



US008179393B2

(12) **United States Patent**
Minear et al.

(10) **Patent No.:** **US 8,179,393 B2**
(45) **Date of Patent:** **May 15, 2012**

(54) **FUSION OF A 2D ELECTRO-OPTICAL
IMAGE AND 3D POINT CLOUD DATA FOR
SCENE INTERPRETATION AND
REGISTRATION PERFORMANCE
ASSESSMENT**

(75) Inventors: **Kathleen Minear**, Palm Bay, FL (US);
Donald Pooley, Melbourne, FL (US);
Anthony O'Neil Smith, Melbourne, FL
(US)

(73) Assignee: **Harris Corporation**, Melbourne, FL
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 672 days.

(21) Appl. No.: **12/371,186**

(22) Filed: **Feb. 13, 2009**

(65) **Prior Publication Data**

US 2010/0207936 A1 Aug. 19, 2010

(51) **Int. Cl.**
G06T 15/00 (2011.01)

(52) **U.S. Cl.** **345/419; 345/422; 345/619; 345/642;**
382/154; 382/190; 382/291; 382/294; 715/851

(58) **Field of Classification Search** **345/419,**
345/422, 619, 642; 382/154, 190, 291, 294;
715/851

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,247,587 A 9/1993 Hasegawa et al.
5,416,848 A 5/1995 Young
5,781,146 A 7/1998 Frederick
5,875,108 A 2/1999 Hoffberg et al.
5,901,246 A 5/1999 Hoffberg et al.

5,988,862 A 11/1999 Kacyra et al.
6,081,750 A 6/2000 Hoffberg et al.
6,206,691 B1 3/2001 Lehmann et al.
6,246,468 B1 6/2001 Dimsdale
6,271,860 B1 8/2001 Gross
6,330,523 B1 12/2001 Kacyra et al.
6,400,996 B1 6/2002 Hoffberg et al.
6,405,132 B1 6/2002 Breed et al.
6,418,424 B1 7/2002 Hoffberg et al.
6,420,698 B1 7/2002 Dimsdale
6,473,079 B1 10/2002 Kacyra et al.
6,476,803 B1 11/2002 Zhang et al.
6,512,518 B2 1/2003 Dimsdale

(Continued)

FOREIGN PATENT DOCUMENTS

DE 197 46 639 5/1999

(Continued)

OTHER PUBLICATIONS

Chen, et al., "Fusion of Lidar Data and Optical Imagery for Building
Modeling".

(Continued)

Primary Examiner — Phu K Nguyen

(74) *Attorney, Agent, or Firm* — Fox Rothschild, LLP;
Robert J. Sacco

(57) **ABSTRACT**

Method and system for combining a 2D image with a 3D
point cloud for improved visualization of a common scene as
well as interpretation of the success of the registration pro-
cess. The resulting fused data contains the combined infor-
mation from the original 3D point cloud and the information
from the 2D image. The original 3D point cloud data is color
coded in accordance with a color map tagging process. By
fusing data from different sensors, the resulting scene has
several useful attributes relating to battle space awareness,
target identification, change detection within a rendered
scene, and determination of registration success.

21 Claims, 8 Drawing Sheets

