

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
04 August 2022 (04.08.2022)



(10) International Publication Number
WO 2022/164388 A1

(51) International Patent Classification:
G05B 13/04 (2006.01) *H02P 21/13* (2006.01)
G05B 11/42 (2006.01)

(21) International Application Number:
PCT/SG2022/050012

(22) International Filing Date:
14 January 2022 (14.01.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10202100932R 28 January 2021 (28.01.2021) SG
10202107052X 28 June 2021 (28.06.2021) SG

(71) Applicant: **NANYANG TECHNOLOGICAL UNIVERSITY** [SG/SG]; 50 Nanyang Avenue, Singapore 639798 (SG).

(72) Inventors: **ZUO, Yuefei**; c/o Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798 (SG). **XIE, Shuangchun**; c/o Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798 (SG). **LEE, Ho Tin**; c/

o Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798 (SG).

(74) Agent: **DAVIES COLLISON CAVE ASIA PTE. LTD.**; 10 Collyer Quay #07-01, Ocean Financial Centre, Singapore 049315 (SG).

(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, 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, 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,

(54) Title: ACTIVE DISTURBANCE REJECTION CONTROL SYSTEM

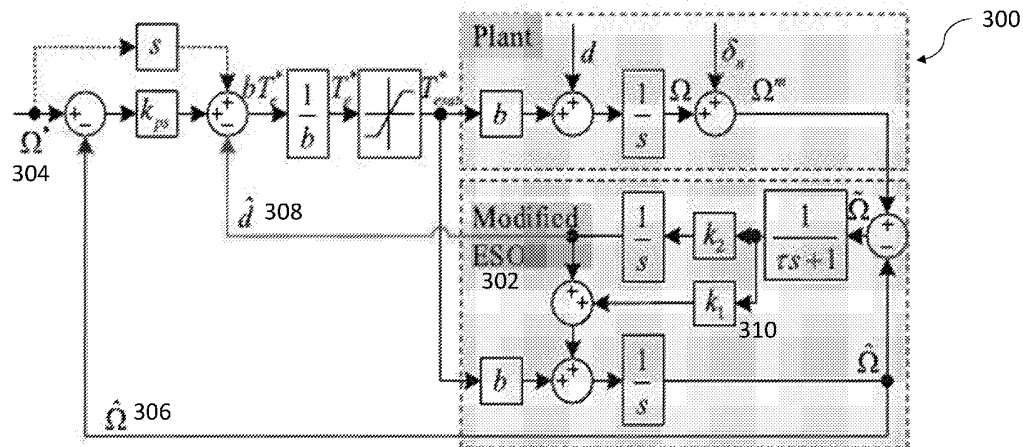


Figure 3

(57) Abstract: An active disturbance rejection control (ADRC) system, comprising an ex-tended state observer (ESO) module that is configured to receive input information comprising a torque reference signal for driving a motor, and an angular position that is a measured output of the motor; determine, based on the input information, an estimated speed value and an estimated disturbance value; and send the estimated speed value as a feedback control signal, and the estimated disturbance value as a feedforward control signal; wherein the estimated speed value is based on a derivative of the angular position, and the estimated disturbance value is an output of a proportional-integral (PI) controller of the ESO module.

[Continued on next page]

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, 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))*
— *in black and white; the international application as filed
contained color or greyscale and is available for download
from PATENTSCOPE*