



(51) International Patent Classification:

G06N 3/08 (2006.01) G06K 9/62 (2022.01)
G06N 5/04 (2006.01)

(21) International Application Number:

PCT/US2022/017943

(22) International Filing Date:

25 February 2022 (25.02.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/153,811 25 February 2021 (25.02.2021) US

(71) Applicant: **NANOTRONICS IMAGING, INC.** [US/US];
2251 Front Street, Suite 110, Cuyahoga Falls, OH 44223
(US).

(72) Inventors: **PUTMAN, Matthew, C.**; 2251 Front
Street, Suite 110, Cuyahoga Falls, OH 44223 (US).
SUNDSTROM, Andrew; 2251 Front Street, Suite 110,
Cuyahoga Falls, OH 44223 (US). **LIMORE, Damas**; 2251
Front Street, Suite 110, Cuyahoga Falls, OH 44223 (US).
PINSKIY, Vadim; 2251 Front Street, Suite 110, Cuyahoga

Falls, OH 44223 (US). **NIRMALESWARAN, Aswin,
Raghav**; 2251 Front Street, Suite 110, Cuyahoga Falls, OH
44223 (US). **KIM, Eun-sol**; 2251 Front Street, Suite 110,
Cuyahoga Falls, OH 44223 (US).

(74) Agent: **WOLFE, Joseph** et al.; DLA Piper LLP US, 33
Arch Street, 26th Floor, Boston, MA 02110 (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, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, IT, JM, 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, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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,

(54) Title: IMITATION LEARNING IN A MANUFACTURING ENVIRONMENT

100

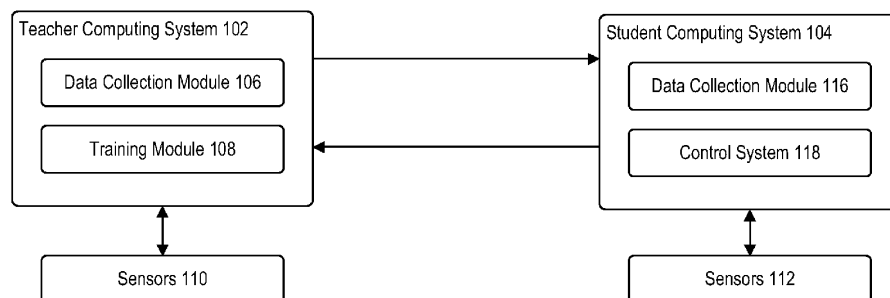


FIG. 1

(57) Abstract: A computing system identifies a trajectory example generated by a human operator. The trajectory example includes trajectory information of the human operator while performing a task to be learned by a control system of the computing system. Based on the trajectory example, the computing system trains the control system to perform the task exemplified in the trajectory example. Training the control system includes generating an output trajectory of a robot performing the task. The computing system identifies an updated trajectory example generated by the human operator based on the trajectory example and the output trajectory of the robot performing the task. Based on the updated trajectory example, the computing system continues to train the control system to perform the task exemplified in the updated trajectory example.

[Continued on next page]

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))