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(71) Applicant *(for all designated States except US)*: **TRW LIMITED** [GB/GB]; Stratford Road, Sollhull B90 4AX (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **TUCKER, Mark, Richard** [GB/GB]; 61 Bitteswell Road, Lutterworth, Leicestershire, LE17 4EP (GB). **HEENAN, Adam, John** [GB/GB]; 33 Nursery Road, Swallownest, Sheffield S26 4UH (GB).

(74) Agent: **BARKER BRETTELL**; 138 Hagley Road, Edgbaston, Birmingham B16 9PW (GB).

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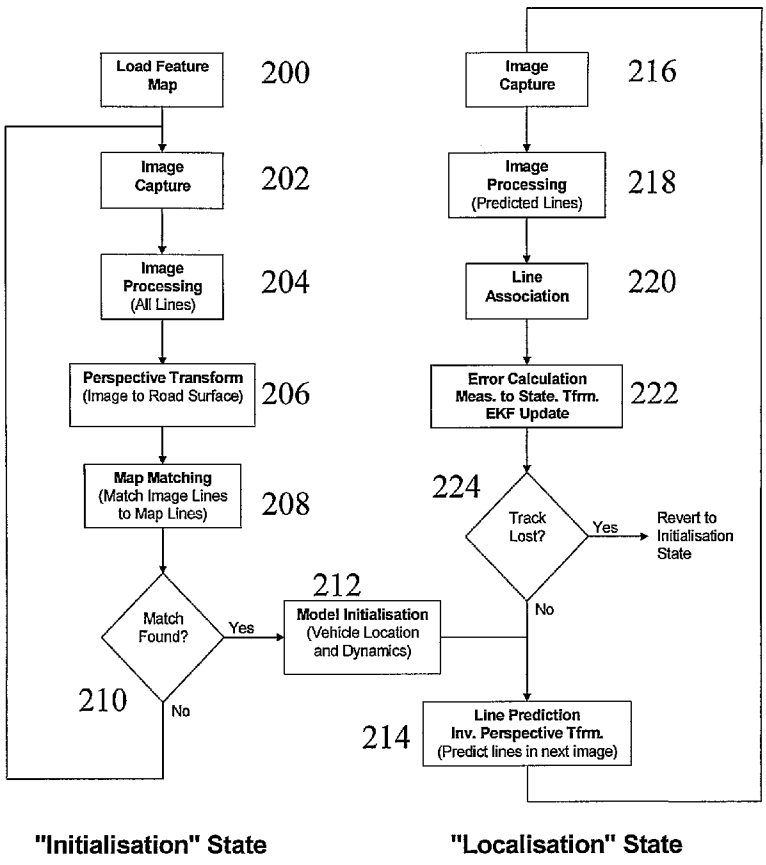
[Continued on next page]

(54) Title: DETERMINING THE LOCATION OF A VEHICLE ON A MAP



(57) Abstract: A method of determining the location of a vehicle (100) on a map, the map comprising a plurality of points associated with features, comprising: capturing (202), typically using a video camera (102) an image of a scene from the vehicle (100), identifying (204) points in the image corresponding to features in the scene, and comparing (208) the points in the captured image to the map to determine the position of the vehicle. The method typically further comprises the step of capturing (216) at least one further image of the scene, identifying points (218) in the at least one further image and comparing (220) the points identified in the image and the or each further images. The method may also comprise comprises modeling (222) the motion of the vehicle (100) using a predictive filter, such as a Kalman filter, or an Extended Kalman filter.

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FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G01C21/30 G05D1/02

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)
G01C G05D G08G G06T

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 practical, search terms used)
EPO-Internal, WPI Data, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 06 074778 A (MITSUBISHI ELECTRIC CORP) 18 March 1994 (1994-03-18) abstract; figures 1-3	1-3,20, 23,28, 30-32
X	EP 1 076 276 A (HONDA MOTOR CO LTD [JP]) 14 February 2001 (2001-02-14) paragraphs [0008], [0009]; figure 1 paragraphs [0016], [0019], [0029] paragraphs [0034], [0044]; figure 4	1-4, 19-22, 25,28, 30-32

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* 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 document but published on or after the international filing date

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"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.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2007	14/02/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Jakob, Clemens

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/125871 A1 (CHERVENY KEVIN [US] ET AL CHERVENY KEVIN [US] ET AL) 3 July 2003 (2003-07-03) paragraph [0039] paragraph [0069]; figure 4B paragraphs [0091] - [0094]; figures 8D-8G	1-4,21, 26,28, 30-32
X	SAWASAKI N ET AL: "Embedded vision system for mobile robot navigation" 15 May 2006 (2006-05-15), ROBOTICS AND AUTOMATION, 2006. ICRA 2006. PROCEEDINGS 2006 IEEE INTERNATIONAL CONFERENCE ON ORLANDO, FL, USA MAY 15-19, 2006, PISCATAWAY, NJ, USA,IEEE, PAGE(S) 2693-2698 , XP010921670 ISBN: 0-7803-9505-0 page 2693, right-hand column, last paragraph; figure 1 page 2697, left-hand column, line 4 - right-hand column, last line figures 8,11	1-5, 30-32
X	MÖSL KLAUS G ET AL: "New position estimation method based on map matching for planetary rover" EUROPEAN SPACE AGENCY, no. 603, 5 September 2005 (2005-09-05), pages 769-776, XP009091506 Munich abstract page 769, right-hand column, lines 25-39 page 772, right-hand column, paragraph 1 - page 773, right-hand column, paragraph 3; figure 6 page 775, left-hand column, lines 16-33; figure 10	1,5,9, 13,18, 30-32
X	US 4 700 307 A (MONS BAREND [US] ET AL) 13 October 1987 (1987-10-13) abstract column 2, lines 9-22 column 2, line 54 - column 3, line 32; figure 1	1,2, 29-32

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2007/002771

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:

see additional sheet

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

2. ☐ As all searchable claims could be searched without effort justifying an 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 reportcovers 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.:

see annex

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-23,25,26,28-32

determining a vehicle's location on a map by comparing points corresponding to features identified in a captured image of a subarea of the vehicle's environment with points comprised in the map

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2. claims: 24,27-32

determining the location of a vehicle by selecting a map based on a first position estimate of the vehicle and matching the first position estimate with the map to generate a second, more accurate, position estimate

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INTERNATIONAL SEARCH REPORT

International application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 6074778 A	18-03-1994	JP 3131300 B2	31-01-2001
EP 1076276 A	14-02-2001	NONE	
US 2003125871 A1	03-07-2003	NONE	
US 4700307 A	13-10-1987	NONE	