

(19) World Intellectual Property Organization
International Bureau



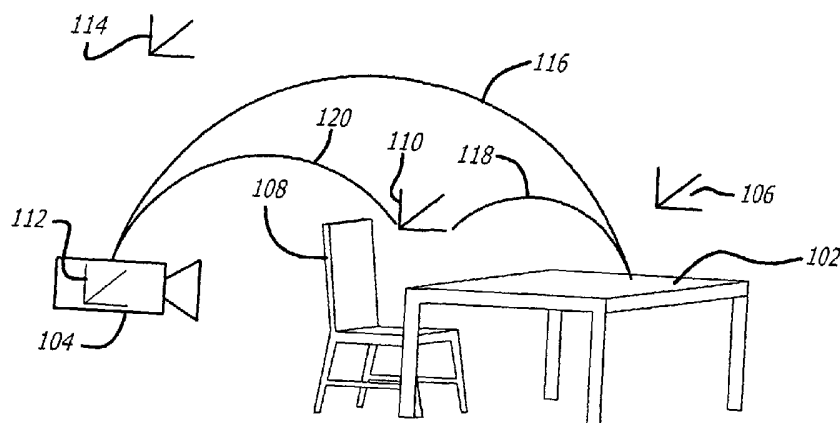
(43) International Publication Date
1 May 2003 (01.05.2003)

PCT

(10) International Publication Number
WO 03/036384 A3

- (51) International Patent Classification⁷: **H04N 7/18**
- (21) International Application Number: PCT/US02/33836
- (22) International Filing Date: 22 October 2002 (22.10.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/336,208 22 October 2001 (22.10.2001) US
- (71) Applicant (for all designated States except US): **UNIVERSITY OF SOUTHERN** [US/US]; Office of Technology Licensing, 3716 South Hope Street, Suite 313, Los Angeles, CA 90007-4344 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **NEUMANN, Ulrich** [US/US]; 526 21st Street, Manhattan Beach, CA 90266 (US). **JIANG, Bolan** [CN/US]; 1138 West 29th Street, Apt. #15, Los Angeles, CA 90007 (US).
- (74) Agents: **BROWN, Marc, E.** et al.; McDermott, Will & Emery, 2049 Century Park East, Suite 3400, Los Angeles, CA 90067 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
- (88) Date of publication of the international search report:
20 November 2003
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: EXTENDABLE TRACKING BY LINE AUTO-CALIBRATION



(57) Abstract: Methods and systems for tracking camera pose using dynamically calibrated line features for augmented reality applications are disclosed. The dynamic calibration of the line features affords an expanded tracking range within the real environment and into adjacent, un-calibrated areas (elements 116, 118 and 120). Line features within a real environment are modeled with a minimal representation (116), such that they can be efficiently dynamically calibrated as a camera pose changes within the environment. A known camera pose is used to initialize line feature calibration within the real environment (106). Parameters of dynamically calibrated line features are also used to calculate camera pose (120). The tracking of camera pose through a real environment allows insertion of virtual objects into the real environment without dependencies on pre-calibrated landmarks (110).

WO 03/036384 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/33836**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :H04N 7/18

US CL :348/143

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)

U.S. : 348/143; 250/559.32

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,424,556 A (SYMOSEK et al) 13 June 1995, figure 1, figures 5-10, see col.1, lines 28-53, col.2, lines 10-45, see col.2, line 46 to col.3, line 36	1-32

 Further documents are listed in the continuation of Box C.
 See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier document published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 29 APRIL 2003	Date of mailing of the international search report 08 AUG 2003
--	---

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer
Chris Kelley
CHRIS KELLEY

Telephone No. (703) 305-4700