patentable. The claims likewise "employed a 'well-known' mathematical equation." *Alice*, 134 S. Ct. at 2358 (quoting *Diehr*,

450 U.S. at 177). A computer performed the calculations as part of a broader process for curing rubber, but "the process as a whole [did] not thereby become unpatentable subject matter." *Diehr*, 450 U.S. at 187. Instead, the Court looked to how the claims "used that equation in a process designed to solve a technological problem in 'conventional industry practice.'" *Alice*, 134 S. Ct. at 2358 (quoting *Diehr*, 450 U.S. at 178). When looked at as a whole, "the claims in *Diehr* were patent eligible because they improved an existing technological process, not because they were implemented on a computer." *Alice*, 134 S. Ct. at 2358.

1. Specific Limitations

The district court determined that claim 1 of the '567 patent is "drawn to the [abstract] idea of automated rules-based use of morph targets and delta sets for lip-synchronized three-dimensional animation." *Patentability Op.*, 55 F. Supp. 3d at 1226. We disagree. We have previously cautioned that courts "must be careful to avoid oversimplifying the claims" by looking at them generally and failing to account for the specific requirements of the claims. *TLI Commc'ns*, 823 F.3d at 611; *see also Diehr*, 450 U.S. at 189 n.12. Here, the claims are limited to rules with specific characteristics. As the district court recognized during claim construction, "the claims themselves set out meaningful requirements for the first set of rules: they 'define[] a morph weight set stream as a function of phoneme sequence and times associated with said phoneme sequence.'" J.A. 4171 (Dist. Ct. Claim Construction Op. 16) (quoting '567 patent, cl. 1). They further require "applying said first set of rules to each sub-sequence . . . of timed phonemes." *Id.* Whether at step one or step two of the *Alice* test, in determining the patentability of a method, a court must look to the claims as an ordered combination, without ignoring the requirements of the individual steps. The specific, claimed features of these rules allow for the improvement realized by the invention.

As the specification confirms, the claimed improvement here is allowing computers to produce "accurate and realistic lip synchronization and facial expressions in animated characters" that previously could only be produced by human animators. '576 patent col. 2 ll. 49–50. As the district court correctly recognized, this computer automation is realized by improving the prior art through "the use of rules, rather than artists, to set the morph weights and transitions between phonemes." *Patentability Op.*, 55 F. Supp. 3d at 1227. The rules are limiting in that they define morph weight sets as a function of the timing of phoneme sub-sequences. *See, e.g.*, '576 patent col. 3 ll. 19–33. Defendants do not dispute that processes that automate tasks that humans are capable of performing are patent eligible if properly claimed; instead, they argue that the claims here are abstract because they do not claim specific rules.[12] This argument echoes the district court's finding that the claims improperly purport to cover all rules. *Patentability Op.*, at 1227. The claimed rules here, however, are limited to rules with certain common characteristics, i.e., a genus.

Claims to the genus of an invention, rather than a particular species, have long been acknowledged as patentable. *E.g., Diamond v. Chakrabarty*, 447 U.S. 303, 305 (1980) (patentable claim to "a bacterium from the genus *Pseudomonas* containing therein at least two stable energy-generating plasmids, each of said plasmids providing a separate hydrocarbon degradative pathway.").

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[12] *See, e.g.*, Hearing Tr. at 14:00–15:09 (Defendants' counsel acknowledging that a process for autopilot or facial recognition using rules could be patented, but arguing the claims here are unpatentable because they do not claim specific rules), *available at* http://oralarguments.cafc.uscourts.gov/default.aspx?fl=2015-1080.mp3.

Patent law has evolved to place additional requirements on patentees seeking to claim a genus; however, these limits have not been in relation to the abstract idea exception to § 101. Rather they have principally been in terms of whether the patentee has satisfied the tradeoff of broad disclosure for broad claim scope implicit in 35 U.S.C. § 112. *E.g.*, *Carnegie Mellon Univ. v. Hoffmann-La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008). It is self-evident that genus claims create a greater risk of preemption, thus implicating the primary concern driving § 101 jurisprudence, but this does not mean they are unpatentable.

The preemption concern arises when the claims are not directed to a specific invention and instead improperly monopolize "the basic tools of scientific and technological work." *Alice*, 134 S. Ct. at 2354 (quoting *Myriad*, 133 S. Ct. at 2116). The abstract idea exception has been applied to prevent patenting of claims that abstractly cover results where "it matters not by what process or machinery the result is accomplished." *Morse*, 56 U.S. at 113; *see also Mayo*, 132 S. Ct. at 1301. "A patent is not good for an effect, or the result of a certain process" because such patents "would prohibit all other persons from making the same thing by any means whatsoever." *Le Roy v. Tatham*, 55 U.S. 156, 175 (1853). A patent may issue "for the means or method of producing a certain result, or effect, and not for the result or effect produced." *Diehr*, 450 U.S. 175, 182 n.7. We therefore look to whether the claims in these patents focus on a specific means or method that improves the relevant technology or are instead directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery. *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1336 (Fed. Cir. 2016) ("*Enfish*"); *see also Rapid Litig. Mgmt. Ltd. v. CellzDirect, Inc.,* No. 2015-1570, 2016 WL 3606624, at *4 (Fed. Cir. July 5, 2016).

2. Claims Directed To

Claim 1 of the '576 patent is focused on a specific asserted improvement in computer animation, i.e., the automatic use of rules of a particular type. We disagree with Defendants' arguments that the claims simply use a computer as a tool to automate conventional activity. While the rules are embodied in computer software that is processed by general-purpose computers, Defendants provided no evidence that the process previously used by animators is the same as the process required by the claims. *See* Defs.' Br. 10–15, 39–40. In support, Defendants point to the background section of the patents, but that information makes no suggestion that animators were previously employing the type of rules required by claim 1. Defendants concede an animator's process was driven by subjective determinations rather than specific, limited mathematical rules. The prior art "animator would decide what the animated face should look like at key points in time between the start and end times, and then 'draw' the face at those times." Defs.' Br. 10. The computer here is employed to perform a distinct process to automate a task previously performed by humans. McRO states that animators would initially set keyframes at the point a phoneme was pronounced to represent the corresponding morph target as a starting point for further fine tuning. J.A. 3573 at 8:53 (McRO's Claim Construction Presentation). This activity, even if automated by rules, would not be within the scope of the claims because it does not evaluate sub-sequences, generate transition parameters or apply transition parameters to create a final morph weight set. It is the incorporation of the claimed rules, not the use of the computer, that "improved [the] existing technological process" by allowing the automation of further tasks. *Alice*, 134 S. Ct. at 2358. This is unlike *Flook*, *Bilski*, and *Alice*, where the claimed computer-automated process and the prior method were

carried out in the same way. *Flook*, 437 U.S. at 585–86; *Bilski*, 561 U.S. at 611; *Alice*, 134 S. Ct. at 2356.

Further, the automation goes beyond merely "organizing [existing] information into a new form" or carrying out a fundamental economic practice. *Digitech*, 758 F.3d at 1351; *see also Alice*, 134 S. Ct. at 2356. The claimed process uses a combined order of specific rules that renders information into a specific format that is then used and applied to create desired results: a sequence of synchronized, animated characters. While the result may not be tangible, there is nothing that requires a method "be tied to a machine or transform an article" to be patentable. *Bilski*, 561 U.S. at 603 (discussing 35 U.S.C. § 100(b)). The concern underlying the exceptions to § 101 is not tangibility, but preemption. *Mayo*, 132 S. Ct. at 1301.

The limitations in claim 1 prevent preemption of all processes for achieving automated lip-synchronization of 3-D characters. McRO has demonstrated that motion capture animation provides an alternative process for automatically animating lip synchronization and facial expressions. Even so, we have recognized that "the absence of complete preemption does not demonstrate patent eligibility." *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015). The narrower concern here is whether the claimed genus of rules preempts all techniques for automating 3-D animation that rely on rules. Claim 1 requires that the rules be rendered in a specific way: as a relationship between subsequences of phonemes, timing, and the weight to which each phoneme is expressed visually at a particular timing (as represented by the morph weight set). The specific structure of the claimed rules would prevent broad preemption of all rules-based means of automating lip synchronization, unless the limits of the rules themselves

are broad enough to cover all possible approaches.[13] There has been no showing that any rules-based lip-synchronization process must use rules with the specifically claimed characteristics.

Defendants' attorney's argument that any rules-based lip-synchronization process must use the claimed type of rules has appeal, but no record evidence supports this conclusion. Defendants again rely only on the patents' description of one type of rules, but the description of one set of rules does not mean that there exists only one set of rules, and does not support the view that other possible types of rules with different characteristics do not exist. The only information cited to this court about the relationship between speech and face shape points to the conclusion that there are many other possible approaches to automating lip synchronization using rules. For example, Amicus cites Kiyoshi Honda, *Physiological Processes of Speech Processing*, *in Springer Handbook of Speech Production* 7 (Jacob Benesty et al. eds., 2008) ("Honda"), as support for the proposition that the claimed rules reflect natural laws. Amicus Public Knowledge Br. 12. Honda shows, however, that the interaction between vocalization and facial expression is very complex, and there are relationships present other than those required by the claimed rules. Honda at 24 ("Physiological processes during speech are multidimensional in nature as described in this chapter."). This complex interaction permits development of alternative rules-based methods of animating lip synchronization and facial expressions of three-dimensional characters, such as simulating the

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[13] This is not a case where the patentee's principal contribution was in discovering relationships that existed in nature, *e.g.*, *Myriad*, 133 S. Ct. at 2112; animators were previously able to naturally depict the relationship between speech, timing, and facial expression.

muscle action underlying characters' facial expressions. Under these circumstances, therefore, we need not assume that future alternative discoveries are foreclosed.

Here, the structure of the limited rules reflects a specific implementation not demonstrated as that which "any [animator] engaged in the search for [an automation process] would likely have utilized." *Myriad*, 133 S. Ct. at 2119–20 (quotation marks omitted). By incorporating the specific features of the rules as claim limitations, claim 1 is limited to a specific process for automatically animating characters using particular information and techniques and does not preempt approaches that use rules of a different structure or different techniques. *See Morse*, 56 U.S. at 113. When looked at as a whole, claim 1 is directed to a patentable, technological improvement over the existing, manual 3-D animation techniques. The claim uses the limited rules in a process specifically designed to achieve an improved technological result in conventional industry practice. *Alice*, 134 S. Ct. at 2358 (citing *Diehr*, 450 U.S. at 177). Claim 1 of the '576 patent, therefore, is not directed to an abstract idea.

Because we find that claim 1 is not directed to ineligible subject matter, we do not reach *Alice* step two. *Enfish*, 822 F.3d at 1339.

V. CONCLUSION

Claim 1 is not directed to an abstract idea and recites subject matter as a patentable process under § 101. Accordingly, we *reverse* and hold that claims 1, 7–9, and 13 of the '576 patent and claims 1–4, 6, 9, 13, and 15–17 of the '278 patent are patentable under 35 U.S.C. § 101.

REVERSED AND REMANDED

COSTS

No costs.