



- (51) **International Patent Classification:**
G06F 3/01 (2006.01) *G06N 3/04* (2006.01)
- (21) **International Application Number:**
PCT/US2018/052092
- (22) **International Filing Date:**
20 September 2018 (20.09.2018)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
15/973,137 07 May 2018 (07.05.2018) US
15/996,389 01 June 2018 (01.06.2018) US
- (71) **Applicant:** FINCH TECHNOLOGIES LTD.; Skelton Bay Lot, Building #10, 1st Floor, P.O. Box, Fish Bay, Tortola, VG1110 (VG).
- (71) **Applicant (for ZW only):** WARD, John P. [US/US]; 1900 University Ave, 5th Floor, East Palo Alto, California 94303 (US).
- (72) **Inventors; and**
(71) **Applicants:** ERIVANTCEV, Viktor Vladimirovich [RU/RU]; 207 Mendeleeva str., ap. 105, Ufa, 450071 (RU). LOBANOV, Alexander Sergeevich [RU/RU]; 5/3 Avro-ry str., ap. 11, Ufa, 450092 (RU). KARTASHOV, Alexey Ivanovich [RU/RU]; 98 Profsoyuznaya, bldg 9, ap. 84, Moscow, 117485 (RU). GONCHAROV, Daniil Ole-govich [RU/RU]; 16 Stepana Kuvikina, bldg 1, ap. 41, Ufa, 450092 (RU).
- (74) **Agent:** WARD, John P.; Greenberg Traurig, LLP, 77 West Wacker Dr, Suite 3100, Chicago, Illinois 60601 (US).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) **Title:** TRACKING USER MOVEMENTS TO CONTROL A SKELETON MODEL IN A COMPUTER SYSTEM

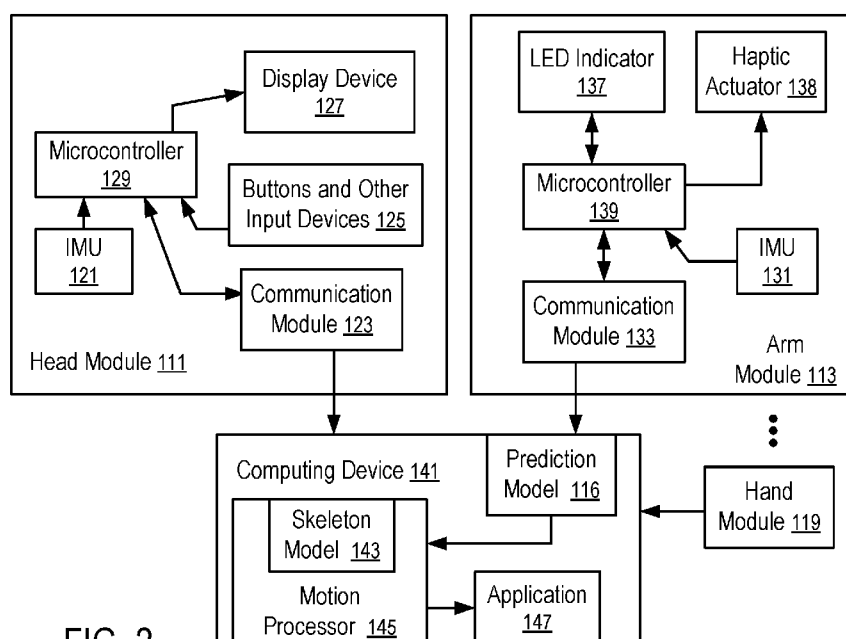


FIG. 2

(57) **Abstract:** A system having sensor modules and a computing device. Each sensor module has an inertial measurement unit attached to a portion of a user. An artificial neural network is used to make predictions of orientations of parts of the user based on the measurements for the inertial-based modules. For example, the artificial neural network can be trained to predict orientations measured using an optical tracking system based on orientations measured using inertial measurement units and/or to prediction orientation measurements of some rigid parts in a kinematic chain based on orientation measurements of other rigid parts in the kinematic chain. For example, the sensor modules can include different subsets that share a common sensor module; and the artificial neural network can be used to combine different predictions, made separately from the different subsets, for the common sensor module.





AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, 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, SA, 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, ST, 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:

20 February 2020 (20.02.2020)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2018/052092

A. CLASSIFICATION OF SUBJECT MATTER		
G06F 3/01 (2006.01) G06N 3/04 (2006.01) 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)		
G06F G06N		
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)		
PatSearch (RUPTO internal), USPTO, PAJ, K-PION, Esp@cenet, Information Retrieval System of FIPS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2018/0020978 A1 (KAIFOSH PATRICK) 25.01.2018, abstract, paragraphs [0042]-[0043], [0050], [0053]-[0054], [0060], [0067]-[0068], [0071], [0077]-[0078], [0088], [0090], [0092], [0104]-[0105], [0113]-[0118], [0120]-[0121], [0127], fig. 4, 6-8, 9A, 9B	1-7, 9, 10
Y		8
A		11-20
Y	US 5515477 A (SUTHERLAND, JOHN) 07.05.1996, col.28, lines 29-45	8
A	US 2012/0214594 A1 (MICROSOFT CORP) 23.08.2012	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 document 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		Date of mailing of the international search report
09 January 2020 (09.01.2020)		16 January 2020 (16.01.2020)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer A. Tokarev Telephone No. (495) 531-65-15