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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARK A. GRISWOLD, ERIC PIERRE,
NICOLE SEIBERLICH, STEPHEN YUTZY,
JEAN TKACH, and VIKAS GULANI

Appeal 2014-003421[1]
Application 12/643,072[2]
Technology Center 3600

Before BART A. GERSTENBLITH, KENNETH G. SCHOPFER, and MATTHEW S. MEYERS, *Administrative Patent Judges*.

MEYERS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 1 and 3–31. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] Our decision references Appellants' Appeal Brief ("Br.," filed August 29, 2013) and the Examiner's Answer ("Ans.," mailed November 7, 2013) and Final Office Action ("Final Act.," mailed December 24, 2012).

[2] Appellants identify Case Western Reserve University as the real party in interest (Br. 2).

CLAIMED INVENTION

Appellants' claimed invention "relates to reducing acquisition time in magnetic resonance imaging (MRI) by accounting for expected signal in an under-sampled data set as a function of data available in an atlas of MRI images and estimations" (Spec. ¶ 1).

Claims 1, 16, 27, and 29 are the independent claims on appeal. Claim 1, reproduced below with added bracketed notations, is illustrative of the subject matter on appeal:

> 1. A computer-readable medium storing computer-executable instructions that when executed by a computer cause the computer to perform a method, the method comprising:
>
> [a] accessing an under-sampled data set that is associated with a scan of an object to be imaged performed by a medical imaging apparatus;
>
> [b] producing an under-sampled approximation of the under-sampled data from previously acquired data;
>
> [c] producing a sparsified data set from the under-sampled approximation and the under-sampled data set;
>
> [d] producing a fully-sampled approximation of the under-sampled raw data set;
>
> [e] storing the sparsified data set on a computer-readable medium;
>
> [f] selectively reconstructing the sparsified data set into a sparse image;
>
> [g] producing a final reconstructed image from the sparse image and the fully sampled approximation; and
>
> [h] storing the final reconstructed image on a computer-readable medium.

REJECTIONS

Claims 1, 3, 4, 8–12, 14–16, 19–23, 25, and 26 are rejected under 35 U.S.C. § 103(a) as obvious over Eidelberg (US 5,873,823, iss. Feb. 23, 1999) and Theriault (US 2008/0009706 A1, pub. Jan. 10, 2008).

Claims 5 and 6 are rejected under 35 U.S.C. § 103(a) as obvious over Eidelberg, Theriault, and Hoenninger (US 5,739,691, iss. Apr. 14, 1998).

Claims 7, 13, 17, 18, and 24 are rejected under 35 U.S.C. § 103(a) as obvious over Eidelberg, Theriault, and Hajian (US 2009/0136104 A1, pub. May 28, 2009).

Claims 27 and 28 are rejected under 35 U.S.C. § 103(a) as obvious over Eidelberg and Hajian.

Claims 29–31 are rejected under 35 U.S.C. § 103(a) as obvious over Theriault and Eidelberg.

ANALYSIS

Independent claim 1 and dependent claims 3–15

We are persuaded by Appellants' argument that the Examiner erred in rejecting independent claim 1 under 35 U.S.C. § 103(a) because the combination of Eidelberg and Theriault fails to disclose or suggest "producing a sparsified data set from the under-sampled approximation and the under-sampled data set," as recited by limitation [c] in independent claim 1 (*see* Br. 16–35).

In the Final Office Action, the Examiner finds that Eidelberg discloses "a sparsified data set," as required by limitation [c] (Final Act. 3 (citing Eidelberg, col. 1, ll. 55–67; col. 2, ll. 45–52; col. 2, l. 64 – col. 3, l. 17; col. 3, l. 60 – col. 4, l. 6; col. 4, ll. 45–61)).

Eidelberg is directed to a system for "provid[ing] a marker for use in screening patients for nervous system dysfunction" (Eidelberg, col. 1, ll. 27–29) by "explor[ing] the functional brain data on an individual case basis for

the presence or absence of a diagnostic marker" (*id.* at col. 4, ll. 51–54). More particularly, Eidelberg discloses that its system

> provid[es] at least one marker for a nervous system dysfunction comprising a profile of predetermined functional activity at a plurality of sets of predetermined coordinates of a given brain geometry, produc[es] a patient profile or functional activity for each of a plurality of regions of interest of a patient's brain corresponding to the plurality of sets of predetermined coordinates of the given brain geometry, cross-correlat[es] the patient profile with the at least one marker and determining the presence or severity of a nervous system dysfunction as a function of the degree of covariance for the cross-correlation.

(*Id.* at col. 2, l. 65 – col. 3, l. 9). Eidelberg further discloses that its system scans a patient's brain to produce data for the patient profile (*id.* at col. 3, ll. 10–14), and then the patient profile is produced

> by calculating numerical values of functional activities of a plurality of regions of interest of the brain of the patient corresponding to the plurality of sets of predetermined coordinates of the given brain geometry. The step of calculating preferably comprises producing a single numerical value for each region of interest.

(*Id.* at col. 2, ll. 5–11).

Theriault is directed to a system "for employing color magnetic resonance imaging technology for medical evaluation, diagnosis and/or treatment" (Theriault ¶ 3). Theriault discloses that its system "process[es] a plurality of subject MRI images" and "includes a colorization module, a reference image storage module, a processing module, and a presentation module" (*id.* ¶ 14). In this regard, Theriault discloses that the colorization module "generate[s] each of the plurality of subject MRI images in color by generating a composite color image from a plurality of gray-scale images" (*id.*; *see also id.* ¶¶ 44, 47), reference image storage module "store[s] a

plurality of color reference MRI images where each of the plurality of color reference MRI images includes a region indicative of a known pathological condition" (*id.* ¶ 14), processing module "compare[s] a subject image selected from the plurality of subject MRI images with a plurality of color reference MRI images and to determine a strength of the closest match between the subject image and at least one of the plurality of color reference MRI images" (*id.*; *see also id.* ¶¶ 52–55, 62–63, 79, 81–82), and presentation module "present[s] the subject image for diagnostic review when the strength of the closest match is above a pre-determined threshold" (*id.* ¶ 14). Theriault further discloses that subject MRI images are removed from the diagnostic review when the closest match is below a predetermined threshold (*id.* ¶ 90).

We have reviewed the cited portions of Eidelberg and agree with Appellants that Eidelberg fails to disclose or suggest the argued limitation. In particular, we fail to see, and the Examiner does not adequately explain, how Eidelberg's disclosure regarding the cross-correlation of patient profiles with diagnostic markers in order to determine the presence or severity of a nervous system dysfunction as a function of the degree of covariance for the cross-correlation (*see* Eidelberg, col. 2, l. 65 – col. 3, l. 9) discloses or suggests "producing a sparsified data set from the under-sampled approximation and the under-sampled data set," as recited by limitation [c] in independent claim 1. In making this determination we construe "sparsified data set," as required by limitation [c], to be data that "only ha[ve] the differences between the under-sampled anatomy and the collection of anatomical images in the database" (*see* Spec. ¶ 23). Thus, the "sparsified data set," as claimed, is created by removing common

information from the under-sampled data set (*see* Spec. ¶ 23), whereas Eidelberg merely makes its diagnoses by comparing a patient profile with a marker.

Responding to Appellants' argument in the Response to Argument section of the Answer, the Examiner now appears to rely, at least in part, on Theriault as disclosing the argued limitation (*see* Ans. 2). More particularly, the Examiner explains that "Theriault's system and method compares the 'subject image' with 'subject MRI images' representative of pathological conditions, then removes the closest match identified." (*id.* at 3 (citing Theriault ¶¶ 13, 86–90, 92; claim 1)). However, we agree with Appellants that "Theriault removes reference images that do not match the patient image to within a threshold fit" (Br. 21 (emphasis omitted)) and "[r]emoving dissimilar images does not teach removing information common between the patient image and other previously acquired images" (*id.* (emphasis omitted)). In this regard, the Examiner provides no explanation as to why Theriault's removal of one or more reference images from the diagnostic review would disclose or suggest the production of a "sparsified data set from the under-sampled approximation and the under-sampled data set," as required by limitation [c] of independent claim 1.

In view of the foregoing, we do not sustain the Examiner's rejection of independent claim 1 under 35 U.S.C. § 103(a). For the same reasons, we also do not sustain the Examiner's rejections of claims 3–15, which depend therefrom.

Independent claims 16 and 29, and dependent claims 17–26, 30, and 31

Independent claims 16, 27, and 29 include a limitation similar to limitation [c] in independent claim 1, and are rejected based on the same

rationale applied with respect to independent claim 1 (*see* Final Act. 8–9, 19–20). Thus, for the same reasons, we also do not sustain the Examiner's rejections of independent claims 16 and 29, and claims 17–26, 30, and 31, which depend therefrom, under 35 U.S.C. § 103(a).

Independent claim 27 and dependent claim 28

We are persuaded by Appellants' argument that the Examiner erred in rejecting independent claim 27 under 35 U.S.C. § 103(a) because Eidelberg, upon which the Examiner relies (*see* Final Act. 18), fails to disclose or suggest "'isolating difference information in an under-sampled medical imaging data set . . . by **removing** data associated with an expected signal . . . by referencing previously acquired medical imaging data'" (Br. 40) for the same reasons discussed above with respect to substantially similar limitation [c] of independent claim 1. We note that the Examiner does not rely on Hajian to address the argued limitation.

Therefore, we do not sustain the Examiner's rejection of independent claim 27 under 35 U.S.C. § 103(a) for the same reasons set forth above with respect to the independent claim 1. For the same reasons, we also do not sustain the Examiner's rejection of claim 28, which depends therefrom.

DECISION

The Examiner's rejections of claims 1 and 3–31 under 35 U.S.C. § 103(a) are reversed.

REVERSED