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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte LEV A. KOYRAKH, MARK HAGFORS,
SIMON T. PRANAITIS, NATHAN A. MULLINS, and YURIY MALININ

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Appeal 2018-002699
Application 14/462,128[1]
Technology Center 3700

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Before LINDA E. HORNER, DAVID M. KOHUT, and
NATHAN A. ENGELS, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant seeks our review under 35 U.S.C. § 134(a) of the
Examiner's rejections of claims 1–15, 25, and 28. Non-Final Office Action
(April 27, 2017, "Non-Final Act.").[2] We have jurisdiction under 35 U.S.C.
§ 6(b).

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[1] St. Jude Medical, Atrial Fibrillation Division, Inc. ("Appellant") is the
applicant under 37 C.F.R. § 1.46 and is identified as the real party in interest.
Appeal Brief (September 22, 2017, "Appeal Br.") 2.
[2] Claims 16–24, 26, and 27 are pending and withdrawn from consideration.
Non-Final Act. 1.

The Examiner rejected all of the appealed claims as being directed to patent ineligible subject matter and as being unpatentable over various combinations of the prior art. The Examiner also rejected one dependent claim as being indefinite. Appellant contests each ground of rejection. As to subject matter eligibility, Appellant argues that the claims are not directed to an abstract idea. As to obviousness, Appellant contests the Examiner's findings about the prior art. As to indefiniteness, Appellant asserts that the Examiner has confused breadth with indefiniteness.

For the reasons explained below, we agree with Appellant that the claims are not directed to an abstract idea and that the dependent claim is not indefinite. Thus, we do not sustain the rejections under 35 U.S.C. §§ 101 and 112(b). We find, however, that several of the Examiner's findings about the prior art, which are contested by Appellant, are supported by a preponderance of the evidence. Thus, we sustain some of the rejections under 35 U.S.C. § 103. Because we sustain at least one rejection of each claim on appeal, we AFFIRM.

CLAIMED SUBJECT MATTER

The claimed subject matter on appeal relates to generating an electrophysiology map, such as may be performed in cardiac diagnostic and therapeutic procedures, using data collected by a roving electrophysiology probe. Specification (August 18, 2014, "Spec.") ¶ 2. Claims 1 and 25 are the independent claims. Claim 1 is illustrative of the subject matter on appeal and is reproduced below with the disputed limitation shown in italics for emphasis.

1.   A method of generating an electrophysiology map of a portion of a patient's anatomy, comprising:

defining a location-based electrophysiology data point inclusion criterion;

defining a rhythm-based electrophysiology data point inclusion criterion;

collecting an electrophysiology data point with an electrophysiology probe, wherein the electrophysiology data point is associated with location-based inclusion data and rhythm-based inclusion data;

comparing the location-based inclusion data associated with the electrophysiology data point to the defined location-based inclusion criterion;

comparing the rhythm-based inclusion data associated with the electrophysiology data point to the defined rhythm-based inclusion criterion; and

adding the electrophysiology data point to the electrophysiology map when both the location-based inclusion data associated with the electrophysiology data point satisfies the location-based inclusion criterion and the rhythm-based inclusion data associated with the electrophysiology data point satisfies the rhythm-based inclusion criterion,

wherein the rhythm-based inclusion criterion comprises an EKG matching criterion, the EKG matching criterion comprising a matching score for an EKG signal at a time the electrophysiology data point is collected calculated using a template area.

Appeal Br. 20 (Claims Appendix).

EVIDENCE

Throne	US 5,000,189	Mar. 19, 1991
Gillberg	US 6,393,316 B1	May 21, 2002
Lian	US 2008/0294217 A1	Nov. 27, 2008
Harlev '863	US 2012/0184863 A1	July 19, 2012
Harlev '858	US 2012/0184858 A1	July 19, 2012

REJECTIONS

The Non-Final Office Action includes the following rejections:

1. Claims 1–15, 25, and 28 are rejected under 35 U.S.C. § 101 as being directed to patent ineligible subject matter.

2. Claim 28 is rejected under 35 U.S.C. § 112(b) as being indefinite.

3. Claims 1–15 and 25 are rejected under 35 U.S.C. § 103 as unpatentable over Harlev '863 and Harlev '858.

4. Claims 1–15 and 25 are rejected under 35 U.S.C. § 103 as unpatentable over Harlev '863, Harlev '858, and Throne.

5. Claims 1–15 and 25 are rejected under 35 U.S.C. § 103 as unpatentable over Harlev '863, Harlev '858, and Lian.

6. Claims 1–15, 25, and 28 are rejected under 35 U.S.C. § 103 as unpatentable over Harlev '863, Harlev '858, and Gillberg.

ANALYSIS

I.   Rejection under 35 U.S.C. § 101

 A. Legal Principles

An invention is patent-eligible if it claims a "new and useful process, machine, manufacture, or composition of matter." 35 U.S.C. § 101. However, the Supreme Court has long interpreted 35 U.S.C. § 101 to include implicit exceptions: "[l]aws of nature, natural phenomena, and abstract ideas" are not patentable. *E.g., Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014).

In determining whether a claim falls within an excluded category, we are guided by the Supreme Court's two-step framework, described in *Mayo* and *Alice. Id.* at 217–18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012)). In accordance with that framework,

we first determine what concept the claim is "directed to." *See Alice*, 573 U.S. at 219 ("On their face, the claims before us are drawn to the concept of intermediated settlement, *i.e.*, the use of a third party to mitigate settlement risk."); *see also Bilski v. Kappos*, 561 U.S. 593, 611 (2010) ("Claims 1 and 4 in petitioners' application explain the basic concept of hedging, or protecting against risk.").

Concepts determined to be abstract ideas, and thus patent ineligible, include certain methods of organizing human activity, such as fundamental economic practices (*Alice*, 573 U.S. at 219–20; *Bilski*, 561 U.S. at 611); mathematical formulas (*Parker v. Flook*, 437 U.S. 584, 594–95 (1978)); and mental processes (*Gottschalk v. Benson*, 409 U.S. 63, 69 (1972)). Concepts determined to be patent eligible include physical and chemical processes, such as "molding rubber products" (*Diamond v. Diehr*, 450 U.S. 175, 192 (1981)); "tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores" (*id.* at 184 n.7 (quoting *Corning v. Burden*, 56 U.S. 252, 267–68 (1854))); and manufacturing flour (*Benson*, 409 U.S. at 69 (citing *Cochrane v. Deener*, 94 U.S. 780, 785 (1876))).

In *Diehr*, the claim at issue recited a mathematical formula, but the Supreme Court held that "[a] claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula." *Diehr*, 450 U.S. at 176; *see also id.* at 192 ("We view respondents' claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula."). Having said that, the Supreme Court also indicated that a claim "seeking patent protection for that formula in the abstract . . . is not accorded the protection of our patent laws, . . . and this principle cannot be circumvented by

attempting to limit the use of the formula to a particular technological environment." *Id.* (citing *Benson* and *Flook*); *see, e.g., id.* at 187 ("It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.").

If the claim is "directed to" an abstract idea, we turn to the second step of the *Alice* and *Mayo* framework, where "we must examine the elements of the claim to determine whether it contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Alice*, 573 U.S. at 221 (quotation marks omitted). "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].'" *Id.* (quoting *Mayo*, 566 U.S. at 77). "[M]erely requir[ing] generic computer implementation[] fail[s] to transform that abstract idea into a patent-eligible invention." *Id.*

B. USPTO § 101 Guidance

The PTO recently published revised guidance on the application of § 101. *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) ("Guidance").[3] Under that guidance, we first look to whether the claim recites:

(1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing

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[3] Although the Examiner issued the rejection before the Guidance was published, because the document provides the PTO's guidance for evaluating subject matter eligibility under existing law, the methodology set forth in the Guidance applies to examinations of all pending claims, including those at issue in this Appeal.

human activity such as a fundamental economic practice, or mental

processes); and

(2) additional elements that integrate the judicial exception into a

practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)).

Only if a claim (1) recites a judicial exception and (2) does not integrate that

exception into a practical application, do we then look to whether the claim:

(3) adds a specific limitation beyond the judicial exception that are not

"well-understood, routine, conventional" in the field (*see* MPEP

§ 2106.05(d)); or

(4) simply appends well-understood, routine, conventional activities

previously known to the industry, specified at a high level of

generality, to the judicial exception.

See Guidance.

> C. *Whether the claims fall within the specific categories of*
> *patentable subject matter*

We begin our analysis by looking at the claims to determine if they

recite a process, machine, manufacture, or a composition of matter. Claims

1–15 and 28 recite a method and claim 25 recites a system that is a machine

or combination of machines. Thus, the claims fall within the specific

categories of patentable subject matter.

We now turn to the next part of the *Alice/Mayo* analysis and examine

whether the claims are directed to a judicial exception.

> D. *Whether the claims are directed to any judicial exceptions*

In accordance with the Guidance, we address the judicial exceptions

relied on by the Examiner. The Examiner determined that the claims are

directed to the abstract ideas of "obtaining and comparing intangible data;

organizing information through mathematical correlations; and, in some

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cases, an algorithm for calculating parameters indicating an abnormal condition." Non-Final Act. 4. The Examiner has not, however, identified clearly the specific limitations that recite mathematical concepts or that otherwise form the Examiner's position that the claims are directed to abstract ideas. For example, it is unclear which limitations of the claims are referred to as "organizing information."

We examine independent claims 1 and 25 each as a whole to see if either recites a mathematical concept. The Guidance explains that judicially excepted mathematical concepts are "mathematical relationships, mathematical formulas or equations, [and/or] mathematical calculations." 80 Fed. Reg. at 52. Claim 1 recites defining criteria and comparing collected data to the defined criteria. Claim 25 recites a processor configured to analyze actual data with defined criteria. Although the comparing/analyzing limitations may be based on mathematical concepts, the mathematical concepts are not recited in the claims. The claims do not recite any mathematical relationships, formulas, or calculations. The Examiner fails to identify where the claims recite a limitation directed to particular "mathematical relationships, mathematical formulas or equations, [and/or] mathematical calculations." Thus, we do not agree with the Examiner's analysis that the claims recite patent ineligible subject matter based on the recitation of mathematical concepts.[4] This determination does

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[4] Even if one were to determine that these claimed steps recite mathematical concepts, for the reasons discussed below, we find that claims 1 and 25 are directed to practical applications because the claims include additional elements that limit the method and system to physical elements applied in a practical application.

not end our inquiry because the Examiner also found that claim 1 recites an additional judicial exception.

The Examiner further explained that claim 1 recites the judicial exception of mental processes. Non-Final Act. 4–5 (finding that claim 1 recites "a method disembodied from any structure thus allowing the claim to be a series of mental steps combined with hand calculations/drawings of maps"). The Guidance explains that judicially excepted mental processes are "concepts performed in the human mind (including an observation, evaluation, judgment, [and/or] opinion)." 84 Fed. Reg. at 52. Appellant argues that the claims are not directed to an abstract idea because they are directed to "the creation of electrophysiology maps using specific hardware (*e.g.*, a localization system; an electrophysiology catheter)." Appeal Br. 10. Appellant argues that the Examiner erred in finding that the claims are "disembodied from any structure." *Id.* at 11.

To the extent the steps of defining criteria and comparing collected data to the defined criteria could be performed in the human mind, the claim, nonetheless, recites additional elements that integrate the judicial exception into a practical application. Specifically, claim 1 recites additional steps that require a specific apparatus, i.e., an electrophysiology probe, for collecting the data, and an apparatus for creating a map. *See Research Corp. Techs. v. Microsoft Corp.*, 627 F.3d 859, 868 (Fed. Cir. 2010) (holding that claims for rendering a halftone image of a digital image by comparing, pixel by pixel, the digital image against a blue noise mask present "functional and palpable applications in the field of computer technology" and are patent eligible). The court in *Research Corp.* stated, "Inventions with specific applications or improvements to technologies in the marketplace are not likely to be so

abstract that they override the statutory language and framework of the Patent Act." *Id.* at 869. The court also stated, "The fact that some claims in the [patents] require a 'high contrast film,' 'a film printer,' 'a memory,' and 'printer and display devices' also confirm this court's holding that the invention is not abstract." *Id.* The additional elements in the claims before us, like the claims before the court in *Research Corp.*, "present[] functional and palpable applications" within the field of the invention. *Id.* at 868. Claim 1 recites a combination of steps designed to provide improved data points for mapping a portion of a patient's anatomy.

Thus, we do not sustain the rejection of claims 1–15, 25, and 28 under 35 U.S.C. § 101.

II.   *Rejection under 35 U.S.C. § 112(b)*

Claim 28 depends from claim 1 and further recites specific steps by which the matching score for the EKG signal is calculated. Appeal Br. 22–23 (Claims Appendix). One of the steps in claim 28 includes, "computing a distance between the template electrophysiological signal and an electrophysiological signal associated with the electrophysiology data point." *Id.* The Examiner determined that this recited step is indefinite because, according to the Examiner, it is unclear which points are being used in each respective signal to calculate the claimed distance. Non-Final Act. 6.

Appellant argues that the Examiner mistakes breadth for indefiniteness. Appeal Br. 14; Reply Brief (January 16, 2018, "Reply Br.") 4 (arguing that the Examiner's rejection is "an objection to the fact that . . . [the claim] recites a distance between signals instead of a distance between points"). Appellant asserts that one of ordinary skill in the art would appreciate the meaning of "a distance" between two signals and, for

instance, "would be familiar with the Euclidean distance between signals." Appeal Br. 14.

Appellant's Specification describes techniques for determining a distance between two signals. For instance, the Specification describes that "a distance function . . . generates a distance between two waveforms containing a peak, such as the current beat waveform and the template beat waveform." Spec. ¶ 78. The Specification provides one example that uses dynamic time warping to determine a distance between the two waves. *Id.* ¶ 79. The Specification provides another example of a Euclidean distance between the waveforms, in which the waves are shifted with respect to each other, and then the distance function is set to the minimum distance between the waveforms after the shifting process. *Id.* ¶ 80.

Claim 28 broadly recites computing a distance between the signals, but does not limit the computation to any particular technique. As noted by Appellant, however, "breadth is not indefiniteness." *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d 1331, 1341 (Fed. Cir. 2005) (quoting *In re Gardner*, 427 F.2d 786, 788 (CCPA 1970)). That the broad recitation of computing a distance between two signals encompasses a variety of distance functions, including the two distance functions described in the Specification, does not render the claim unclear. We find that the claimed step of computing a distance between two signals, when read in light of the Specification, would be clear to a person of ordinary skill in the art. For this reason, we do not sustain the rejection of claim 28 under 35 U.S.C. § 112(b).

III.   *Rejections under 35 U.S.C. § 103*

      A. *Unpatentability of claims 1–15 and 25 over Harlev '863 and Harlev '858*

The Examiner found that Harlev '863 discloses obtaining location-based data points and rhythm-based data points, comparing each type of data points to inclusion thresholds, and adding electrophysiological data to an electrophysiological map when both the location-based inclusion criteria and rhythm-based inclusion criteria are met. Non-Final Act. 7–8. The Examiner found that Harlev '863 is silent regarding using template matching as an inclusion criterion. *Id.* at 8. The Examiner relied on Harlev '858 to teach using EKG template matching as an inclusion criterion for an electrophysiological map. *Id.* (citing Harlev '858 ¶¶ 111–114, 132– 136). The Examiner determined it would have been obvious to modify Harlev '863 to use template matching inclusion criteria to increase the accuracy and consistency of the generated map. *Id.*

The Examiner acknowledged that "Harlev '858 does not explicitly use the term 'template area.'" *Id.* But the Examiner found that the matching of templates described in Harlev '858 involves "indirectly considering the areas of the template." *Id.* ("[B]y correlating a beat to a template, one is determining how closely the beat in question and the template match in shape (i.e. amplitude and duration)" so that "any correlation determination between a beat and a template implicitly includes a correlation of the template areas to one another.").

Appellant contests the Examiner's finding that matching templates implicitly uses a template area. Appeal Br. 15. We agree with Appellant that "not every matching score necessarily uses template areas." *Id.* at 16 (emphasis omitted). For instance, Lian discloses matching a signal

waveform to a template waveform using either morphological metrics of the waveforms or using a correlation analysis technique, such as the Pearson's Correlation Coefficient. Lian ¶ 22. Likewise, Appellant's Specification describes that the Pearson Correlation Coefficient can be used as an alternative to a distance function in order to compute a matching score. Spec. ¶ 90. The Examiner's finding that Harlev '858 implicitly discloses matching using a template area is not supported by a preponderance of the evidence. Thus, we do not sustain the rejection of claims 1–15 and 25 as unpatentable over Harlev '863 and Harlev '858.

The Examiner provided alternate rejections of the claims based on further modification[5] of the Harlev '863/Harlev '858 combination with the explicit teachings of waveform matching using template area, as described in one or more of Throne, Lian, or Gillberg. Non-Final Act. 10–18. We examine each additional reference for its teachings.

B. *Unpatentability of claims 1–15 and 25 over Harlev '863,*
   Harlev '858, and Throne

The Examiner found that "Throne discloses that templates can be matched to corresponding ECG signals by comparing template areas, particularly [areas under] the curve." Non-Final Act. 11 (citing Throne, Abstract). Appellant argues the Examiner erred in this rejection because Throne discloses using "the area beneath the derivative," which is not the same as the claimed "template area." Appeal Br. 16 (citing Throne,

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[5] Appellant does not contest the Examiner's proffered reasoning for further modifying the system and method of Harlev '863, as modified by Harlev '858, with the teachings of either Throne, Lian, or Gillberg. Appeal Br. 16–17 (arguing only that Throne, Lian, and Gillberg do not cure the shortcoming of Harlev '863 and Harlev '858).

Abstract; Spec. ¶ 83). The Examiner responds that "Throne discloses generically that two signals can be matched by comparing their respective areas at specific time points." Ans. 25.

Appellant's Specification defines "template area" as the distance "between the template and a zero signal" calculated for a template beat. Spec. ¶ 83. We agree with Appellant that Throne discloses comparing area beneath the derivative. Throne, Abstract. Specifically, Throne provides a method to determine the similarity between a template and a waveform in an implantable antitachycardia device that produces results similar to correlation waveform analysis but which is computationally simpler and less demanding of power. Throne, col. 3, ll. 8–11. Thus, one having ordinary skill in the art, in order to obtain the computational benefits disclosed in Throne, would have employed Throne's method of comparing areas beneath the derivative of the waveform and template. The area beneath the derivative is different from the claimed "template area," which is the area beneath the template waveform. *Compare* Throne, Fig. 3 (showing the reference template), *with* Fig. 5 (showing a derivative of the waveform). The Examiner does not explain adequately why one having ordinary skill in the art would have been led (in light of Throne) to modify Harlev '863 to compare a template area to an area below a collected signal.

The Examiner further offers that even if one were to modify Harlev '863 to use the template derivative, as disclosed by Throne, the claim limitations still would be met because "the derivative of a template signal is still a template signal" and, thus, "matching calculations using the derivative of the template can be considered the claimed "using a template area." Ans. 25 (finding that the claim does not recite "any particular use of 'a

template area'"). The Examiner does not explain adequately why use of an area of a derivative of a template falls within the scope of "using a template area" recited in claim 1. The Examiner proffers no interpretation of "using a template area," as that phrase would be understood by one having ordinary skill in the art in light of Appellant's Specification, to encompass using a derivative of the template. For these reasons, we agree with Appellant that Throne does not disclose matching using a template area as recited in independent claims 1 and 25. Thus, we do not sustain the rejection of claims 1–15 and 25 as unpatentable over Harlev '863, Harlev '858, and Throne.

C. *Unpatentability of claims 1–15 and 25 over Harlev '863, Harlev '858, and Lian*

The Examiner found that "Lian discloses that template matching can be based off of simple morphological metrics such as wave width, height, zero-crossing, area, etc." Non-Final Act. 13 (citing Lian ¶ 22). Appellant argues that Lian discusses generally using area for template matching "but does not disclose a 'template area' as claimed (*i.e.*, the distance between a template beat and a zero signal)."[6] Appeal Br. 17.

> Lian describes prior art methods used to analyze a pace waveform:
>
> The template waveform corresponding to captured beats is created. Capture is declared if a paced signal waveform matches the template, otherwise, non-capture is declared. Whether or not a waveform matches the template can be evaluated based on simple morphological metrics such as wave width, height, zero-crossing, *area*, etc., or based on

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[6] Appellant argues claims 1–15 and 25, subject to this ground of rejection, as a group. Appeal Br. 17. We select claim 1 as representative, and claims 2–15 and 25 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

> conventional correlation analysis techniques, such as the
> Pearson's correlation coefficient.

Lian ¶ 22 (emphasis added).

We agree with the Examiner's reading of "simple morphological metrics such as … area" to refer to the claimed "template area." In the context of "capture classification" and determining whether a waveform matches a template as described in Lian, the morphology of the waveform refers to its form, and an area of a waveform refers to a surface included within a set of lines. *See id.* Consistent with "template area" as defined in Appellant's Specification, a morphological metric of a waveform that looks at the area of the waveform refers to the area below the curve, i.e., an integration of the signal over time, which is based on the distance between the curve and a zero signal. Thus, Appellant has not identified error in the Examiner's rejection. For this reason, we sustain the rejection of claims 1– 15 and 25 as unpatentable over Harlev '863, Harlev '858, and Lian.

> *D. Unpatentability of claims 1–15, 25, and 28 over Harlev '863,
> Harlev '858, and Gillberg*

The Examiner found that "Gillberg discloses that templates can be matched to corresponding ECG signals by using area of distance calculations for the purpose of providing a matching and classification system that is computationally simple." Non-Final Act. 16 (citing Gillberg, col. 1, ll. 45–55). Appellant argues that "Gillberg references in passing the 'so-called Area of Difference Analysis (AD)[,]' but offers nothing to support the conclusion that AD includes a 'template area' as claimed."[7] Appeal

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[7] Appellant argues claims 1–15 and 25, subject to this ground of rejection, as a group. Appeal Br. 17. We select claim 1 as representative, and claims 2– 15 and 25 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv). Appellant

Br. 17. The Examiner responds that Gillberg discloses comparing an electrophysiological signal to a template (i.e., a sample waveform) where each signal has a baseline for establishing the relative values of the peaks and troughs of the signal. Ans. 25–26 (citing Gillberg, col. 1, ll. 33–36, Fig. 4). The Examiner explains that Gillberg discloses an Area of Difference Analysis can be used to match the waveforms using the sum of absolute differences between the signal and the template, thereby comparing the differences in area of one signal to the other. *Id.* at 26 (citing Gillberg, col. 1, ll. 47–55). Appellant replies that Gillberg does not "offer[] any details that would lead a person of ordinary skill in the art to recognize a connection to a 'template area' as claimed." Reply Br. 5.

We disagree with Appellant's proposition that Gillberg does not provide details about the Area of Difference Analysis. In fact, the Area of Difference Analysis described in Gillberg is the same as the template area matching described in paragraphs 83 and 84 of Appellant's Specification.

Gillberg describes second and third embodiments of its invention in which template and unknown waveforms are compared using this AD metric. Gillberg, col. 20, ll. 42–48. Gillberg describes that in this method, "the distance is computed between the wavelet image of the unknown waveform [] and wavelet images of the template waveform." *Id.* at col. 21, ll. 34–37 (describing computing a distance between electrophysiological signal of a data point and the template electrophysiological signal). Gillberg describes that "[i]n order to make [a] . . . decision about how small the distance is, the microprocessor divides the calculated distance by the

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presents additional arguments for the patentability of dependent claim 28 (Appeal Br. 17–18), which we address below.

corresponding norm of the template wave to provide distance normalization. If the resulting number is significantly smaller than 1, the waves are considered to be similar." *Id.* at col. 21, ll. 41–45 (describing dividing the computed distance by the computed template area). Gillberg defines the norm of the template wave as "the calculated distance between tie [sic, the] template wave and the zero signal (signal consisting of zero values)." *Id.* at col. 21, ll. 46–48 (describing computing the template area as a distance between a template electrophysiological signal and a zero signal). Gillberg's "norm of the template wave" is equivalent to the claimed "template area." Spec. ¶¶ 83 ("[T]he matching score for a particular beat is calculated as follows. First, for each template . . . a distance is computed between the template and a zero signal (that is, the model signal, for which all samples are set to zero. This distance is referred herein to as the 'template area.'"), 84 ("Then, for each waveform (*e.g.*, for the current beat from each selected EKG lead), a distance is computed between the waveform and the template beat.") The above-referenced details provided in Gillberg about the AD metric support the Examiner's finding that Gillberg matches an unknown waveform with a template waveform to assign a matching score using the template area. Appellant has not demonstrated that the Examiner erred in this finding about Gillberg. Thus, we sustain the rejection of claims 1–15 and 25 as unpatentable over Harlev '863, Harlev '858, and Gillberg.

Turning to dependent claim 28, Appellant also argues that the Examiner failed to map the specific steps recited in dependent claim 28 to Gillberg. Appeal Br. 18. The Examiner explains, in response, that Gillberg "discloses taking a difference (i.e. distance) between the two signals at a plurality of points, summing the difference and minimizing the sum in order

to match the signal to the template" and that "[o]ne of ordinary skill in the art would readily understand that the Area of Difference calculation as discussed in Gilliberg [sic] would provide a measure of correlation between the two signals and that normalizing the calculated difference to a template area is a simple and routine manipulation of data in attempting to quantify a minimization value between the two signals." Ans. 27–28. We agree with the Examiner's findings.

As described above, Gillberg describes matching a template and an unknown waveform by computing a template area (i.e., norm of the template wave) as a distance between the template signal and a zero signal. *Id.* at col. 21, ll. 46–48. Gillberg then computes a distance between the template signal and the unknown waveform. *Id.* at col. 21, ll. 34–37. Gillberg then divides this computed distance by the computed template area (norm of the waveform) to provide distance normalization. *Id.* at col. 21, ll. 41–45. The Examiner's determination of obviousness of the subject matter of claim 28 is supported by Gillberg. Thus, we sustain the rejection of claim 28 as unpatentable over Harlev '863, Harlev '858, and Gillberg.

DECISION

We do not sustain the rejection of claims 1–15, 25, and 28 under 35 U.S.C. § 101 and of claim 28 under 35 U.S.C. § 112(b). We also do not sustain the rejections of claims 1–15 and 25 under 35 U.S.C. § 103 as unpatentable over the combination of Harlev '863 and Harlev '858, either alone or in further combination with Throne.

We sustain, however, the rejection of claims 1–15 and 25 under 35 U.S.C. § 103 as unpatentable over Harlev '863, Harlev '858, and Lian and the rejection of claims 1–15, 25, and 28 under 35 U.S.C. § 103 as

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unpatentable over Harlev '863, Harlev '858, and Gillberg. Because we sustain at least one ground of rejection of each of the claims on appeal, the decision of unpatentability of claims 1–15, 25, and 28 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

<u>AFFIRMED</u>