



(51) International Patent Classification:

G06F 3/01 (2006.01) G06K 9/00 (2006.01)
G06F 3/03 (2006.01)

(21) International Application Number:

PCT/GB2019/000120

(22) International Filing Date:

19 August 2019 (19.08.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1813450.2 17 August 2018 (17.08.2018) GB

(72) Inventor; and

(71) Applicant: **HILTERMANN, Sean** [GB/GB]; Flat 7, The Pavillions, 35A Brighton Road, South Croydon, CR2 6EB (GB).

(74) Agent: **FRY, David John**; Agile IP LLP, Airport House, Purley Way, Croydon, London, CR0 0XZ (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, 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))
- 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))

(54) Title: AUGMENTED REALITY DOLL

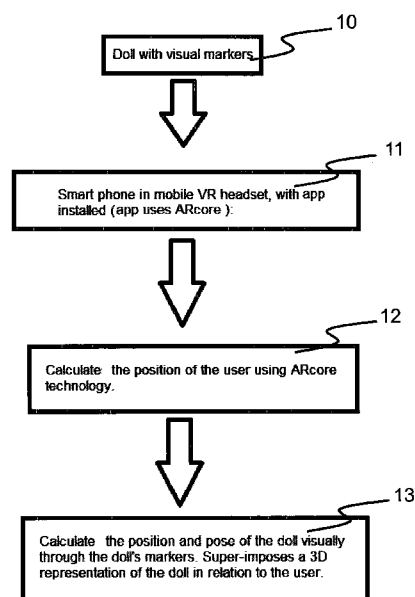


Fig. 1

(57) **Abstract:** A system and method for augmenting the visual representation of a visualised object with a different overlaid visualisation in a seamless lifelike manner, comprising: means arranged to provide information on the location and motion of each movable part of the object; image acquisition means arranged to acquire images and video of the object; processing means arranged to calculate three dimensional distance and position of the movable parts and of the object; image processing means arranged to generate an overlay image into the same space as the object; display means to display the overlaid image. The system may be self-contained in a smartphone based Virtual Reality headset.



AUGMENTED REALITY DOLL

Field of the Invention

This invention relates to system and method that augments or changes,
5 swaps the visual representation and perception of a human or that of an
inanimate object with a different visualisation in a seamless life like manner.
More specifically the invention uses image and video capturing, processing
and display, as well as a virtual reality representation.

Background to the invention

Virtual Reality (VR) and Augmented Reality (AR) offer the possibility of
visually immersing users in virtually other worlds. However, their limitation is
that they offer only visual stimulation.

The inventor herewith presents an invention that connects the virtual visual
15 world to the physical tactile environment close to them.

Summary of the Invention

According to a first aspect of the invention there is provided a system for
augmenting the visual representation of a visualised object with a different
20 overlaid visualisation in a seamless lifelike manner, comprising:

means arranged to provide information on the location and motion of
each movable part of the object;

image acquisition means arranged to acquire images and video of the
object;

25 processing means arranged to calculate three dimensional distance
and position of the movable parts and of the object;

image processing means arranged to generate an overlay image into the same space as the object;

display means to display the overlaid image.

- 5 Wherein the means may be arranged to provide information on the location and motion of each movable part of the object are markers with different appearances or colours to each movable part of the object;

wherein image acquisition means may be arranged to acquire images and video of the object with markers.

10

Wherein the object may be covered in a bodysuit.

- In a further embodiment the system, the means may be arranged to provide information on the location and motion of each movable part of the object
15 are inertial measurement units embedded inside each movable part of the object;

wherein the image acquisition means may be arranged to acquire images and video of the object and of its movable parts.

- 20 In a further embodiment the system, the means may be arranged to provide information on the location and motion of each movable part of the object are rotary encoders arranged to acquire the angle of each movable part embedded inside each movable part of the object;

- wherein the image acquisition means may be arranged to acquire
25 images and video of the object and of its movable parts.

- In a further embodiment the system, the means may be arranged to provide information on the location and motion of each movable part of the object are based on chroma key methodology,

- 30 wherein the image acquisition means may be arranged to acquire images and video of the object and of its movable parts;

and the image is post-processed to replace a particular colour with a predefined visual feature.

5 In a further embodiment the system, wherein the processing, image acquisition and displaying may be performed with a smartphone based Virtual Reality headset.

The object may be a toy.

10 The object may be object may an adults' doll.

The bodysuit may be arranged to be suitable and wearable for a human.

15 A further embodiment of the invention presents a method for augmenting the visual representation of a human or of an inanimate object with a different overlaid visualisation in a seamless lifelike manner, comprising the system of claims 1 to 11.

Brief Description of the Drawings

20 The invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a dataflow diagram of a system in accordance with an embodiment of the invention that employs visual markers;

25 Figure 2 shows a dataflow diagram of a system in accordance with an embodiment of the invention that employs inertial measurement units (IMU);

Figure 3 shows a dataflow diagram of a system in accordance with an embodiment of the invention that employs rotary encoders;

Figure 4 illustrates the use of a chroma key suit in the invention.

Detailed Description of the Invention

Below are presented embodiments and methods of achieving the invention:

1. Children's Toy

The invention presents a toy, such as a doll, modified or added on to with
5 the goal of being overlaid with a 3D computer generated model of similar
proportions or effect in a virtual reality (VR) or augmented reality (AR)
environment. The overlay model is so closely aligned with the physical toy
that the user is able to feel the sensation of touching the overlay model.
Essentially the overlay model or effect occupies the same space in the
10 virtual reality / augmented reality environment that the physical toy does in
the real world. It is possible to attach computer generated effects to the toys
such as flames or goo, which is visible in virtual reality / augmented reality,
without there actually being any flames or goo in the physical world. A usage
example for this is standard "tanks and army men" toys having virtual fire
15 emitted from the tip of their guns to simulate gunshots.

A first aspect of the invention is achieved with optical markers. Referring to
Figure 1, various markers with different appearances or colours are attached
to each movable part of a toy, e.g. of a doll. The VR headset can be a
smartphone VR headset with embedded cameras with which to acquire the
20 optical markers on the toy (10). A smart device application (App) is installed
on the smartphone (11). The smartphone app displays the computer-
generated overlay and uses the image acquired by the camera feed to
perform calculations for positioning the computer-generated overlay into the
same space as the toy (12). Each movable part of the toy has different
25 markers. When the smartphone's camera detects a marker denoting for
example the loader of a toy bulldozer, the smartphone app will position a
computer generated overlay of dirt and dust falling, into the position of the
physical toy's loader to make it appear that the toy bulldozer's loader is
overflowing with dirt. Calculations are done with the angle of the marker and
30 the distance it is from the camera to achieve this positioning. Calculate the

position and pose of the toy and superimpose a 3D representation of the toy in relation to the user (13).

This is done with every marker detected on the camera feed to position each corresponding moveable part of the computer-generated overlay. Measure
5 distance and angle from the user. For example, if the toy bulldozer's loader is 2m from the camera and at a 30-degree angle, then the computer-generated overlay is positioned at 2m from the user and at a 30-degree angle in virtual reality / augmented reality space. The app also displays the computer-generated overlay and also does the calculations.

10

A second aspect of the invention is achieved with inertial measurement unit (IMU).

Referring to Figure 2, an inertial measurement unit (IMU) is embedded inside each movable part of the toy (20).

15 Each IMU will record the current angle and position of each movable part. This information is sent wirelessly, e.g. via Wi-Fi or Bluetooth to the app (21). The app will set the angle and position of the computer-generated overlays to correspond with the toy and its movable parts (22).

20 Calculate the position and pose of the doll via the IMUs and superimpose a 3D representation of the doll in relation to the user (23). For example, if the toy is 2m in front from the user, the computer-generated overlay will appear 2m in front of the user in virtual reality / augmented reality space. The IMUs will require a portable power source also embedded into the toy and will have an access point for charging.

25

A third aspect of the invention is achieved with Encoders.

Rotary encoders are used to store the angle of each movable part of the toy. In the case of the arm of a toy excavator a rotary encoder is embedded in

each joint of the excavator's arm and will store the angle of each joint on a microcontroller (30). The rotary encoders are connected by wire to a microcontroller which will send the data from the movable joints to a computer or smartphone (31). Also embedded in the toy is a single IMU for positional tracking, and a portable power supply with an access point for charging. The IMU will send positional information to a computer or smartphone where the app will calculate the pose of the entire toy (32) using the skeleton data and positional data, and display the computer generated overlay for the toy in virtual reality / augmented reality space for the user (33).

The system is open to accept a large number of encoders and computer boards they may be needed, or if the IMU will need to be connected.

Possibly microcontrollers / Arduino boards may be employed.

15 A fourth aspect of the invention is named Post-processing.

This method is useful for making a toy look like a cartoon. The toy will need to be physically extremely similar to the target cartoon. Each movable part of the toy is a different colour. If two segments are directly connected, for example the loader and the arm of a toy excavator, there is a strip of additional colour between them (in this case, at the joint). This additional colour is the same between every directly connected segment. the app uses the smartphone's camera feed to detect when two different colours are next to each other. If two different colours are next to each other, and neither of them is the "additional colour", then a black outline is drawn between them.

25 All colours not including the background and outlines is replaced with the corresponding cartoon colour.

There are two aims to this system.

1: To add computer generated effects like fire to a toy to make it seem more realistic. For example, instead of a toy soldier having a plastic moulded muzzle flash it can have a computer-generated muzzle flash.

2: To make the toy more like the object they are meant to represent with computer graphics. For example, a plastic toy soldier can become a realistic-looking computer generated soldier who blinks and breaths. In another example, a toy that is meant to be the likeness of a cartoon character from television can match the show's cartoon art style much more closely when it is overlaid with computer graphics.

10

2. Adult Doll

A further embodiment of the invention may be for example for enhancing adults' interactions with a sex doll.

A sex doll is modified or added on to with the goal of being overlaid with a humanoid 3D computer generated model in a virtual reality (VR) or augmented reality (AR) environment. The overlay model is so closely aligned with the physical doll that the user is able to feel the sensation of touching the overlay model. Essentially the overlay doll will occupy the same space in the VR / AR environment that the physical doll does in the real world.

20

A fifth aspect of the invention is achieved with optical markers. This is similar to the first aspect of the invention.

Referring again to Figure 1, various markers with different appearances or colours is attached to the doll to denote each body part. The VR headset can be a smartphone-based VR headset with embedded cameras with which to acquire the optical markers on the toy (10). Other types of VR headset may also be used. A smart device application (App) is installed on the smartphone (11). The smartphone app will display the overlay model and

use the camera feed to perform calculations for positioning the overlay model into the same space as the doll (12). Each limb of the doll will have different markers. When the smartphone's camera detects a marker denoting the right arm the smartphone app will position the overlay model's right arm into the position of the doll's right arm. Calculations are done with the angle of the marker and the distance it is from the camera to achieve this positioning. This is done with every marker detected on the camera feed to position each corresponding limb of the overlay model. Calculate the position and pose of the toy and superimpose a 3D representation of the doll in relation to the user (13).

For example, if the doll's right arm is 2m from the camera and at a 30-degree angle, then the overlay model's right arm is positioned at 2m from the user and at a 30-degree angle in virtual reality / augmented reality space.

A sixth aspect of the invention is achieved with inertial measurement unit (IMU).

Referring to Figure 2, an inertial measurement unit (IMU) is embedded inside each limb or movable part of the doll (20).

Each IMU will record the current angle and position of limb or movable part e.g. via Wi-Fi or Bluetooth to the app (21).

The visual features of a human model have been previously acquired and are in a library of the software, i.e. the app.

The app will set the angle and position of the computer-generated overlays to correspond with the toy and its movable parts (22).

The app will set the angle and position of the overlay model's limbs to be the same as the doll. Calculate the position and pose of the doll via the IMUs and superimpose a 3D representation of the doll in relation to the user (23). For example, if the doll is 2m in front from the user, the overlay model will

appear 2m in front of the user in virtual reality / augmented reality space. The IMUs comprises a portable power source also embedded into the doll and will have an access point for charging. Various setups of IMU, power and Wi-Fi or wireless system may be used.

5

A seventh aspect of the invention is achieved with Encoders similar to the third aspect.

A humanoid skeleton is made from thin metal rods for the bones, and rotary encoders for the joints. In the case of the shoulder joint (where the arm's movement can move up and down as well as side to side) two rotary encoders can be joined in close proximity to determine both horizontal and vertical rotation of the joint. In the case of single direction joints like the knees, only one rotary encoder is needed for the joint. The whole system of rotary encoders and metal rods is the size of the doll's skeleton. The doll's silicone is moulded around the skeleton to embed the skeleton inside the doll. The rotary encoders are connected by wire to a computer board which will send the data from the skeleton to a computer or smartphone. Also embedded in the doll are an IMU for positional tracking, and a portable power supply with an access point for charging. The IMU will send positional information to a computer or smartphone where the app will calculate the pose of the entire doll using the skeleton data and positional data, and display the resulting overlay model in virtual reality / augmented reality space for the user.

25 An eighth aspect of the invention is similar to the fourth aspect named Post-processing.

This method is most useful for making the doll appear as a cartoon with simple colours and outlines. The doll will need to be physically extremely similar to the target overlay model. Each limb of the doll is a different colour.

- The different colour segments are: Left forearms, left upper arms, Left hand, Right forearms, Right upper arms, Right hand. Left upper legs, left lower legs, left foot, right upper legs, right lower legs, Right foot, Head, Neck, left breast, Right breast, Abdominal area, Chest area, Pelvic area and Each
- 5 phalanx of each finger and toe will all have separate colours. If two segments are directly connected, for example the right forearm and right upper arm, there is a strip of additional colour between them (in this case, at the elbow). This additional colour is the same between every segment. the app uses the smartphone's camera feed to detect when two different colours
- 10 are next to each other. If two different colours are next to each other, and neither of them is the "additional colour", then a black outline is drawn between them. This will produce the cartoon-style black outline around the cartoon. All colours not including the background and outlines is replaced with cartoon skin tone.
- 15 The doll's silicone may be dyed before casting it solid or the colouring might be applied to the doll after casting.

A ninth aspect of the invention is achieved with Chroma Key method.

- This method is most useful for making the doll appear as a cartoon with
- 20 simple colours and outlines. The doll is coloured with one solid "chroma key" colour and the user's smartphone will apply a post-process to the camera feed to replace that colour with cartoon skin tone. The doll will need to be brightly illuminated by a light mounted to the VR headset. This will give the "chroma key" colour an even lighting which will fall off near the edges of the
- 25 doll. This dimming near the edges will produce a vague outline so that the user can tell the shape of the doll, or for example when the dolls arm passes in front of its torso.

- Figure 4 is a similar example of a person in a "chroma key" suit (40). The shadows around the fingers show where the hand is in front of the wearer.
- 30 Usually the wearer of a chroma key suit would want even lighting all around

them to remove all shadows, but for this solution the lighting needs to be placed in front of the doll (mounted on the VR headset) to produce these shadows so that the user can still tell the shape of the doll in cases like this.

In most of these methods there will also be a way of determining the position
5 of the doll's face. This could be done with an IMU or a visual marker. This will allow a face with moving features like blinking to be overlaid on the doll.

3. A Bodysuit

A further embodiment of the invention proposes a bodysuit. There are two
10 main users for this product: A "wearer" and a "viewer".

A silicone body suit is modified or added on to with the goal of being overlaid with a humanoid 3D computer generated model in a virtual reality (VR) or augmented reality (AR) environment. The wearer will wear the suit while the viewer uses a smartphone VR headset to view the overlay model. The
15 overlay model is so closely aligned with the wearer of the suit that the viewer with a smartphone VR headset is able to feel the sensation of touching the overlay model, while the overlay model is controlled by the wearer. Essentially the overlay model will occupy the same space in the VR / AR environment that the wearer does in the real world.

20

Method 1: (Optical marker method) - Various markers with different appearances or colours is attached to the body suit to denote each body part. The VR headset will need to be a smartphone VR headset because they have cameras with which to see the optical markers on the suit. The
25 app will need to be installed on the smartphone. The smartphone app will display the overlay model and use the camera feed to perform calculations for positioning the overlay model into the same space as the suit. Each limb of the suit will have different markers. When the smartphone's camera detects a marker denoting the right arm the smartphone app will position the

overlay model's right arm into the position of the suit's right arm. Calculations is done with the angle of the marker and the distance it is from the camera to achieve this positioning. This is done with every marker detected on the camera feed to position each corresponding limb of the overlay model. For example, if the suit's right arm is 2m from the camera and at a 30-degree angle, then the overlay model's right arm is positioned at 2m from the viewer and at a 30-degree angle in virtual reality / augmented reality space.

The app also displays the overlay model. Different types of markers with various appearances may be employed. The app also does the calculations.

10

Method 2: (Post-processing) - This method is most useful for making the wearer appear as a cartoon with simple colours and outlines. The wearer of the suit should be physically extremely similar to the target overlay model. Each limb of the suit is a different colour. The different colour segments are: Left forearms, left upper arms, Left hand, Right forearms, Right upper arms, Right hand. Left upper legs, left lower legs, left foot, right upper legs, right lower legs, Right foot, Head, Neck, left breast, Right breast, Abdominal area, Chest area, Pelvic area and Each phalanx of each finger and toe will all have separate colours. If two segments are directly connected, for example the right forearm and right upper arm, there is a strip of additional colour between them (in this case, at the elbow). This additional colour is the same between every segment. the app uses the smartphone's camera feed to detect when two different colours are next to each other. If two different colours are next to each other, and neither of them is the "additional colour", then a black outline is drawn between them. This will produce the cartoon-style black outline around the cartoon. All colours not including the background and outlines is replaced with cartoon skin tone.

The body suit's silicone may be dyed before casting it solid or the colouring might be applied to the body suit after casting.

30

Method 3: (Chroma Key method) - This method is most useful for making the wearer appear as a cartoon with simple colours and outlines. The suit is coloured with one solid "chroma key" colour and the viewer's smartphone will apply a post-process to the camera feed to replace that colour with cartoon skin tone. The wearer of the suit will need to be brightly illuminated by a light mounted to the viewer's VR headset. This will give the "chroma key" colour an even lighting which will fall off near the edges of the suit. This dimming near the edges will produce a vague outline so that the viewer can tell the shape of the wearer, or for example when the wearer's arm passes in front of its torso

Figure 4 is a similar example of a person in a "chroma key" suit (40). The shadows around the fingers show where the hand is in front of the wearer. Usually the user of a chroma key suit would want even lighting all around them to remove all shadows, but for this solution the lighting needs to be placed in front of the wearer (mounted on the VR headset) to produce these shadows so that the viewer can still tell the shape of the wearer in cases like this.

In most of these methods there will also be a way of determining the position of the doll's face. This could most easily be done with visual markers. This will allow a face with moving features like blinking to be overlaid on the doll. Possibly an existing solution for "facial motion capture" could be used.

CLAIMS:

1. A system for augmenting the visual representation of a visualised object with a different overlaid visualisation in a seamless lifelike manner,
5 comprising:
means arranged to provide information on the location and motion of each movable part of the object;
image acquisition means arranged to acquire images and video of the object;
10 processing means arranged to calculate three dimensional distance and position of the movable parts and of the object;
image processing means arranged to generate an overlay image into the same space as the object;
display means to display the overlaid image.
15
2. The system of claim 1, wherein the means arranged to provide information on the location and motion of each movable part of the object are markers with different appearances or colours to each movable part of the object;
20 wherein image acquisition means arranged to acquire images and video of the object with markers.
3. The system of claim 2, wherein the object is covered in a bodysuit.
- 25 4. The system of claim 1, wherein the means arranged to provide information on the location and motion of each movable part of the object are inertial measurement units embedded inside each movable part of the object;
wherein the image acquisition means are arranged to acquire images
30 and video of the object and of its movable parts.

5. The system of claim 1, wherein the means arranged to provide information on the location and motion of each movable part of the object are rotary encoders arranged to acquire the angle of each movable part embedded inside each movable part of the object;
- 5 wherein the image acquisition means are arranged to acquire images and video of the object and of its movable parts.
6. The system of claim 1, wherein the means arranged to provide information on the location and motion of each movable part of the object
10 are based on chroma key methodology,
wherein the image acquisition means are arranged to acquire images and video of the object and of its movable parts;
and the image is post-processed to replace a particular colour with a predefined visual feature.
- 15
7. The system of claim 6, wherein the object is covered in a bodysuit.
8. The system of anyone of the above claims, wherein the processing, image acquisition and displaying is performed with a smartphone based
20 Virtual Reality headset.
9. The system of anyone of the above claims, wherein the object is a toy.
10. The system of anyone of claims 1 to 8, wherein the object is an adults'
25 doll.
11. The system of claims 3 and 7, wherein the bodysuit is arranged to be wearable for a human.
- 30 12. A method for augmenting the visual representation of a human or of an inanimate object with a different overlaid visualisation in a seamless lifelike manner, comprising the system of claims 1 to 11.

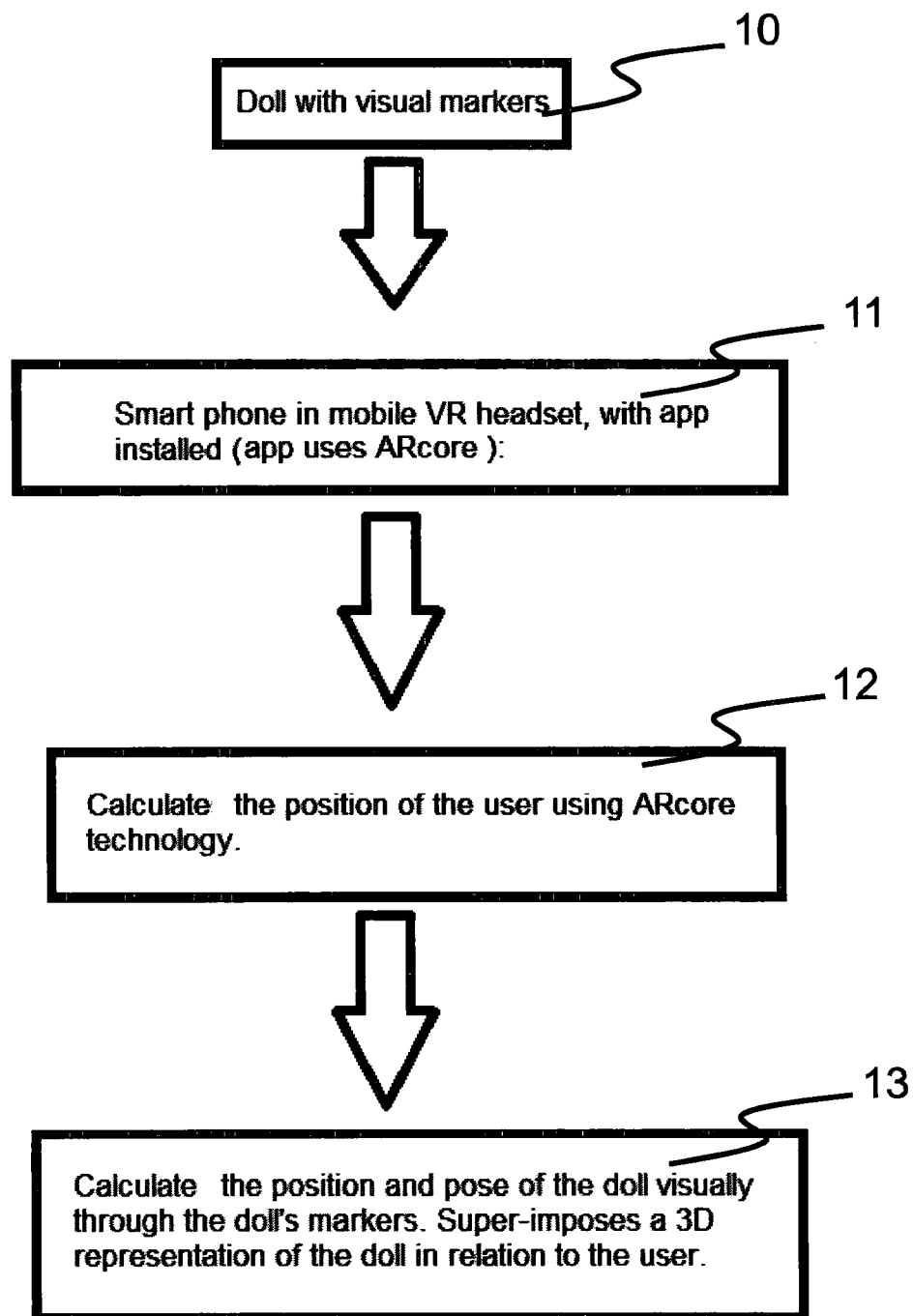


Fig. 1

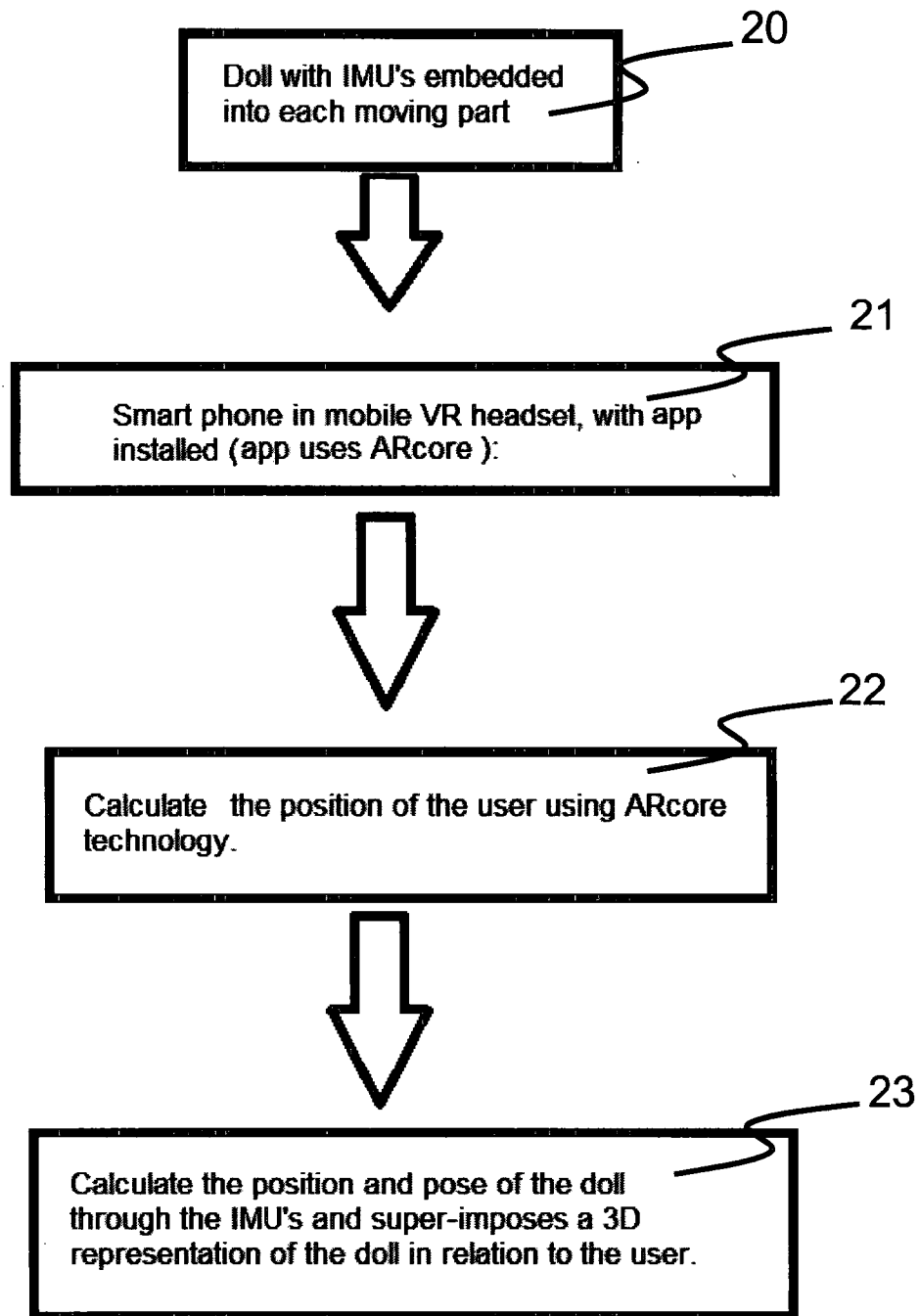


Fig. 2

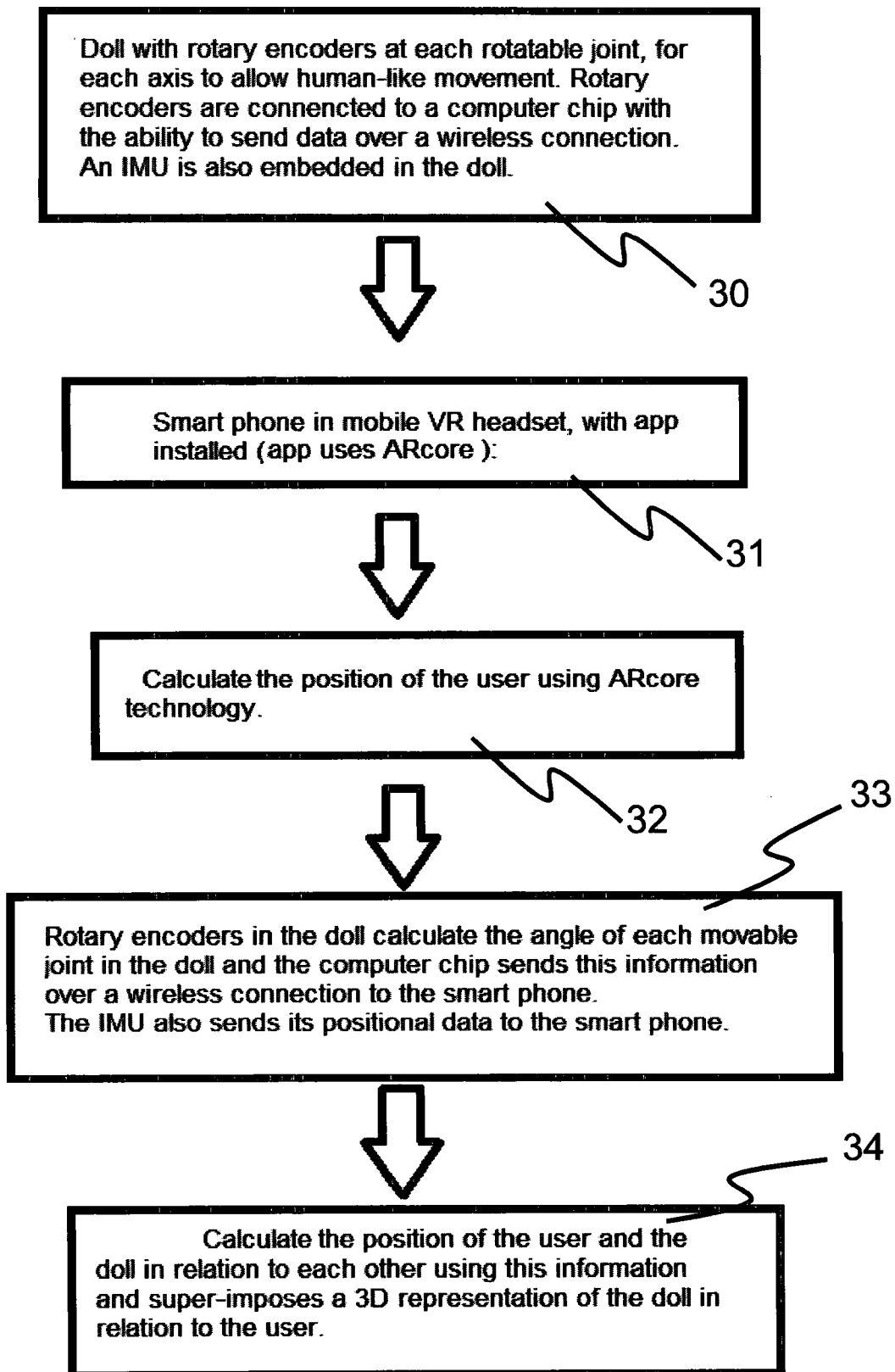


Fig. 3

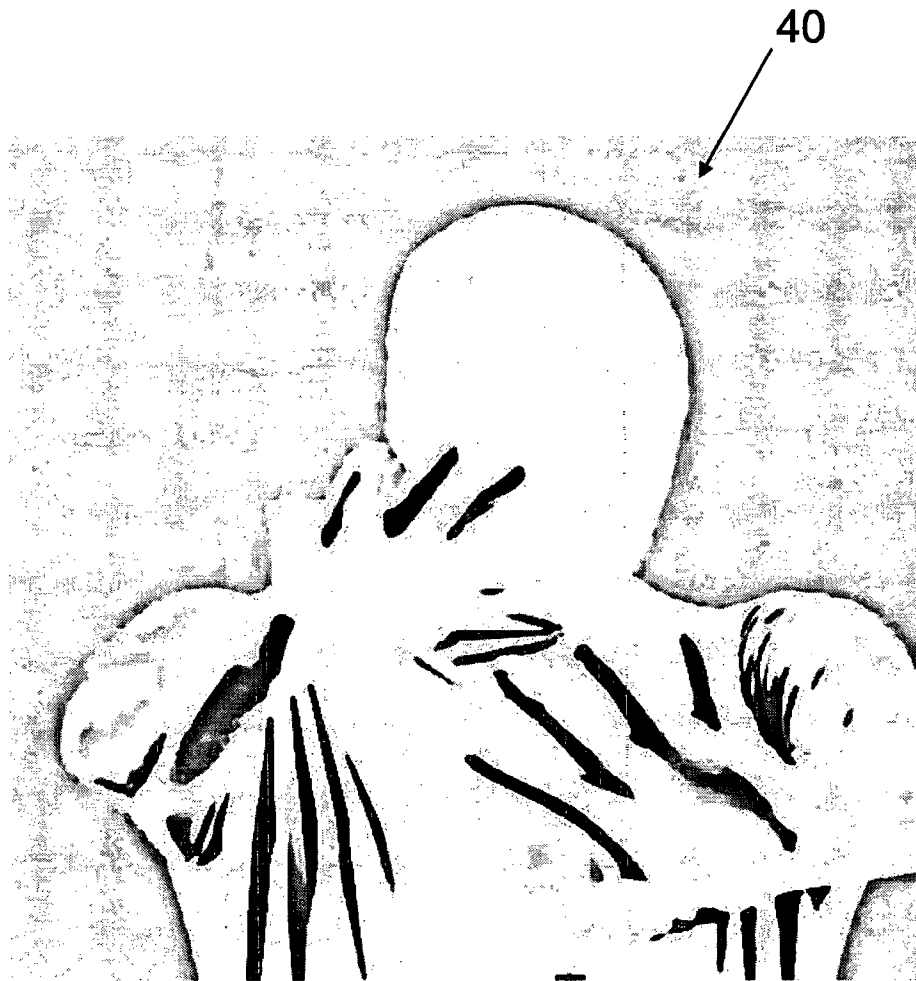


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2019/000120

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F3/01 G06F3/03 G06K9/00
ADD.

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)
G06F G06T G06K A63F A63H G09B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2016/054837 A1 (STAFFORD JEFFREY ROGER [US]) 25 February 2016 (2016-02-25) figures 1-22 paragraph [0048] - paragraph [0191] paragraph [0225] claims 1-20	1,2,4, 8-10,12 3,7,11
X	----- WO 2006/115261 A1 (CANON KK [JP]; ENDO TAKAAKI [JP]; MATSUI TAICHI [JP]; NORO HIDEO [JP]) 2 November 2006 (2006-11-02) figures 1-15 page 8, line 23 - page 39, line 17 claims 1-9 ----- -/-	1,2,5, 8-10,12



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

"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

13 December 2019

Date of mailing of the international search report

20/12/2019

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Roth, Lucia

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2019/000120

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 443 620 A2 (SIMQUEST LLC [US]) 25 April 2012 (2012-04-25) figures 1-12 paragraph [0030] paragraph [0046] - paragraph [0132] figures 1-15 -----	1,2,6, 8-10,12
Y	GB 2 466 714 A (LUCASFILM ENTERTAINMENT COMPAN [US]) 7 July 2010 (2010-07-07) figures 1-6 page 3, line 28 - page 18, line 26 -----	3,7,11
A	WO 2012/160055 A1 (LEGO AS) 29 November 2012 (2012-11-29) figures 1-11 claims 1-15 page 3, line 14 - page 28, line 20 -----	1-12
A	EP 3 298 479 A1 (CAKMAK TUNCAY [AT]) 28 March 2018 (2018-03-28) figures 1-19 page 3, line 6 - page 5, line 33 page 15, line 30 - page 16, line 18 -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2019/000120

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 2016054837	A1	25-02-2016	CN	106664401 A	10-05-2017
			EP	3183042 A1	28-06-2017
			US	2016054837 A1	25-02-2016
			US	2017322655 A1	09-11-2017
			WO	2016028450 A1	25-02-2016

WO 2006115261	A1	02-11-2006	CN	101164084 A	16-04-2008
			EP	1886281 A1	13-02-2008
			JP	4667111 B2	06-04-2011
			JP	2006302034 A	02-11-2006
			US	2009051758 A1	26-02-2009
			WO	2006115261 A1	02-11-2006

EP 2443620	A2	25-04-2012	EP	2443620 A2	25-04-2012
			US	2012045742 A1	23-02-2012
			WO	2010148078 A2	23-12-2010

GB 2466714	A	07-07-2010	NONE		

WO 2012160055	A1	29-11-2012	BR	112013029916 A2	24-01-2017
			CA	2836360 A1	29-11-2012
			CN	103998107 A	20-08-2014
			DK	2714222 T3	13-06-2016
			DK	3042704 T3	11-06-2019
			EP	2714222 A1	09-04-2014
			EP	3042704 A1	13-07-2016
			EP	3511062 A1	17-07-2019
			ES	2570852 T3	20-05-2016
			HK	1196327 A1	23-09-2016
			JP	6262127 B2	17-01-2018
			JP	2014515961 A	07-07-2014
			KR	20140043904 A	11-04-2014
			MX	339520 B	30-05-2016
			PL	2714222 T3	29-07-2016
			US	2014378023 A1	25-12-2014
			US	2018126293 A1	10-05-2018
			WO	2012160055 A1	29-11-2012

EP 3298479	A1	28-03-2018	EP	3298479 A1	28-03-2018
			US	2018147110 A1	31-05-2018
			WO	2016183606 A1	24-11-2016
