Abstract: An optical system for the detection of skin disease, such as melanoma, acquires images of a lesion on a subject's skin at different wavelengths and utilizes a sweeping arm rotating about the lesion in a clock-like sweep to produce diagnostically relevant metrics and classifiers from the image data so as to enhance detection of the skin disease.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61 B 5/022 (2015.01 )
CPC - A61B 5/0077, 5/0059

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): A61B 5/022 (2015.01 )
CPC: A61B 5/0077, 5/0059; USPC: 382/128; 600/306

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSer (US, EP, WO, GB); ESer; Google/Google Scholar; IP.com; PubMed/Medline: dermatoscope*, cell phone, asymmetry, symmetry, pixel, camera, skin, cancer, melanoma, algorithm, calculator, clock, sweep, rotat, clockwise, counter, lesion, dermal, dermis, imag, illuminat

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>WO 2012/162596 A1 (DERM SYSTEMS, LLC) November 29, 2012; pages 5, 15-17; claim 14; figure 2</td>
<td>1-49</td>
</tr>
<tr>
<td>A</td>
<td>US 2008/0132794 A1 (ALFANO, RR et al.) June 5, 2008; paragraphs [0029], [0034]; claim 1</td>
<td>1-49</td>
</tr>
<tr>
<td>A</td>
<td>US 2011/0013006 A1 (UCHENBAJAKA, NE et al.) January 20, 2011; abstract; claim 1</td>
<td>1-49</td>
</tr>
<tr>
<td>A</td>
<td>US 2012/0320340 A1 (COLEMAN, III, WT) December 20, 2012; paragraph [0034], [0042], [0049], [0052], [0056]</td>
<td>1-49</td>
</tr>
<tr>
<td>A</td>
<td>US 2012/0172685 A1 (GILBERT, J) July 5, 2012; abstract; paragraphs [0020], [0029], [0094]-[0100], [0162]</td>
<td>1-49</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:
  “A” document defining the general state of the art which is not considered to be of particular relevance
  “E” earlier application or patent but published on or after the international filing date
  “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  “O” document referring to an oral disclosure, use, exhibition or other means
  “P” document published prior to the international filing date but later than the priority date claimed
  “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  “Z” document member of the same patent family

Date of the actual completion of the international search:
16 January 2015 (16.01.2015)

Date of mailing of the international search report:
13 FEB 2015

Name and mailing address of the ISA/US:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:
Shane Thomas

PCT Help Desk: 571-272-4300
PCT OSP: 571-272-7774
**INTERNATIONAL SEARCH REPORT**

**Box No. II** Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III** Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I Claims 1-49 are directed toward an apparatus for detecting skin disease in a lesion on a subject's skin comprising a processor adapted to process the image data with a clock-like sweep algorithm.

Group II Claims 50-69 are directed toward a system and method of diagnostically imaging at least one skin lesion on a subject's skin comprising a wide field camera with a first lens and a narrow field camera with a second lens.

"-Continued Within the Next Supplemental Box--"

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

   1-49

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.
The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I include a processor adapted to process the image data with a clock-like sweep algorithm to obtain metrics and/or one or more classifiers defining the rotational symmetry of the lesion, which are not present in Group II; the special technical features of Group II include a wide field camera with a first lens and a narrow field camera with a second lens, which are not present in Group I.

The common technical features of Groups I and II are illuminating the subject's skin including the lesion; obtaining image data from reflection of light off the illuminated subject's skin with a camera; processing the image data to identify a skin lesion/produce an indication of the likelihood of the presence or absence of skin disease in the subject.

These common technical features are disclosed by US 2011/0013006 A1 to Uzenbajakava et al. (hereinafter 'Uzenbajakava'). Uzenbajakava discloses illuminating the subject's skin including the lesion (a light source 7 is directed at the exposed skin area 4; paragraph [0031]); obtaining image data from reflection of light off the illuminated subject's skin with a camera (part of the scattered light 11 is recorded directly by the first camera 6; paragraph [0031]); processing the image data to identify a skin lesion/produce an indication of the likelihood of the presence or absence of skin disease in the subject (the processed combination of images under different angles yields a skin profile; the method is a reliable and easy way of indicating anomalies which can lead to diagnosing skin cancer; paragraph [0034]).

Since the common technical features are previously disclosed by the Uzenbajakava reference, the common features are not special and so Groups I and II lack unity.