

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
08 July 2021 (08.07.2021)



(10) International Publication Number
WO 2021/137111 A1

(51) International Patent Classification:
G06K 9/00 (2006.01) *G06T 7/50* (2017.01)

(21) International Application Number:
PCT/IB2020/062376

(22) International Filing Date:
23 December 2020 (23.12.2020)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
16/732,424 02 January 2020 (02.01.2020) US

(71) Applicant: **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, New York, 10504 (US).

(71) Applicants (for MG only): **IBM UNITED KINGDOM LIMITED** [GB/GB]; PO Box 41, North Harbour, Portsmouth Hampshire PO6 3AU (GB). **IBM (CHINA) INVESTMENT COMPANY LIMITED** [CN/CN]; 25/F, Pangu Plaza, No. 27, Cental North 4th Ring Road, Chaoyang District, Beijing 100101 (CN).

(72) Inventors: **ZHOU, Bing**; IBM Corporation, PO Box 218, 1101 Kitchawan Road, Yorktown Heights, New York, 10598 (US). **GUVEN, Sinem**; IBM Corporation, PO Box 218, 1101 Kitchawan Road, Yorktown Heights, New York,

10598 (US). **TAO, Shu**; IBM Corporation, Intellectual Property Law, PO Box 218, 1101 Kitchawan Road, Yorktown Heights New York, 10598 (US).

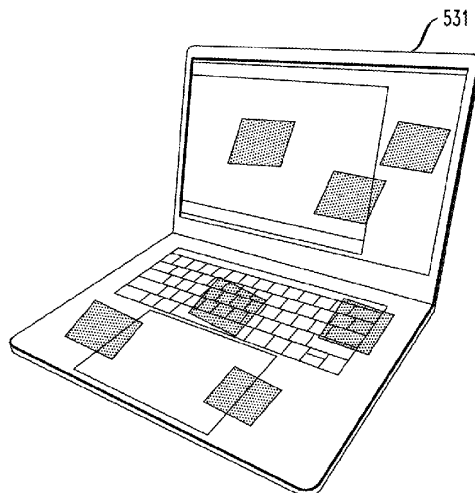
(74) Agent: **GRAHAM, Timothy**; IBM United Kingdom Limited, Intellectual Property Law, Hursley Park, Hursley, Winchester Hampshire SO21 2JN (GB).

(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: FINE-GRAINED VISUAL RECOGNITION IN MOBILE AUGMENTED REALITY

FIG. 6H



(57) Abstract: Obtain access to a three-dimensional point cloud representation of an object including poses of a scanning digital camera and corresponding video frames. Down-sample the three-dimensional point cloud representation to obtain a set of region-of-interest candidates. Filter the region-of-interest candidates to select those of the region-of-interest candidates having appearance changes, which distinguish different visual states, as selected regions of interest, based at least in part on the poses of the camera. Generate region of interest images for the selected regions of interest from corresponding ones of the video frames; and train a deep learning recognition model based on the region of interest images. the trained deep learning recognition model can be used, for example, to determine a visual state of the object for repair instructions.

WO 2021/137111 A1

[Continued on next page]

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))*
- *in black and white; the international application as filed
contained color or greyscale and is available for download
from PATENTSCOPE*