



(51) International Patent Classification:

<i>G02B 27/01</i> (2006.01)	<i>H04N 7/15</i> (2006.01)
<i>G06F 3/01</i> (2006.01)	<i>G06N 3/04</i> (2023.01)
<i>G06F 3/0481</i> (2022.01)	<i>G06T 15/04</i> (2011.01)
<i>G06F 3/0482</i> (2013.01)	<i>G06T 15/20</i> (2011.01)
<i>G06T 19/00</i> (2011.01)	<i>G06T 17/20</i> (2006.01)
<i>G06T 19/20</i> (2011.01)	<i>G10L 17/00</i> (2013.01)
<i>H04N 7/14</i> (2006.01)	<i>H04L 12/18</i> (2006.01)

(21) International Application Number:

PCT/IB2022/054350

(22) International Filing Date:

10 May 2022 (10.05.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/201,713 10 May 2021 (10.05.2021) US

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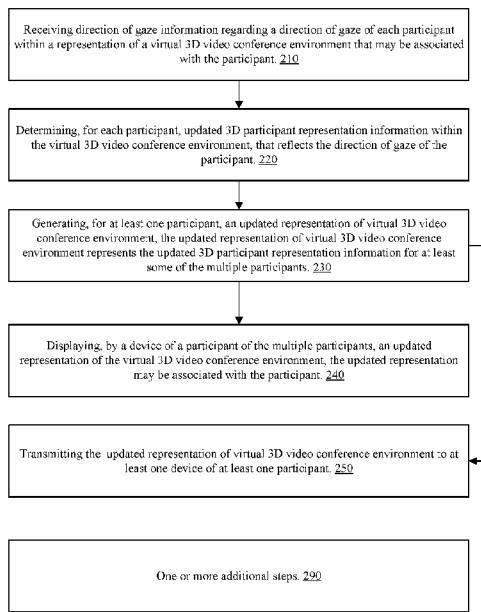
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, 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, 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: METHOD AND SYSTEM FOR VIRTUAL 3D COMMUNICATIONS



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FIG. 1

(57) Abstract: There may be provided a method for conducting a three dimensional (3D) video conference between multiple participants, the method may include acquiring visual information, by a visual sensing unit related to a certain participant; identifying multiple persons that appear in the visual information; finding, out of the multiple persons, at least one relevant person; determining 3D entity representation information, for each of the at least one relevant person; and generating, for at least one participant, a representation of a virtual 3D video conference environment, based on the 3D entity representation information for each of the at least one relevant person.



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

(88) Date of publication of the international search report:

12 January 2023 (12.01.2023)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB22/54350

A. CLASSIFICATION OF SUBJECT MATTER
 IPC - INV. G02B 27/01; G06F 3/01; G06F 3/0481; G06F 3/0482; G06T 19/00; G06T 19/20; H04N 7/14; H04N 7/15 (2022.01)
 ADD. G06N 3/04; G06T 15/04; G06T 15/20; G06T 17/20; G10L 17/00; H04L 12/18 (2022.01)
 CPC - INV. G02B 27/01; G06T 19/006; G06T 19/20; H04N 7/157; H04N 13/243; H04R 27/00; H04S 7/303
 ADD. G06F 3/013; G06N 3/04; G06N 3/0454; G06T 7/11; G06T 15/04; G06T 15/205; G06T 17/20; H04N 7/147
 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)
 See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	US 2019/0253667 A1 (PCMS HOLDING INC.) 15 August 2019; abstract; figures 1, 3, 9, 10, 11, 16, 19; paragraphs [0004], [0005], [0020], [0022], [0025], [0050], [0058], [0059], [0062], [0067]-[0069], [0109], [0134], [0161], [0204]	1, 4, 7, 11, 13, 15, 102 --- 2, 3, 5, 6, 12 --- 8-10, 14
Y	US 2010/0085415 A1 (RAHMAN, M) 08 April 2010; abstract; figures 2, 3; paragraphs [0004], [0020]-[0023], [0025], [0026]	2, 5, 6, 12
Y	US 10,904,481 B1 (FACEBOOK, INC.) 26 January 2021; abstract; column 2, lines 1-30	3
A	US 10,356,364 B2 (BADER-NATAL, A et. al) 16 July 2019; abstract; column 2, lines 18-57	8, 9
A	US 9,930,270 B2 (MICROSOFT TECHNOLOGY LICENSING LLC) 27 March 2018; abstract; figures 8A, 8B	10
A	US 2019/0173926 A1 (MITEL NETWORKS CORPORATION) 06 June 2019; abstract; figure 4; paragraphs [0039]-[0045]	14

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

"D" document cited by the applicant in the international application

"E" earlier application or patent 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

14 October 2022 (14.10.2022)

Date of mailing of the international search report

DEC 02 2022

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/B22/54350

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Supplemental Page-***-

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-15, 102

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

-***-Continued From Box No. III: Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-15 and 102 are directed towards a method comprising: finding at least one relevant person.

Group II: Claims 16-43 and 103 are directed towards a method comprising: receiving direction of gaze information.

Group III: Claims 44-55 and 104 are directed towards a method for sharing content.

Group IV: Claims 56-67 and 105 are directed towards a method for foreground and background segmentation.

Group V: Claims 68-79 and 106 are directed towards a method comprising: generating a second participant 3D representation under different constraints.

Group VI: Claims 80-91 and 107 are directed a method audio quality improvement.

Group VII: Claims 92-101 and 108 are directed a method for predicting behavior changes.

The inventions listed as Groups I-VII do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include at least finding, out of the multiple persons, at least one relevant person; determining 3D entity representation information, for each of the at least one relevant person; and generating, for at least one participant, a representation of a virtual 3D video conference environment, based on the 3D entity representation information for each of the at least one relevant person, which are not present in Groups II-VII.

The special technical features of Group II include at least receiving direction of gaze information regarding a direction of gaze of each participant within a representation of a virtual 3D video conference environment; estimating whether a gaze of a certain participant is aimed towards a person located within a field of view of a visual sensing unit that also captures at least a head of the participant; deciding whether a 3D representation of the person should appear within the virtual 3D video conference environment; that reflects the direction of gaze of the participant; wherein the determining, for the certain participant, of the updated 3D participant representation information, is responsive to an outcome of the estimating and the deciding, which are not present in Groups I & III-VII.

The special technical features of Group III include at least a method for sharing content during a virtual 3D video conference, the method comprises: inviting multiple participants to join a virtual 3D video conference; creating a shared folder dedicated for storing shared content items, wherein the shared content is accessible during at least during the virtual 3D video conference; enabling access, to the multiple participants, to the shared folder; wherein the access is governed by one or more access control rule; wherein conducting comprises sharing at least one of the content items, which are not present in Groups I-II & IV-VII.

The special technical features of Group IV include at least a method for foreground and background segmentation related to a virtual three-dimensional (3D) video conference, the method comprises: segmenting each image of multiple images of a video stream, to segments, each segment has one or more properties that are constant; determining temporal properties of the segments; classifying each segment as a background segment or a foreground segment, based at least in part, on the temporal properties of the segments, which are not present in groups I-III & V-VII.

The special technical features of Group V include at least receiving by a user device of a first participant of the virtual 3D video conference, reference second participant 3D representation information for generating a second participant 3D representation under different constraints; wherein the different constraints comprise at least one out of (a) a touch up constraint, (b) a makeup constraint, and (c) one or more circumstances constraint; receiving, by the user device of the first participant and during the 3D video conference call, second participant constraints metadata indicative of one or more current constraints regarding a second participant; updating, based on the second participant constraints metadata, and by the user device of the first participant, a 3D participant representation of the second participant; and generating an avatar of the second participant based on 3D participant representation information of the second participant, which are not present in Groups I-IV & VI-VII.

The special technical features of Group VI include at least a method audio quality improvement related to a participant of a virtual three dimensional (3D) video conference, the method comprises: determining participant generated audio, by a machine learning process and based on image analysis of a video of the participant obtained during the virtual 3D video conference; and generating participant related audio information based at least on the participant generated audio; wherein the participant related audio information, once provided to a computerized system of another participant, causes the computerized system of the other participant to generate participant related audio of higher quality than participant audio when the participant audio is included in sensed audio that is sensed by an audio sensor that is associated with the participant, which are not present in Groups I-V & VII.

The special technical features of Group VII include at least a method for predicting behavior changes of a participant of a virtual three dimensional (3D) video conference, the method comprises: determining, for each part of multiple parts of the virtual 3D video conference, and by a first computerized unit, (a) a participant behavioral predictor to be applied by a second computerized unit during the part of the virtual 3D video conference, (b) one or more prediction inaccuracies related to the applying of the participant behavioral predictor during the part of the virtual 3D video conference, and (c) whether to generate and transmit to the second computerized unit prediction inaccuracy metadata that is indicative of at least one prediction inaccuracy that affects a representation of the participant within a virtual 3D video conference environment presented to another participant of the virtual 3D video conference during the part of the virtual 3D video conference; and generating and transmitting to the second computerized unit the prediction inaccuracy metadata, when determining to generate and transmit to the second computerized unit prediction inaccuracy metadata, which are not present in Groups I-VI.

The common technical features shared by Groups I-VII are a method for conducting a three dimensional (3D) video conference between multiple participants, the method comprising: acquiring visual information, analyzing the visual information; generating, for at least one participant, a representation of a virtual 3D video conference environment, based on the 3D entity representation information; determining, for each participant, updated 3D participant representation information within the virtual 3D video conference environment;

-***-Continued Within the Next Supplemental Box-***-

-***-Continued from previous Supplemental Box-***-

and generating, for at least one participant, an updated representation of virtual 3D video conference environment, the updated representation of virtual 3D video conference environment represents the updated 3D participant representation information.

However, these common features are previously disclosed by US 2014/0033044 A1 to XMOBB, INC, (hereinafter "XMOBB").

XMOBB discloses a method for conducting a 3D video conference between multiple participants (a three-dimensional platform to enable friends to interact within a three-dimensional social venue; Abstract; para [0042]), the method comprising: acquiring visual information, analyzing the visual information (acquiring field of view position and orientation from a streaming video of a user; para [0077]); generating, for at least one participant, a representation of a virtual 3D video conference environment, based on the 3D entity representation information (users in virtual scene are represented as avatars; para [0067]); determining, for each participant, updated 3D participant representation information within the virtual 3D video conference environment and generating, for at least one participant, an updated representation of virtual 3D video conference environment, the updated representation of virtual 3D video conference environment represents the updated 3D participant representation information (platform three-dimensionally transforms content of streaming video in real time to each user consistent with user's unique relative position and orientation; para [0077]).

Since the common technical features are previously disclosed by the XMOBB reference, these common features are not special and so Groups I-VII lack unity.