

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 January 2009 (08.01.2009)

PCT

(10) International Publication Number
WO 2009/004479 A3

(51) International Patent Classification:
G06K 9/00 (2006.01)

(21) International Application Number:
PCT/IB2008/002205

(22) International Filing Date:
26 August 2008 (26.08.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/773,254 3 July 2007 (03.07.2007) US

(71) Applicant (for all designated States except US): SHOP-
PERTRACK RCT CORPORATION [US/US]; 200
West Monroe Street, 11th Floor, Chicago, IL 60606 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): WANG, Zhiqian
[CN/US]; 602 Hanover Court, Schaumburg, IL 60194
(US). KASTILAHN, William, C. [US/US]; 816 Hinman
Avenue House 6, Evanston, IL 60202 (US).

(74) Agent: GEOFFREY, Michael, M.; Reed Smith, LLP, 10
S. Wacker Drive, Chicago, IL 60606-7507 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,

CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ,
EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO,
NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG,
SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

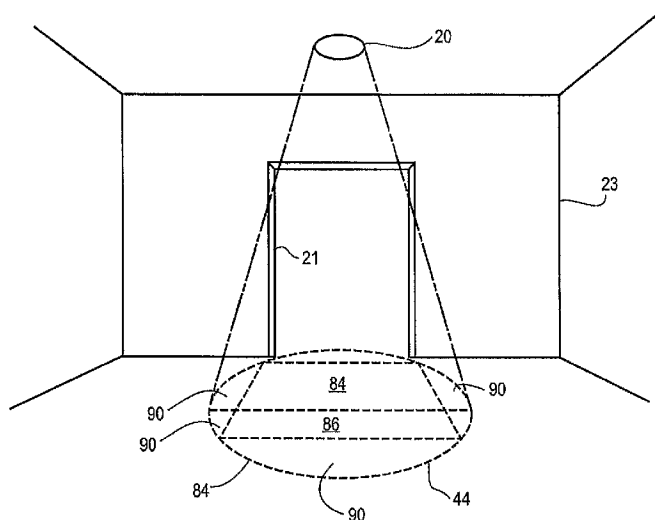
— with international search report (Art. 21(3))

— with information concerning request for restoration of
the right of priority in respect of one or more priority
claims (Rules 26bis.3 and 48.2(b)(vii))

[Continued on next page]

(54) Title: SYSTEM AND PROCESS FOR DETECTING, TRACKING AND COUNTING HUMAN OBJECTS OF INTEREST

Fig. 1



(57) Abstract: A method of identifying, tracking, and
counting human objects of interest based upon at least
one pair of stereo image frames taken by at least one
image capturing device, comprising obtaining said
stereo image frames and converting them to a rectified
image frame using calibration data, generating a dis-
parity map based upon a pair of said rectified image
frames, generating a depth map based upon said dis-
parity map and said calibration data, identifying the
presence or absence of said objects of interest from
said depth map and comparing each of said objects of
interest to existing tracks comprising previously iden-
tified objects of interest, for each said presence of an
object of interest, adding said object of interest to one
of said existing tracks or creating a new track, updat-
ing each said existing track, and maintaining a count
of said objects of interest in a given time period.



WO 2009/004479 A3



(88) Date of publication of the international search report:
30 December 2009

Previous Correction:
see Notice of 12 November 2009

(15) Information about Correction:

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 08/02205

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G06K 9/00 (2009.01) USPC - 382/103 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) USPC - 382/103 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 382/103, 154; 702/127, 128, 129 (keyword limited, see terms below) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST(PGPB,USPT,EPAB,JPAB); Google. Search Terms Used: human, person, people, crowd, detect, track, identify, length, threshold, limit, maximum, cutoff, boundary, edge, local maxima, image, picture, frame, pixel, noise, depth, map, height, threshold, track, stereo, binocular, vision, view, sense, noise		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,445,810 B2 (Darrell et al.) 03 September 2002 (03.09.2002) entire document, especially: col.4, ln 48-67, col. 5, ln 35-66, col. 6, ln 1-9	1-46
Y	US 5,973,732 A (Guthrie) 26 October 1999 (26.10.1999) col. 3, ln 21-67, col. 4, ln 1-4, col. 5, ln 1-40, col. 6, ln 22-67, col. 7, ln 15-30, 40-67, col. 8, ln 1-54, col. 9, ln 29-32, 5667, col. 10, ln 1-67, col. 11, ln 1-3	1-46
A	US 6,697,104 B1 (Yakobi et al.) 24 February 2004 (24.02.2004), entire document entire document	1-46
A	US 7,003,136 B1 (Harville) 21 February 2006 (21.02.2006), entire document	1-46
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 29 January 2009 (29.01.2009)		Date of mailing of the international search report 12 FEB 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774