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(54) Title: ENHANCED SITUATIONAL AWARENESS AND TARGETING (eSAT) SYSTEM

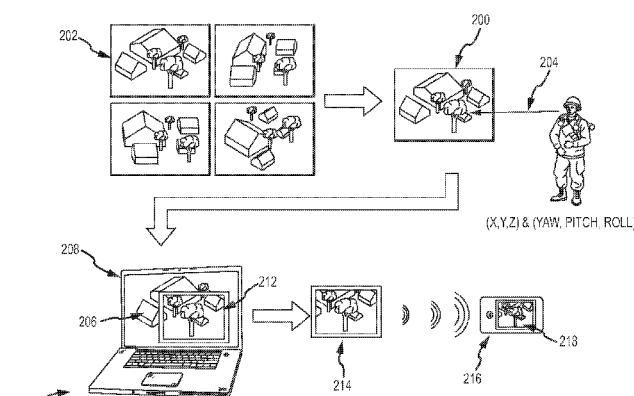


FIG. 4

(57) Abstract: eSAT pushes 3D scene awareness and targeting to forward positioned mobile operators and their handheld devices in environments such as found in military theaters of operation, border control and enforcement, police operations, search & rescue and large commercial industrial operations. A host computer hosts a 3D model of a scene and dynamically captures and transmits a windowed portion of the visual representation of that 3D model over a wireless network to the mobile operators' handheld devices. The windowed portion of the visual representation is streamed directly to the operators' handheld device displays. The mobile operators may interact with and control the 3D model via the wireless network. The host computer may synthesize the visual representation of the 3D model with live feeds from one or more of the handheld devices or other assets to improve situational awareness. Either the mobile operators or host operator can make point selections on the visual representation to extract geo-coordinates from the 3D model as a set of target coordinates.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/044055

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06T17/05 G06T19/00 G06T7/00
 ADD. G06T17/00

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)

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 practicable, search terms used)

EPO-Internal, BIOSIS, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Matthias Baldauf, Peter Fröhlich, Przemyslaw Musialski: "A Lightweight 3D Visualization Approach for Mobile City Exploration", http://ifgi.uni-muenster.de/archives/tipugg/ 30 September 2008 (2008-09-30), pages 1-6, XP002666328, Retrieved from the Internet: URL:ifgi.uni-muenster.de/tipugg/paper/tipugg2008_%20Baldauf.pdf [retrieved on 2011-12-22] the whole document ----- -/--	1-13, 15-19, 25,27, 29,30, 32,33,36



Further documents are listed in the continuation of Box C.



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 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

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/044055

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	BALADRON C ET AL: "Integrating User-Generated Content and Pervasive Communications", IEEE PERVASIVE COMPUTING, IEEE SERVICE CENTER, LOS ALAMITOS, CA, US, vol. 7, no. 4, 1 October 2008 (2008-10-01), pages 58-61, XP011236563, ISSN: 1536-1268, DOI: 10.1109/MPRV.2008.76 the whole document	1-12, 15-19, 25,27
A	MIYAZAKI Y ET AL: "Pedestrian navigation system for mobile phones using panoramic landscape images", APPLICATIONS AND THE INTERNET, 2006. SAINT 2006. INTERNATIONAL SYMPOSIUM ON PHOENIX, AZ, USA 23-27 JAN. 2006, PISCATAWAY, NJ, USA, IEEE, LOS ALAMITOS, CA, USA, 23 January 2006 (2006-01-23), pages 7PP-108, XP031461921, ISBN: 978-0-7695-2508-2 the whole document	1-12, 15-19, 25,27
A	FROHLICH P ET AL: "Visual Presentation Challenges for Mobile Spatial Applications: Three Case Studies", INFORMATION VISUALISATION, 2008. IV '08. 12TH INTERNATIONAL CONFERENCE, IEEE, PISCATAWAY, NJ, USA, 9 July 2008 (2008-07-09), pages 533-538, XP031290956, ISBN: 978-0-7695-3268-4 the whole document	1-12, 15-19, 25,27
A	Matthias Baldauf, Peter Fröhlich, Przemyslaw Musialski: "A Lightweight 3D Visualization Approach for Mobile City Exploration (Slides)", http://ifgi.uni-muenster.de/archives/tipugg/paper/ , 2008, XP002666329, Retrieved from the Internet: URL: http://ifgi.uni-muenster.de/archives/tipugg/paper/ppttipugg2008_%20Baldauf.pdf [retrieved on 2011-12-22] the whole document	1-12, 15-19, 25,27
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/044055

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FUJII K ET AL: "Reconstruction of 3D urban model using range image and aerial image", IGARSS 2001. IEEE 2001 INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM. SYDNEY, AUSTRALIA, JULY 9 - 13, 2001; [IEEE INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM], NEW YORK, NY : IEEE, US, vol. 4, 9 July 2001 (2001-07-09), pages 1928-1932, XP010572304, DOI: 10.1109/IGARSS.2001.977119 ISBN: 978-0-7803-7031-9 abstract -----	1-12, 15-19, 25,27
X	BERNHARD REITINGER ET AL: "Augmented Reality Scouting for Interactive 3D Reconstruction", VIRTUAL REALITY CONFERENCE, 2007. VR '07. IEEE, IEEE, PI, 1 March 2007 (2007-03-01), pages 219-222, XP031080316, ISBN: 978-1-4244-0905-1 the whole document -----	1-13, 15-19, 25,27, 29,30, 32,33,36
X	ZHUMING AI ET AL: "Integration of georegistered information on a virtual globe", MIXED AND AUGMENTED REALITY, 2009. ISMAR 2009. 8TH IEEE INTERNATIONAL SYMPOSIUM ON, IEEE, PISCATAWAY, NJ, USA, 19 October 2009 (2009-10-19), pages 169-170, XP031568927, ISBN: 978-1-4244-5390-0 the whole document -----	1-13, 15-19, 25,27, 29,30, 32,33,36
A	Kevin Barry, Craig Stoneking, Cyndi Carpenter, Karen Goselin: "SHARED SITUATION AWARENESS FOR NETWORKED DISMOUNTED SOLDIERS", , 2004, XP002675452, Retrieved from the Internet: URL:http://handle.dtic.mil/100.2/ADA431998 [retrieved on 2012-05-07] page 1 - page 3; figures 1-2 ----- -/--	13,29, 30,32, 33,36

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/044055

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PAUL LABBE ET AL: "Creating a dynamic picture of network participant geospatial information in complex terrains", INTERNET MONITORING AND PROTECTION, 2007. ICIMP 2007. SECOND INTERNATIONAL CONFERENCE ON, IEEE; PI, 1 July 2007 (2007-07-01), pages 39-39, XP031115507, ISBN: 978-0-7695-2911-0 page 1, left-hand column, paragraph 1 - page 2, left-hand column, paragraph 1 last two pgphs of left column of page 5 -----	13,29, 30,32, 33,36
A	US 2004/020083 A1 (STAUB MICHAEL DAVID [US] ET AL) 5 February 2004 (2004-02-05) paragraphs [0028], [0034], [0047], [0053]; figure 12 -----	13,29, 30,32, 33,36

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/044055

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 all searchable 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 report covers only those claims for which fees were paid, specifically claims Nos.:
1-13, 15-19, 25, 27, 29, 30, 32, 33, 36
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.:

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: 1-12, 15-19, 25, 27

The first subject matter is related to a method or an apparatus, resp., for enhanced situation(al) awareness with the special technical features that

- the 3D model is geo-rectified (from claim 2) and updated in time, spatial extent or resolution using images of the scene received from mobile assets (from claim 4) like hand-held devices (e.g. smart phones) (from claim 5) or unmanned aerial vehicles (UAV) with a camera above the scene (from claim 6)... .

2. claims: 13, 29, 30, 32, 33, 36

The second subject matter is related to a method or an apparatus, resp., for enhanced situation(al) awareness with the special technical features of

- locating local users (mobile operators) in the scene by displaying geo-positioned markers in a view of the 3D model reflecting the positions of the local users.

3. claims: 14, 20-22, 26, 28, 31, 34, 35

The third subject matter is related to a method or an apparatus, resp., for enhanced situation(al) awareness with the special technical features of

- targeting an asset (e.g. a munition) to a location in a 3D world scene (e.g. a military theatre of operation).

4. claims: 23, 24

The forth subject matter is related to a method or an apparatus, resp., for enhanced situation(al) awareness with the special technical features of

- estimation of the geographic position of a host computer or mobile operator in aGPS-signal denied-environment by correlating live captured images to a 3D scene model.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/044055

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004020083	A1	05-02-2004	NONE
