



(51) International Patent Classification:

*B25J 9/16* (2006.01)      *B25J 13/02* (2006.01)  
*G05B 19/42* (2006.01)      *B25J 11/00* (2006.01)

(21) International Application Number:

PCT/US2013/046996

(22) International Filing Date:

21 June 2013 (21.06.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/662,646	21 June 2012 (21.06.2012)	US
61/676,586	27 July 2012 (27.07.2012)	US
13/621,657	17 September 2012 (17.09.2012)	US
13/621,561	17 September 2012 (17.09.2012)	US
13/621,519	17 September 2012 (17.09.2012)	US
13/621,687	17 September 2012 (17.09.2012)	US
13/621,658	17 September 2012 (17.09.2012)	US
13/621,708	17 September 2012 (17.09.2012)	US
13/621,517	17 September 2012 (17.09.2012)	US
13/621,648	17 September 2012 (17.09.2012)	US
13/621,706	17 September 2012 (17.09.2012)	US

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[Continued on next page]

(54) Title: USER INTERFACES FOR ROBOT TRAINING

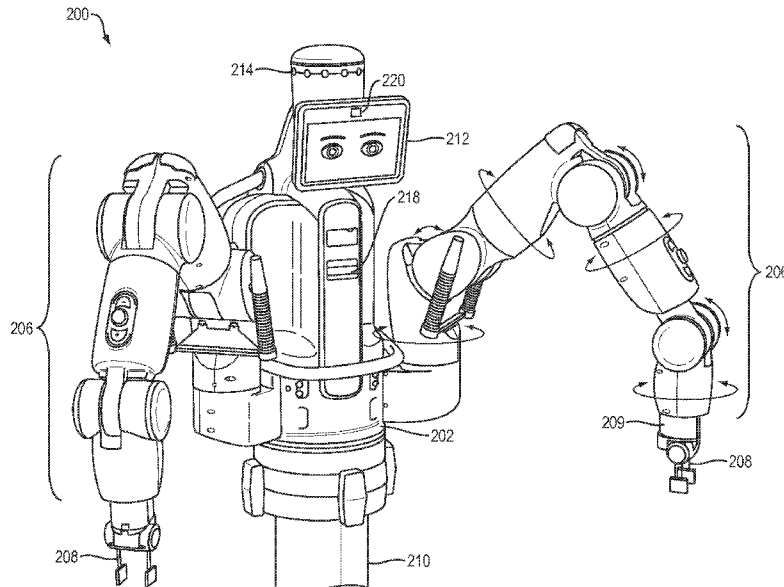


FIG. 2A

(57) Abstract: In accordance with various embodiments, a user interface embedded into a robot facilitates robot training via direct and intuitive physical interactions. In some embodiments, the user interface includes a wrist cuff that, when grasped by the user, switches the robot into zero-force gravity-compensated mode.





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

**Published:**

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

**(88) Date of publication of the international search report:**  
17 April 2014

INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/046996

A. CLASSIFICATION OF SUBJECT MATTER  
INV. B25J9/16 G05B19/42 B25J13/02 B25J11/00  
ADD.  
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)  
B25J G05B H01H

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, 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	US 2012/130541 A1 (SZALEK LESZEK A [US]) 24 May 2012 (2012-05-24) page 1 - page 3	1-9
A	EP 0 162 565 A2 (FUJI ELECTRIC RES [JP]) 27 November 1985 (1985-11-27) page 1 - page 5	1-9
X	US 2002/050802 A1 (INOUE MAKOTO [JP] ET AL) 2 May 2002 (2002-05-02) page 1 - page 2 figures 1,2	10-13
X	US 2012/116584 A1 (KIM JONG-CHEOL [KR] ET AL) 10 May 2012 (2012-05-10) page 1 page 4 figures 1, 3	10-13
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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 <b>17 February 2014</b>	Date of mailing of the international search report <b>03/03/2014</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <b>Bassi, Luca</b>
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/046996

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/020858 A1 (FUTURE ROBOT CO LTD [KR]; SONG SE KYUNG [KR]) 16 February 2012 (2012-02-16) abstract figures 1,2 -----	10-13
X	US 2008/147239 A1 (CHIANG CHIN-CHONG [TW] ET AL) 19 June 2008 (2008-06-19) page 1 - page 3 figures 1,2a-2c,4a-4b,7 -----	10-14, 16-23
X	WO 2010/049101 A1 (KUKA ROBOTER GMBH [DE]; SEDLMAYER ANDREAS [DE]) 6 May 2010 (2010-05-06) page 1 - page 5 -----	26-31, 35,36
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/046996

## 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.:
  
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: 1-9

Robot operable in a zero-force gravity compensated mode

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2. claims: 10-22

Robot having a body and a user interface integrated with the robot body

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3. claim: 23

Robot configured to turn in the general direction of the user

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4. claims: 24, 25

Robot and corresponding robot-interaction method where commands can be issued through any one of a plurality of identical navigators.

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5. claims: 26-31, 35, 36

Robot and corresponding robot-interaction method wherein haptic feedback is used to avoid collisions

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6. claims: 32-34, 37

Robot and corresponding robot-interaction method wherein haptic feedback is used to simulate an environmental condition

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/046996

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