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FOX ROTHSCHILD LLP
PRINCETON PIKE CORPORATE CENTER
997 LENOX DRIVE
BLDG. #3
LAWRENCEVILLE, NJ 08648

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ALLISON, ANDRAE S	

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SUSAN NG, PETER A. RINGER, and JOHNNY KUO

Appeal 2018-008458
Application 14/776,435
Technology Center 2600

Before JOHN A. JEFFERY, JOHN P. PINKERTON, and NORMAN H. BEAMER, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants[1] appeal under 35 U.S.C. § 134(a) from the Examiner's decision to reject claims 1 and 30. Claims 2, 3, 7, 9, 11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 32, and 33 were withdrawn from consideration, and claims 4–6, 8, 10, 12, 14, 16, 18, 21, 22, 25, 27, 29, and 31 were cancelled. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

Appellants' invention renders and displays images from digital x-ray tomosynthesis or tomography by displaying co-registered projection and

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[1] Appellants identify the real party in interest as Real Time Tomography, LLC. App. Br. 3.

tomosynthesis images in an image volume at a same z-depth and orientation. *See generally* Spec. ¶¶ 2, 47–48. Claim 1 is illustrative:

> 1. (Previously Presented) A method of dynamically reconstructing three dimensional (3D) tomographic images from a set of projection images, the method comprising:
>
> by a processing device, executing programming instructions that are configured to cause the processing device to perform a method comprising:
>
> loading a set of projection images into a memory device;
> determining a reconstruction method for the set of projection images;
>
> reconstructing a 3D tomographic image from the set of projection images to be displayed to a user;
>
> rendering and causing a screen to display the reconstructed 3D tomographic image; and
>
> providing one or more enhancements for advanced image processing and manipulation of 3D tomographic data included within the reconstructed 3D tomographic image, wherein:
>
> the one or more enhancements comprise providing 2D projection image and 3D tomosynthesis image co-registration, and
>
> providing 2D projection image and 3D tomosynthesis image coregistration further comprises displaying, by the processing device display
>
> projection and tomosynthesis images that are spatially co-registered in an imaged volume at a same z-depth and orientation.

THE REJECTION

The Examiner rejected claims 1 and 30 under 35 U.S.C. § 102(a) as anticipated by Ng (US 2009/0274354 A1; published Nov. 5, 2009). Ans. 2–3.[2]

FINDINGS AND CONTENTIONS

The Examiner finds that Ng discloses every recited element of claim 1, including providing 2D projection image and 3D tomosynthesis image co-registration by displaying projection and tomosynthesis images that are spatially co-registered in an image volume at a same z-depth and orientation. Ans. 2–3.

Appellants argue that, although Ng recreates 3D tomosynthesis images with depth by reconstructing 2D images, Ng does not co-register 2D projection and 3D tomosynthesis images as claimed, let alone spatially co-register them in an image volume at a same z-depth and orientation as claimed. App. Br. 8–12; Reply Br. 3–6.

ISSUE

Under § 102, has the Examiner erred in rejecting claim 1 by finding that Ng co-registers 2D projection and 3D tomosynthesis images by displaying projection and tomosynthesis images that are spatially co-registered in an image volume at a same z-depth and orientation?

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[2] Throughout this opinion, we refer to (1) the Appeal Brief filed March 16, 2018 ("App. Br."); (2) the Examiner's Answer mailed June 27, 2018 ("Ans."); and (3) the Reply Brief filed August 24, 2018 ("Reply Br.").

ANALYSIS

As noted above, the key issue in this appeal is whether Ng *co-registers* 2D projection and 3D tomosynthesis images as claimed, namely by spatially *co-registering* projection and tomosynthesis images in an image volume at a same z-depth and orientation.

The Specification does not define the term "co-registration," unlike other terms whose concrete definitions leave no doubt as to their meaning. *See* Spec. ¶ 41 (defining various terms). The term "registration," however, is defined in the art as "[t]he process of aligning multiple images obtained from different modalities, at different timepoints, or with different image acquisition parameters." DICTIONARY OF COMPUTER SCIENCE, ENGINEERING, AND TECHNOLOGY 416 (Phillip A. Laplante ed. 2001). Co-registering 2D projection and 3D tomosynthesis images, then, would mutually align these images consistent with this plain meaning.

But claim 1 does not just co-register these images: rather, it does so in a particular *way*, namely by spatially co-registering the images in an imaged volume *at the same z-depth and orientation*. The Specification's paragraph 47 explains that this particular form of co-registration has an advantage over conventional medical review workstations that, despite their ability to display a reconstructed tomosynthesis image corresponding to a z-depth in an imaged volume, nevertheless show projection images *full screen* with no correlation between how the tomosynthesis and projection images are displayed.

But by co-registering the projection and reconstructed images at the same z-depth and orientation as shown in Appellants' Figure 2, the viewer can determine the contribution of each projection image to objects that are in focus in the reconstructed image. Spec. ¶ 48. This co-registration, therefore, helps a clinician distinguish tissue from artifacts that may arise from reconstruction or image processing. *Id.*

This discussion informs our understanding of the recited co-registration of 2D projection and 3D tomosynthesis images *at the same z-depth and orientation*—a crucial, recited limitation. Given this particular recited co-registration, the Examiner's construing "co-registration" as *any* method of aligning images (Ans. 4) is, therefore, problematic, for this construction ignores the particular form of co-registration claimed, namely *spatially* co-registering projection and tomosynthesis images in an image volume *at a same z-depth and orientation*. *Accord* Reply Br. 5–6 (noting this point).

On this record, we agree with Appellants that Ng's paragraphs 49 and 54, on which the Examiner relies for disclosing the recited projection and tomosynthesis image spatial co-registration (Ans. 3–4), fall short of *necessarily* disclosing this co-registration—a crucial requirement for anticipation. *See In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). So, even if we were to accept the Examiner's unsupported definition of tomosynthesis as a method of registering 2D and 3D images (Ans. 4), the Examiner still has not shown that Ng *necessarily* discloses the particular form of co-registration claimed, namely spatially co-registering projection and tomosynthesis images in an image volume *at a same z-depth and orientation*. To the extent the Examiner finds that this particular form of co-registration is necessarily present in Ng to anticipate the claim, there is no evidence on this record to substantiate such a finding. And as to whether and to what extent this particular form of co-registration would have been obvious from Ng's teachings, we cannot say on this record, nor will we speculate in that regard here in the first instance on appeal.

Therefore, we are persuaded that the Examiner erred in rejecting independent claim 1, and, for similar reasons, independent claim 30 that recites commensurate limitations.

CONCLUSION

The Examiner erred in rejecting claims 1 and 30 under § 102.

DECISION

We reverse the Examiner's decision to reject claims 1 and 30.

REVERSED

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Notice of References Cited	Application/Control No. 14/776,435	Applicant(s)/Patent Under Patent Appeal No. 2018-008458	
	Examiner	Art Unit 2668	Page 1 of 1

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register file a collection of CPU registers addressable by number.

register indirect addressing an instruction addressing method in which the register field contains a pointer to a memory location that contains the memory address of the data to be accessed or stored.

register renaming dynamically allocating a location in a special register file for an instance of a destination register appearing in an instruction prior to its execution. Used to remove antidependencies and output dependencies. *See* reorder buffer.

register set a designation of a storage class in a computer represented by one or more equivalent registers. The implementation of one register set may not necessarily be disjoint from a different register set; for example, the integer register set and the floating-point register set may be the same physical registers in some machines and disjoint physical registers in other machines. *Register sets* form the basis of one of the problems in most compilers, that of allocating intermediate computations to storage classes which are more efficiently accessed by the machine instructions.

register transfer notation a mathematical notation to show the movement of data from one register to another register by using a backward arrow. Notation used to describe elementary operations that take place during the execution of a machine instruction.

register window in the SPARC architecture, a set or window of registers selected out of a larger group.

registration the process of aligning multiple images obtained from different modalities, at different timepoints, or with different image acquisition parameters.

regression the methods which use backward prediction error as input to produce an estimation of a desired signal. Quantitatively, the regression of y on X, denoted by $r(y)$, is defined as the first conditional moment, i.e.,

$$r(y) = E(X|y) .$$

regression analysis a mathematical method where an empirical function is derived from a set of experimental data.

regression testing the test that is performed on a system when this has been produced in a new version/release. The *regression testing* has to verify: (i) all of the already tested functionalists that were correct and available in the previous version are also present in the new version without any problems, (ii) that the problems solved in the new version have been effectively solved without causing second level problems. The regression testing is very important in order to verify if the new release has solved the problems without adding new problems at the same time.

regular expression a recursive notation for a linguistic construct that can be analyzed by a finite state automaton. Equivalent to a Type 3 grammar in the Chomsky Hierarchy.

regularization a procedure to add a constraint term in the optimization process that has a stabilizing effect on the solution.

regularization-based motion detection a gradient motion detection approach which considers the optical flow estimation as an ill-posed problem according to the Hadamard theory.

regular language a language that can be described by some right-linear/regular grammar (or equivalently, by some regular expression).

regulator a controller that is designed to maintain the state of the controlled variable at a constant value, despite fluctuations of the load.

reinforcement learning learning on the basis of a signal that tells the learning system whether its actions in response to an input (or series of inputs) are good or bad. The signal is usually a scalar, indicating how good or bad the actions are, but may be binary.