

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
07 May 2020 (07.05.2020)



(10) International Publication Number
WO 2020/088962 A1

- (51) **International Patent Classification:**
G06Q 10/02 (2012.01) *G06N 3/08* (2006.01)
- (21) **International Application Number:**
PCT/EP2019/078491
- (22) **International Filing Date:**
21 October 2019 (21.10.2019)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
1860075 31 October 2018 (31.10.2018) FR
- (71) **Applicant:** AMADEUS S.A.S. [FR/FR]; 485 Route du Pin Montard, 06410 BIOT - Sophia Antipolis (FR).
- (72) **Inventors:** ACUNA AGOST, Rodrigo Alejandro; c/o Amadeus S.A.S., 485, Route du Pin Montard, 06410 BIOT - Sophia-Antipolis (FR). FIIG, Thomas; c/o Amadeus S.A.S., 485, Route du Pin Montard, 06410 BIOT - Sophia-Antipolis (FR). BONDOUX, Nicolas; c/o Amadeus S.A.S., 485, Route du Pin Montard, 06410 BIOT - Sophia-Antipolis (FR). NGUYEN, Anh-Quan; c/o Amadeus S.A.S., 485, Route du Pin Montard, 06410 BIOT - Sophia-Antipolis (FR).
- (74) **Agent:** SAMSON & PARTNER PATENTANWÄLTE MBB; Widenmayerstr. 6, 80538 Muenchen (DE).

(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, 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))

(54) **Title:** REINFORCEMENT LEARNING SYSTEMS AND METHODS FOR INVENTORY CONTROL AND OPTIMIZATION

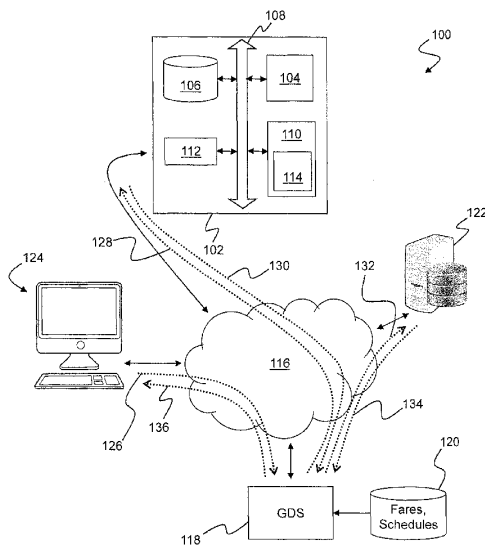


Figure 1

(57) **Abstract:** A method of reinforcement learning for a resource management agent in a system for managing an inventory of perishable resources having a sales horizon, while seeking to optimize revenue generated therefrom. The inventory has an associated state. The method comprises generating a plurality of actions. Responsive to the actions, corresponding observations are received, each observation comprising a transition in the state associated with the inventory and an associated reward in the form of revenues generated from sales of the perishable resources. The received observations are stored in a replay memory store. A randomised batch of observations is periodically sampled from the replay memory store according to a prioritised replay sampling algorithm wherein, throughout a training epoch, a probability distribution for selection of observations within the randomised batch is progressively adapted. Each randomised batch of observations is used to update weight parameters of a neural network that comprises an action-value function approximator of the resource management agent, such that when provided with an input inventory state and an input action, an output of the neural network more closely approximates a true value of generating the input action while in the input inventory state. The neural network may thereby be used to select each of the plurality of actions generated depending upon a corresponding state associated with the inventory.

WO 2020/088962 A1