



- (51) International Patent Classification:
G05D 1/02 (2006.01) *A61G 5/04* (2013.01)
- (21) International Application Number:
PCT/US2013/050280
- (22) International Filing Date:
12 July 2013 (12.07.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/671,390 13 July 2012 (13.07.2012) US
- (71) Applicant: LOVE PARK ROBOTICS, LLC [US/US];
2025 Washington Avenue, Suite 217, Philadelphia,
Pennsylvania 19146 (US).
- (72) Inventors: PANZARELLA, Thomas A.; 2442 S. 19th
Street, Philadelphia, Pennsylvania 19145 (US). SPLET-
ZER, John R.; 2959 Kristin Court, Center Valley,
Pennsylvania 18034 (US).
- (74) Agent: CARROLL, Frank T.; Fox Rothschild LLP, Prin-
ceton Pike Corporate Center, 997 Lennox Drive, Building
3, Lawrenceville, New Jersey 08648-2311 (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, BN, BR, BW, BY,
BZ, CA, CH, CL, 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, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

[Continued on next page]

(54) Title: DRIVE-CONTROL SYSTEMS FOR VEHICLES SUCH AS PERSONAL-TRANSPORTATION VEHICLES

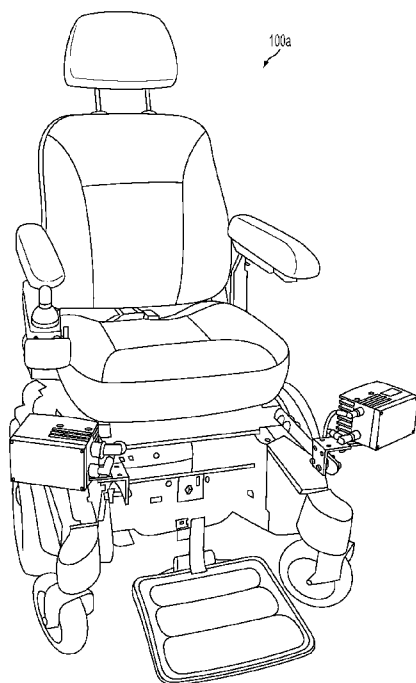


FIG. 1A

(57) Abstract: Drive-control systems for personal-transportation vehicles can function as active driving aids that enable autonomous and semi-autonomous cooperative navigation of electric-powered wheelchairs (EPWs) and other vehicles both indoors, and in dynamic, outdoor environments. The systems can help to compensate for the loss of cognitive, perceptive, or motor function in the driver by interpreting the driver's intent and seeing out into the environment on the driver's behalf. The systems can incorporate intelligent sensing and drive-control means that work in concert with the driver to aid in negotiating changing terrain, avoiding obstacles/collisions, maintaining a straight trajectory, etc. In addition, the systems can be configured to facilitate higher-level path planning, and execution of non-linear routes of travel in a safe and efficient manner.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Published:

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

(88) Date of publication of the international search report:

27 March 2014

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/050280**A. CLASSIFICATION OF SUBJECT MATTER****G05D 1/02(2006.01)i, A61G 5/04(2006.01)i**

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)

G05D 1/02; G05D 1/10; G01C 21/28; G05D 1/00; B60K 1/00; G01C 5/00; A61G 5/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: vehicle, wheelchair, trajectory, obstacles, sensor, terrain

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003-0226698 A1 (DEAN L. KAMEN et al.) 11 December 2003 See abstract; paragraphs [0026]-[0048]; and figures 1-3.	1-17, 19, 20
A		18
Y	WO 2006-098945 A1 (HONEYWELL INTERNATIONAL, INC.) 21 September 2006 See page 4; claim 1; and figure 1.	1-17, 19, 20
Y	KR 10-2010-0108093 A (AGENCY FOR DEFENSE DEVELOPMENT) 6 October 2010 See paragraphs [0004], [0019]; claims 1, 10; and figure 1.	8-16
A	US 2012-0095633 A1 (YOHEI KUME et al.) 19 April 2012 See paragraphs [0041]-[0053]; and figures 1A-1C.	1-20
A	US 2004-0267442 A1 (LINDA FEHR et al.) 30 December 2004 See paragraphs [0041]-[0072]; and figures 1-5.	1-20



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

24 January 2014 (24.01.2014)

Date of mailing of the international search report

27 January 2014 (27.01.2014)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City,
302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

KIM, Do Weon

Telephone No. +82-42-481-5560



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/050280

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003-0226698 A1	11/12/2003	AT 449987 T	15/12/2009
		AU 2000-33980 A1	04/10/2000
		AU 2000-33980 B2	01/04/2004
		AU 2000-35278 A1	04/10/2000
		AU 2000-35278 B2	12/02/2004
		AU 2000-37430 A1	04/10/2000
		AU 2000-37430 B2	08/07/2004
		AU 2000-53137 A1	28/12/2000
		AU 2000-53137 B2	23/10/2003
		AU 2001-47150 A1	18/06/2001
		AU 2002-11908 A1	22/04/2002
		AU 2002-211908 B2	02/03/2006
		AU 2003-237536 A1	22/12/2003
		AU 2003-276075 A1	31/12/2003
		CA 2366076 A1	21/09/2000
		CA 2366076 C	17/11/2009
		CA 2367146 A1	21/09/2000
		CA 2367146 C	08/12/2009
		CA 2367501 A1	21/09/2000
		CA 2367501 C	15/07/2008
		CA 2375645 A1	14/12/2000
		CA 2375645 C	15/12/2009
		CA 2393418 A1	14/06/2001
		CA 2393418 C	16/02/2010
		CA 2425148 A1	18/04/2002
		CA 2425148 C	20/09/2011
		CA 2578196 A1	20/04/2006
		CA 2580632 A1	23/03/2006
		CA 2580632 C	06/08/2013
		CA 2582463 A1	20/04/2006
		CA 2625275 A1	21/09/2000
		CA 2625275 C	12/03/2013
		CA 2682811 A1	21/09/2000
		CA 2682811 C	30/07/2013
		CA 2683099 A1	14/12/2000
		CN 101056680 A	17/10/2007
		CN 101056680 B	10/11/2010
		CN 1213712 C	10/08/2005
		CN 1345216 A	17/04/2002
		DE 60330240 D1	07/01/2010
		EP 1161214 A2	12/12/2001
		EP 1161214 B1	26/07/2006
		EP 1161215 A1	12/12/2001
		EP 1161215 B1	19/10/2005
		EP 1161216 A1	12/12/2001
		EP 1161216 B1	03/08/2005
		EP 1181187 A1	27/02/2002
		EP 1181187 B1	08/03/2006
		EP 1237779 A2	11/09/2002

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/050280

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 1237779 B1	20/07/2005
		EP 1324911 A2	09/07/2003
		EP 1324911 B1	21/09/2011
		EP 1512055 A2	09/03/2005
		EP 1512055 B1	25/11/2009
		EP 1599355 A2	30/11/2005
		EP 1674065 A2	28/06/2006
		EP 1674065 A3	12/07/2006
		EP 1791609 A1	06/06/2007
		EP 1791609 B1	02/11/2011
		EP 1796953 A2	20/06/2007
		EP 1805071 A1	11/07/2007
		JP 04162995 B2	08/10/2008
		JP 04511344 B2	28/07/2010
		JP 04564175 B2	20/10/2010
		JP 04574016 B2	04/11/2010
		JP 04709390 B2	22/06/2011
		JP 04866521 B2	01/02/2012
		JP 04875684 B2	15/02/2012
		JP 04948416 B2	06/06/2012
		JP 05184088 B2	17/04/2013
		JP 05243795 B2	24/07/2013
		JP 05309071 B2	09/10/2013
		JP 2002-538891 A	19/11/2002
		JP 2002-538892 A	19/11/2002
		JP 2003-502002 A	14/01/2003
		JP 2003-528756 A	30/09/2003
		JP 2004-500271 A	08/01/2004
		JP 2004-510637 A	08/04/2004
		JP 2005-529655 A	06/10/2005
		JP 2007-269316 A	18/10/2007
		JP 2008-513055 A	01/05/2008
		JP 2008-516582 A	15/05/2008
		JP 2008-517569 A	22/05/2008
		JP 2009-056321 A	19/03/2009
		JP 2010-094533 A	30/04/2010
		JP 2010-188998 A	02/09/2010
		JP 2011-246124 A	08/12/2011
		JP 2012-178975 A	13/09/2012
		KR 10-0655819 B1	11/12/2006
		KR 10-0704800 B1	10/04/2007
		KR 10-0707932 B1	13/04/2007
		KR 10-0885555 B1	24/02/2009
		KR 10-0911065 B1	06/08/2009
		KR 10-0978686 B1	30/08/2010
		KR 10-2009-0032143 A	31/03/2009
		TW 425281 A	11/03/2001
		TW 470641 A	01/01/2002
		TW 481633 A	01/04/2002
		TW 515770 A	01/01/2003

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/050280

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2001-0001992 A1	31/05/2001
		US 2001-0022242 A1	20/09/2001
		US 2001-0032743 A1	25/10/2001
		US 2002-0063006 A1	30/05/2002
		US 2002-0092686 A1	18/07/2002
		US 2002-0121394 A1	05/09/2002
		US 2002-0170754 A1	21/11/2002
		US 2002-0189870 A1	19/12/2002
		US 2003-0111279 A1	19/06/2003
		US 2003-0141832 A1	31/07/2003
		US 2003-0146025 A1	07/08/2003
		US 2003-0155167 A1	21/08/2003
		US 2003-0183435 A1	02/10/2003
		US 2003-0205419 A1	06/11/2003
		US 2003-0231022 A1	18/12/2003
		US 2004-0007398 A1	15/01/2004
		US 2004-0007399 A1	15/01/2004
		US 2004-0007425 A1	15/01/2004
		US 2004-0011573 A1	22/01/2004
		US 2004-0050611 A1	18/03/2004
		US 2004-0055804 A1	25/03/2004
		US 2004-0069543 A1	15/04/2004
		US 2004-0118622 A1	24/06/2004
		US 2005-0034553 A1	17/02/2005
		US 2005-0121866 A1	09/06/2005
		US 2005-0126832 A1	16/06/2005
		US 2006-0061460 A1	23/03/2006
		US 2006-0108156 A1	25/05/2006
		US 2006-0108165 A1	25/05/2006
		US 2006-0125433 A1	15/06/2006
		US 2006-0249313 A1	09/11/2006
		US 2007-0252683 A1	01/11/2007
		US 2007-0296170 A1	27/12/2007
		US 2008-0018443 A1	24/01/2008
		US 2008-0099265 A1	01/05/2008
		US 2008-0105471 A1	08/05/2008
		US 2008-0319627 A1	25/12/2008
		US 2009-0099762 A1	16/04/2009
		US 2010-0033315 A1	11/02/2010
		US 2010-0140009 A1	10/06/2010
		US 2010-0217497 A1	26/08/2010
		US 2010-0222994 A1	02/09/2010
		US 2011-0012721 A1	20/01/2011
		US 5701965 A	30/12/1997
		US 5791425 A	11/08/1998
		US 5794730 A	18/08/1998
		US 5971091 A	26/10/1999
		US 5975225 A	02/11/1999
		US 6288505 B1	11/09/2001
		US 6302230 B1	16/10/2001

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/050280

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 6311794 B1	06/11/2001
		US 6343664 B2	05/02/2002
		US 6367817 B1	09/04/2002
		US 6408240 B1	18/06/2002
		US 6415879 B2	09/07/2002
		US 6443250 B1	03/09/2002
		US 6443251 B1	03/09/2002
		US 6538411 B1	25/03/2003
		US 6543564 B1	08/04/2003
		US 6571892 B2	03/06/2003
		US 6581714 B1	24/06/2003
		US 6615938 B2	09/09/2003
		US 6651763 B1	25/11/2003
		US 6651766 B2	25/11/2003
		US 6779621 B2	24/08/2004
		US 6789640 B1	14/09/2004
		US 6796396 B2	28/09/2004
		US 6799649 B2	05/10/2004
		US 6815919 B2	09/11/2004
		US 6827163 B2	07/12/2004
		US 6837327 B2	04/01/2005
		US 6866107 B2	15/03/2005
		US 6868931 B2	22/03/2005
		US 6874591 B2	05/04/2005
		US 6915878 B2	12/07/2005
		US 6929080 B2	16/08/2005
		US 6965206 B2	15/11/2005
		US 7017686 B2	28/03/2006
		US 7023330 B2	04/04/2006
		US 7090040 B2	15/08/2006
		US 7157875 B2	02/01/2007
		US 7275607 B2	02/10/2007
		US 7357202 B2	15/04/2008
		US 7370713 B1	13/05/2008
		US 7479872 B2	20/01/2009
		US 7546889 B2	16/06/2009
		US 7592900 B2	22/09/2009
		US 7690452 B2	06/04/2010
		US 7708094 B2	04/05/2010
		US 7740099 B2	22/06/2010
		US 7757794 B2	20/07/2010
		US 7779939 B2	24/08/2010
		US 7812715 B2	12/10/2010
		US 7857088 B2	28/12/2010
		US 7900725 B2	08/03/2011
		US 7938207 B2	10/05/2011
		US 8248222 B2	21/08/2012
		US 8322477 B2	04/12/2012
WO 2006-098945 A1	21/09/2006	EP 1733285 A1	20/12/2006

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/050280

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 1783572 A2	09/05/2007
		EP 1783572 A3	14/05/2008
		EP 1783572 B1	21/04/2010
		EP 1856585 A1	21/11/2007
		JP 05249507 B2	31/07/2013
		JP 2007-210599 A	23/08/2007
		US 2004-0215372 A1	28/10/2004
		US 2006-0038720 A1	23/02/2006
		US 2006-0158350 A1	20/07/2006
		US 7098810 B2	29/08/2006
		US 7589646 B2	15/09/2009
		US 7633410 B2	15/12/2009
		WO 2005-083540 A1	09/09/2005
KR 10-2010-0108093 A	06/10/2010	KR 10-1054479 B1	05/08/2011
US 2012-0095633 A1	19/04/2012	CN 102452394 A	16/05/2012
		EP 2444274 A2	25/04/2012
		JP 05161353 B2	13/03/2013
		JP 2012-106722 A	07/06/2012
US 2004-0267442 A1	30/12/2004	AU 2003-281326 A1	23/01/2004
		US 2004-0006422 A1	08/01/2004
		US 6842692 B2	11/01/2005
		US 7383107 B2	03/06/2008
		WO 2004-005852 A1	15/01/2004