Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocketing@lowegrahamjones.com
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ANMING HE CAI, WENGUANG LI, SHASHIDHAR SATHYANARAYANA, and LEWIS JONES THOMAS III 1

Appeal 2018-000314
Application 14/193,574
Technology Center 3700


STEPINA, Administrative Patent Judge.

DECISION ON APPEAL

STATEMENT OF THE CASE


We affirm.

1 Boston Scientific SciMed, Inc., (Appellant) is listed in the Appeal Brief as the real party in interest. Appeal Br. 2.
CLAIMED SUBJECT MATTER

The claims are directed to systems and methods\(^2\) for lumen border
detection in intravascular ultrasound sequences. Claim 1, reproduced below,
is illustrative of the claimed subject matter:

1. A method for processing a sequence of intravascular ultrasound frames for display, the method comprising:
   - receiving a sequence of intravascular ultrasound (IVUS) frames of a vessel having a lumen, the sequence comprising a
     first frame and a second frame, wherein each frame comprises a
     plurality of scan lines, each scan line comprising a plurality of
     pixels;
   - determining one or more texture features for each of one
     or more regions of the first frame, wherein at least one of the one
     or more texture features comprises a difference between intensity
     values of i) the region of the first frame and ii) another region of
     the first frame spaced apart from the region by at least two pixels;
   - determining at least one flow feature for each of the one or
     more regions by comparing the first and second frames;
   - deriving a lumen border for the first frame using the one
     or more texture features and the at least one flow feature to
     characterize the one or more regions as within or outside of the
     lumen of the vessel; and
   - displaying an ultrasound image of the first frame with the
     lumen border.

Appeal Br. 14 (Claims App.).

REFERENCES RELIED ON BY THE EXAMINER

<table>
<thead>
<tr>
<th>Reference</th>
<th>Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nachtomy</td>
<td>US 6,152,878</td>
</tr>
<tr>
<td>Fritz</td>
<td>US 2005/0119555 A1</td>
</tr>
</tbody>
</table>

\(^2\) Claim 15 recites a computer-readable medium that includes instructions enabling a device to perform a method. Appeal Br. 16–17 (Claims App.).
THE REJECTIONS ON APPEAL

I. Claims 1–11, 15, 16, 18, and 19 are rejected under 35 U.S.C. § 103(a) as unpatentable over Nachtomy, Fritz, and Watkins.\(^3\)

II. Claims 12–14, 17, and 20 are rejected under 35 U.S.C. § 103(a) as unpatentable over Nachtomy, Fritz, Watkins, and Katouzian.

OPINION

Rejection I

Appellant argues for the patentability of the claims subject to the first ground of rejection, i.e., claims 1–11, 15, 16, 18, and 19, as a group. Appeal Br. 6–12. We select claim 1 as representative of the group, and claims 2–11, 15, 16, 18, and 19 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Nachtomy discloses many of the steps recited in claim 1, but does not disclose determining textural features by calculating a difference between intensity values in the same image frame that are spaced apart from each other by at least two pixels. Final Act. 2–4. The Examiner finds that the teachings of Fritz and Watkins remedy this deficiency inasmuch as Fritz discloses a lateral filter for reducing noise to

---

\(^3\) COS 429 is cited in the Final Office Action and Answer as evidence of the mathematical operations the Examiner finds occur in the method disclosed by Watkins. See Final Act. 10, Ans. 5–6.
better discern anatomical features, and Watkins discloses image edge enhancement via filtering that is dependent upon the differences in intensity between pixels. *Id.* at 4–5 (citing Fritz ¶98, Watkins, p. 55). With respect to the requirement in claim 1 that the two regions of the frame used to determine the “texture feature” be spaced apart by at least two pixels, the Examiner finds that Watkins discloses an example of a kernel\(^4\) of a size large enough to provide the required two-pixel separation. Ans. 3–4 (citing Watkins, p. 57). The Examiner reasons it would have been obvious to a person skilled in the art to have modified the IVUS classification as described by Nachtomy to have included an additional “texture” feature determining means (e.g. lateral filter) as described by Fritz and to have specifically used an “enlarged” horizontal edge determining filter as described by Watkins in order to distinguish/identify common IVUS anatomical features (e.g. horizontal lumen edges) using conventional filtering. Such a modification is considered to be combining prior art elements according to known methods to yield predictable results (e.g. edge enhancement/detection).

Ans. 4–5.\(^5\) The Examiner also determines that choosing “the filter as described above could be seen as useful to one skilled in the art depending on the specificity needed to segment or identify anatomical features in an ultrasound image,” and “the selection of the filter kernel size is an obvious

---

\(^4\) A “kernel” as used in the prior art is a numerical matrix of values that correlate to a quantifiable characteristic of a pixel located in a corresponding position, and such kernels are used in various filtering techniques in image processing. *See* Watkins, p. 41–42, COS 429, p. 5.

\(^5\) The Examiner refers to COS 429, p. 21 as evidence that the subtraction step to determine the “difference between intensity Values” recited in claim 1 occurs in the kernel the Examiner proposes to implement in Nachtomy. Ans. 5–6.
Appellant notes that the specific example of a kernel set forth on page 57 of Watkins relates to a filter for finding a horizontal line. Reply Br. 6–8. Appellant contends that a person of ordinary skill in the art would not turn to the teachings of such a kernel and filter when considering modifying the method taught by Nachtomy because a lumen border, as disclosed by Nachtomy, is a circular shape, not a horizontal line. See id.

Even assuming as correct Appellant’s allegation that the shape addressed by the example on page 57 of Watkins and the shape of a lumen border are different, the argument that such differences preclude the combination of teachings proposed by the Examiner rests on a bodily incorporation of an example disclosed on page 57 of Watkins. This is not the proper obviousness inquiry. “It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.” In re Mouttet, 686 F. 3d 1322, 1332 (Fed. Cir. 2012); see also KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 421 (2007) (“[a] person of ordinary skill is also a person of ordinary creativity, not an automaton”).

In light of the general teaching in Watkins that “[i]ncreased kernel sizes result in highly selective filtering at the cost of added computation[, and] filters that resemble more precisely details within the image are referred to as matched filters” (Watkins, p. 57 (emphasis added)), followed by the specific example of such an increased kernel size applied to one shape (a horizontal line), we agree with the Examiner that a person of ordinary skill in the art would have had reason to implement such a solution in the method disclosed by Nachtomy. Even if, as asserted by Appellant, “the horizontal
edge filter on page 57 of Watkins would provide little help in deriving the lumen border because the lumen is generally circular” (Reply Br. 8), Appellant makes no argument that the general teachings in Watkins, provided immediately before this limited example, would be applicable only to horizontal lines. Indeed, Watkins’ expressly preempts such an argument. See Watkins, p. 55 (“So far we have used only 3 x 3 filter kernels. Certainly if we are attempting to highlight horizontal edges, we will be able to, but other edges such as diagonal edges may also be highlighted. To combat this problem, we must increase our kernel size.”). Thus, Appellant’s argument regarding the specific shape of object addressed by the example on page 57 of Watkins does not apprise us of Examiner error. We sustain the rejection of claims 1–11, 15, 16, 18, and 19 are rejected as unpatentable over Nachtomy, Fritz, and Watkins

Rejection II

Appellant makes no additional arguments traversing Rejection II. See Appeal Br. 13; Reply Br. 9. Accordingly, we sustain Rejection II for the same reasons we sustain Rejection I.

DECISION

The Examiner’s rejection of claims 1–20 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).

AFFIRMED