

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 5 October 2017**

Case Number: T 1698/12 - 3.4.02

Application Number: 03755838.4

Publication Number: 1540937

IPC: H04N1/00, G01C11/02, G01S13/86,
G01S17/89, G01S7/48

Language of the proceedings: EN

Title of invention:
VEHICLE BASED DATA COLLECTION AND PROCESSING SYSTEM

Applicant:
Visual Intelligence LP

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step: yes (amended claims)



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1698/12 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 5 October 2017

Appellant: Visual Intelligence LP
(Applicant) 510 Bering Drive, Suite 310
Houston, TX 77057-1452 (US)

Representative: Suckling, Andrew Michael
Marks & Clerk LLP
Fletcher House
Heatley Road
The Oxford Science Park
Oxford OX4 4GE (GB)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 8 March 2012
refusing European patent application No.
03755838.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Bekkering
Members: F. J. Narganes-Quijano
G. Decker

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 03755838.4

In its decision the examining division held that the subject-matter of claim 1 of the sole request then on file did not involve an inventive step in view of the following documents:

D1: US 5 878 356 A
D3: DE 197 14 396 A
D5: US 4 708 472 A.

- II. With the statement setting out the grounds of appeal the appellant filed sets of amended claims according to a main request and a first to a third auxiliary request. The appellant requested that the decision under appeal be set aside and a patent be granted.
- III. In reply to the preliminary opinion expressed by the board in a communication annexed to summons to oral proceedings, the appellant filed amended application documents according to a new main request and a new auxiliary request.

In reply to the observations made by the board in a subsequent communication, the appellant filed with its letter dated 21 September 2017 a set of claims 1 to 10, pages 1 to 42 of the description, and drawing sheets 1/14 to 14/14, replacing the application documents of the previous main request.

IV. In view of the application documents of the new main request, the oral proceedings were cancelled.

V. Claim 1 of the main request reads as follows:

" A system (100) for generating a map of a surface, comprising:
a vehicle, disposed over the surface;
an elevation measurement unit (118), secured to the vehicle;
a global positioning antenna, secured to the vehicle;
an attitude measurement unit (108), secured to the vehicle;
an imaging array (112,300), secured to the vehicle, comprising;
 a housing (304);
 an aperture (320), disposed in the housing (304), having an intersection area therein;
 a first imaging sensor (310), disposed within the housing, having a first focal axis (324) passing through the aperture (320) within the intersection area, generating a first array of image pixels, wherein the first array of image pixels is two dimensional; and
 a second imaging sensor (308), disposed within the housing (304) and offset from the first imaging sensor (310) in a cross-eyed fashion, having a second focal axis (330) passing through the aperture and intersecting the first focal axis (324) within the intersection area, generating a second array of image pixels, wherein the second array of image pixels is two dimensional, wherein the focal axes of the first and second imaging sensors (310,308) are in a common plane orthogonal to a vector representing the direction of movement of the vehicle whereby the imaging array consists only of imaging sensors having focal axes in the common plane; and

a computer (104), connected to the elevation measurement unit, the global positioning antenna, the attitude measurement unit and first and second imaging sensors, for correlating at least a portion of the image data from the first and second imaging sensors to a portion of the surface based on input from: the elevation measurement unit, the global positioning antenna and the attitude measurement unit."

The set of claims of the main request includes dependent claims 2 to 10 directly or indirectly referring back to claim 1.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments and formal requirements*

The board is satisfied that the application documents amended according to the present main request meet the requirements of Article 123(2) EPC, and also the formal requirements of the EPC. In particular,

- claim 1 is based on a clarified version of claim 1 as originally filed, in combination with the following parts of the application as originally filed: claims 14 and 15, page 4, lines 4 and 5, page 16, lines 14 to 17, page 17, lines 4 to 8, page 18, lines 9 and 10, page 19, lines 15 to 20, page 40, lines 8 to 10, and Fig. 3, 9 and 11 to 17 together with the corresponding description;

- dependent claims 2 to 10 are respectively based on the following parts of the application as originally

filed: dependent claim 2 together with Fig. 3 and the corresponding description; dependent claim 5; independent claim 8; dependent claims 9 to 12; independent claim 15 and paragraph [0018] of the description; and dependent claim 20; and

- Fig. 1 is a schematic version of Fig. 1 of the application as originally filed, and Fig. 1A and 1B are each based on an enlarged view of a partial section of Fig. 1 of the application as originally filed together with the corresponding description.

In addition, the description has been brought into conformity with the invention as defined in the claims (Article 84 and Rule 27(1) (c) EPC 1973), the pertinent state of the art (documents D1 and D3) has been acknowledged in the introductory part of the description (Rule 27(1) (b) EPC 1973), and some physical values have been expressed using SI units (Rule 35(12) EPC 1973).

3. *Novelty and inventive step*

3.1 In its decision the examining division did not question the novelty of claim 1 of the request then on file, and the board concurs with this view in respect of amended claim 1 of the present main request which is directed to a more restricted subject-matter.

3.2 Document D1, considered by the examining division and also by the board to represent the closest state of the art, discloses a system for generating a map of a surface (abstract, and Fig. 1 together with the corresponding description). The system comprises an imaging device (imager 12, see column 6, lines 21 to 26) mounted in a vehicle (column 6, lines 19 to 21) for capturing images of the surface (column 6, lines 27 to

33), and a computer (computer 30) for correlating image data from the imaging device to a portion of the surface (column 5, lines 2 to 9, column 6, line 48, to column 7, line 12, column 10, lines 54 to 60, column 11, lines 45 to 65, column 12, lines 9 to 11, and column 17, lines 42 to 62) using data (column 6, lines 42 to 47, and column 12, lines 2 to 19) obtained by an elevation measurement unit (column 7, lines 1 to 4, and column 15, lines 23 and 26, together with column 19, lines 15 to 17 and 53), a global positioning antenna (GPS antenna 19, see column 6, lines 35 to 37 together with column 7, lines 62 to 65), and an attitude measurement unit (gyroscope 26, see column 6, lines 37 to 47) secured to the vehicle.

The imaging device of the system of document D1 comprises a single imaging sensor generating a two-dimensional array of image pixels (column 10, lines 37 to 50). In addition, the imaging sensor is enclosed in an imager housing (column 10, lines 61 to 63), and this feature implicitly requires an aperture in the housing through which the optical axis of the imaging sensor passes.

- 3.2.1 The system defined in claim 1 differs from the system disclosed in document D1 in that
- the imaging device is constituted by a first and a second imaging sensor, and
 - the two imaging sensors are offset from each other in a cross-eyed fashion so that their optical axes
 - are in a common plane orthogonal to the direction of movement of the vehicle and
 - pass through the aperture of the housing and intersect each other at an intersection area located in the aperture.

The provision of two imaging sensors with their axes lying in a common plane orthogonal to the direction of movement of the vehicle allows capturing a mosaic-like image of two adjacent sections of the surface aligned in the mentioned orthogonal direction, thus broadening the effective field of view of the imaging device in the orthogonal direction (see description of the application, paragraph [0002], and Fig. 3 to 17 together with the corresponding description, in particular page 17, lines 8 to 17). In addition, the claimed cross-eyed arrangement of the two imaging sensors with their optical axes intersecting at an area in the aperture of the housing renders possible the use at the aperture position of optical means (a lens, a protective screen or window, etc.) common to both imaging sensors (description of the application, page 14, lines 15 to 21).

- 3.2.2 It was already known in the prior art to generate a map of a surface using two or more imaging sensors mounted in a vehicle within a housing and arranged in a cross-eyed fashion with their optical axes passing through, and intersecting at, an aperture of the housing, as disclosed in document D3 (see abstract, and Fig. 1 and 2 together with the corresponding description). In this document, the optical axes of the imaging sensors arranged offset from each other (sensors 3, 5 and 7 in Fig. 1, and sensors 23, 25 and 27 in Fig. 2) intersect each other at an area coincident with a common objective lens (lens 15 in Fig. 1, and lens 39 in Fig. 2, see column 3, lines 53 to 60, and column 5, lines 9 to 12), and this arrangement implicitly requires a housing enclosing the sensors and having an aperture receiving the objective lens. However, in this arrangement the imaging sensors are used for scanning

the surface to be mapped and sequentially capturing images of a same section of the surface from different perspectives and generating a parallax or relief mapping of the surface (column 3, lines 61 to 67), and the arrangement requires that the optical axes of the imaging sensors are in a common plane parallel to the direction of movement of the vehicle (see abstract, and arrows 9 and 29 in Fig. 1 and 2). The application of the teaching of document D3 to the system of document D1 would therefore result in a relief-capturing imaging arrangement with the optical axes of the imaging sensors lying in a plane parallel to the direction of movement of the vehicle, and not in the claimed mosaic-like imaging arrangement with the optical axes of the imaging sensors lying in a plane orthogonal to the direction of movement of the vehicle. In addition, the claimed mosaic-like imaging capturing arrangement imposes constraints to the optical configuration of the arrangement (such as the adjacent imaging sensors being arranged to capture an image of adjacent sections of the surface, while having their optical axes intersecting each other in a region close to the vehicle) that are absent in the relief-capturing imaging arrangement of document D3, and this would dissuade the skilled person from considering using the imaging arrangement of document D3 for imaging sections of the surface aligned in a direction orthogonal to the movement of the vehicle.

The board notes that document D3 also discloses embodiments (see Fig. 3 and 4, and column 5, lines 13 to 56) comprising, in addition to the imaging sensors (54, 58, 66) aligned in the direction parallel to the movement of the vehicle (arrow 52 in Fig. 4) mentioned above, additional imaging sensors (53 and 55, 57 and 59, 65 and 67) aligned in the direction orthogonal to

the movement of the vehicle. However, these additional imaging sensors are arranged to also capture relief images of essentially the same section of the surface imaged by the imaging sensors aligned in the direction parallel to the movement of the vehicle (see Fig. 3 and 4), and as a consequence their optical axes are oriented so that they no longer intersect at a common area of a housing of the system, but far below towards the surface being mapped (see Fig. 3). As a consequence, contrary to the embodiments disclosed in the same document with reference to Fig. 1 and 2, each imaging sensor has its own lens (47, 49, 51, 60, 62, 64, 69, 71, 73). Therefore, none of these embodiments would suggest the claimed system either.

Document D5 discloses the generation of a map of a surface using three imaging sensors mounted in a vehicle and sharing a common objective lens (abstract, and Fig. 1 together with the corresponding description). However, as in the case of document D3, the imaging sensors are not aligned in a direction orthogonal to the direction of movement of the vehicle, but in the direction of movement of the vehicle (see Fig. 1) for the purpose of capturing relief images (Fig. 2 and 3 and the corresponding description, together with column 1, lines 5 to 15, and column 4, lines 9 to 44). Therefore, for reasons analogous to those given above in connection with document D3, the teaching of document D5 would not lead the skilled person towards the claimed system either.

The remaining documents on file are less pertinent.

- 3.2.3 It follows that the system of claim 1 is not obvious when starting with document D1 as the closest state of the art. It is also apparent from the above analysis

that the same conclusion would also be drawn when the closest state of the art is considered to be constituted - as submitted by the appellant - by document D3.

- 3.3 The board concludes that the subject-matter of claim 1 is new and involves an inventive step (Articles 54(1) and 56 EPC 1973) with respect to the prior art on file. The same conclusion applies to dependent claims 2 to 10 by virtue of their dependence on claim 1.
4. In view of the above considerations, the board concludes that the present main request of the appellant is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the following application documents:
 - claims: No. 1 to 10 of the main request filed with the letter dated 21 September 2017;
 - description: pages 1 to 42 filed with the letter dated 21 September 2017; and
 - drawings: sheets 1/14 to 14/14 filed with the letter dated 21 September 2017.

The Registrar:

The Chairman:



N. Schneider

R. Bekkering

Decision electronically authenticated