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(54) Title: METHODS FOR PROCESSING A COMPOSITE VIDEO IMAGE WITH FEATURE INDICATION

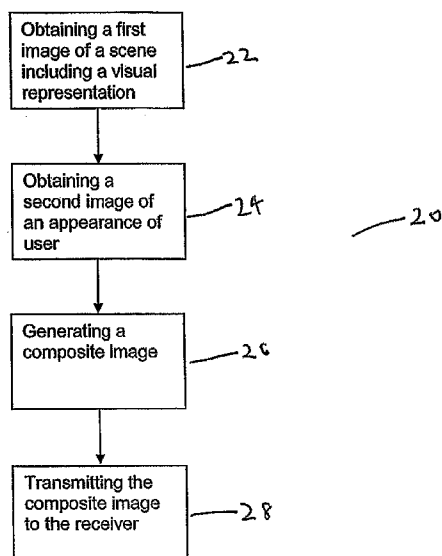


Figure 1

(57) Abstract: There is provided a first and second method for processing a composite video image. The methods generally include obtaining a first image of a scene through a first image capturing device with the composite image including a visual representation for directing a receiver's attention to at least one portion of the first image. Preferably, the visual representation may be an arm, a hand, a finger, or an object used for pointing.

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METHODS FOR PROCESSING A COMPOSITE VIDEO IMAGE WITH FEATURE INDICATION

FIELD OF INVENTION

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The present invention relates to the field of processing a video image, including methods of processing a composite image which includes a visual indication of at least one feature in the composite image.

10 BACKGROUND

The ready availability and affordability of broadband internet access globally has led to an exponential increase in the adoption of communication methods like video messaging and video conferencing. The variety and availability of
15 free software enabling such communication methods from companies like Microsoft, Yahoo, Skype, and America Online also aid in increasing the popularity of such communication methods. Currently, there are also an increasing number of devices which are used for video conferencing. These devices may or may not employ the aforementioned communication software
20 for video conferencing.

Generally, during video conferencing, parties who are communicating with each other only see one another. There are certain inconveniences for a first party to highlight/point out to the second party features relating to objects
25 which are outside a field of view of an image capture device in a video conferencing device, while still being able to see one another. This limitation may cause some problems during certain instances of communication between the parties.

30 SUMMARY

In a first aspect, there is provided a method for processing a composite video image. The method includes obtaining a first image of a scene through a first image capturing device with the first image including a visual representation

for directing a receiver's attention to at least one portion of the first image. A second image of an appearance of a user of a second image capturing device is also obtained through the second image capturing device. The second image is preferably obtained simultaneously when obtaining the first image.

- 5 The second image may be either a face or an upper torso of the user of the second image capturing device.

A composite image that includes both the first image and the second image is subsequently generated, the first image making up a substantial proportion of
10 the composite image with the second image being located at a position to create a perception that the user is making the visual representation to the receiver. The composite image is then transmitted to the receiver. The composite image may undergo perspective gaze correction before transmission to the receiver, with the gaze corrected image being akin to the
15 user of the second image capturing device looking upon the scene of the first image.

It is preferable that the first image capturing device and second image capturing device include a lens of a type such as, for example, standard (50
20 mm), wide-angle or fish eye. The at least one of the first and second image capturing devices have either a fixed or variable field of view. A first field of view of the first image capturing device and a second field of view of the second image capturing device may or may not overlap.

- 25 Preferably, the visual representation may be an arm, a hand, a finger, or an object used for pointing. The visual representation may be visually enhanced using wavefront coding to enable it to appear as an optically focused object.

It is preferable that the first image capturing device and the second image capturing device are integrated in a single apparatus, the single apparatus
30 being, for example, a handheld media player, a mobile phone, a handheld digital camera, a webcam and the like.

There is provided an alternative method for processing a composite video image. The method includes obtaining a first image of a scene through a first lens of a first image capturing device; using a preview image of the first image and overlaying a visual representation for directing a receiver's attention to at least one portion of the scene on the preview image; the first image capturing device focus-locking on at least one portion of the first image, with the focus-lock enabling movement of the visual representation when a field of view of the first image capturing device is varied. A composite image that includes the visual representation is then generated and transmitted to the receiver.

The first lens may be a type such as, for example, standard (50 mm), wide-angle, fish eye and the like. The first image capturing device may have either a fixed or variable field of view. It is preferable that the visual representation is of a form such as, for example, an arrow, a cross hair, a pointer, a cross and so forth. The focus-lock may preferably maintain a position of at least one portion of the first image in the preview image.

The variation of the field of view of the first image capturing device may be detected using techniques for detecting movement of the first image capturing device such as, for example, an electronic compass for detecting horizontal panning using bearings, an inertial meter for detecting vertical tilting, a tilt sensor for detecting vertical tilting, optical flow analysis for detecting specific pixel movements and the like.

DESCRIPTION OF DRAWINGS

In order that the present invention may be fully understood and readily put into practical effect, there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being with reference to the accompanying illustrative drawings.

Figure 1 shows a process flow of a first embodiment of the present invention. Figure 2 shows a process flow of a second embodiment of the present invention.

Figure 3 shows a first setup for an apparatus used in a preferred embodiment.
Figure 4 shows a second setup for the apparatus used in a preferred embodiment.

Figure 5 shows a third setup for the apparatus used in a preferred embodiment.

Figure 6 shows a fourth setup for the apparatus used in a preferred embodiment.

Figure 7 shows a first example of a composite video image resulting from a preferred embodiment.

Figure 8 shows a second example of a composite video image resulting from a preferred embodiment.

Figure 9 shows a representation of the second embodiment when in use.

DESCRIPTION OF PREFERRED EMBODIMENTS

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There is shown in Figure 1 a process flow denoting a method 20 for processing a composite video image. Figures 7 and 8 denote examples of the composite video image 98. The method 20 includes obtaining a first image 102 of a scene through a first image capturing device (22). The first image 102 may include a visual representation 104 for directing a receiver's attention to at least one portion of the first image 102. The visual representation 104 may be of a form such as, for example, an arm (as shown in Figures 7 and 8), a hand, a finger, an object used for pointing and the like.

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25 A second image 106 of an appearance of a user of a second image capturing device may be obtained through a second image capturing device (24). It should be noted that the first image 102 may be obtained after obtaining the second image 106. The order of obtaining the first image 102 and the second image 106 is variable. The second image 106 may also be obtained simultaneously when obtaining the first image 102. The first and second image capturing devices may include lenses of a type such as, for example, standard (50 mm), wide-angle, fish eye and the like. At least one of the first and second image capturing devices may have a fixed field of view. Similarly, at least one of the first and second image capturing devices may have a

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variable field of view. Further discussion of the first and second image capturing devices will be provided in a subsequent portion of the description. Both the first image capturing device and the second image capturing device may be integrated in a single apparatus, the single apparatus may be, for
5 example, a handheld media player, a mobile phone, a handheld digital camera, a webcam and the like.

Subsequently, a composite image 98 is generated (26) that includes both the first image 102 and the second image 106. The first image 102 may make up
10 a substantial proportion of the composite image 98 with the second image 106 being located at a position to create a perception that the user of the second image capturing device is making the visual representation 104 to the receiver.

Referring to Figure 7, it can be seen that the user of the second image capturing device is making a visual representation (pointing) to a car. The
15 second image 106 may be either a face or an upper torso of the user of the second image capturing device. Figure 7 shows an upper torso of the user of the second image capturing device. When the second image 106 is only a face, the face may be superimposed onto a shape that may be humanoid in
20 form. For example, the face may be superimposed to replace a head of a fictional cartoon character, or the face may be superimposed onto a fruit and so forth. In Figure 7, the second image 106 is shown in a first side 108 of the composite image 98. The second image 106 may be in another portion of the
25 composite image 98 as a location of the user of the second image capturing device in the composite image is dependent on the positioning of the visual representation 104 in the first image 102. The second image 106 may be joined 110, preferably seamlessly, to the visual representation 104 using
known image filling methods for non-overlapping regions. The second image 106 may even be moving about the composite image 98 if the positioning of
30 the visual representation 104 continually changes. The visual representation 104 may be visually enhanced using wavefront coding (commonly employed in microscopes and endoscopes) to enable it to appear as an optically focused object as it may be out of focus when compared to the first image 102.

Referring to Figure 8, there is shown the composite image 98 which has undergone gaze correction. The gaze correction of the composite image 98 provides a receiver with a view akin to the user of the second image capturing device looking upon the scene of the first image 102. The gaze correction is generally performed before transmission to the receiver. The composite image 98 which undergoes gaze correction creates an appearance of the user of the second image capturing device presenting/pointing out features on the first image 102 to the receiver. In Figure 8, the second image 106 is shown in a first side 108 of the composite image 98. The second image 106 may be in another portion of the composite image 98 as a location of the second image 106 in the gaze corrected composite image is dependent on the positioning of the visual representation 104 in the first image 102. The second image 106 may be joined 110, preferably seamlessly, to the visual representation 104 using known image filling methods for non-overlapping regions. The second image 106 may even be moving about the composite image 98 if the positioning of the visual representation 104 continually changes. The visual representation 104 may be visually enhanced to enable it to appear as an optically focused object as it may be out of focus when compared to the first image 102.

Finally, the composite image 98 may be transmitted to the receiver (28). The receiver is thus able to view the composite image 98 in which the user of the second image capturing device is able to indicate features within the first image 102 which aid in communication with the receiver.

Referring to Figures 3 – 6, there are shown some examples of the apparatus with dual image capturing devices that may be used in the method 20. As mentioned earlier, the apparatus may be for example, a handheld media player, a mobile phone, a handheld digital camera, a webcam and the like. Figure 3 shows a first example of apparatus 40. The apparatus 40 includes a main body 42 which contains a first image capturing device 44 and a second image capturing device 46. In the first example of the apparatus 40, both the first image capturing device 44 and the second image capturing device 46 utilise wide angle/fish eye lenses. In such an instance, a combination of the

images captured by the first image capturing device 44 and the second image capturing device 46 provides a substantially 360° field of view 48 around the apparatus 40. Given that some wide angle lens have fields of view of up to 200° , fields of view of the first image capturing device 44 and the second image capturing device 46 may overlap. In the instance when the fields of view overlap, image filling methods may not need to employed to join the visual representation 104 in first image 102 to the second image 106 in the composite image 98. However, distortion correction may still be applied to the composite image 98.

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Figure 4 shows a second example of apparatus 40. The apparatus 40 includes a main body 42 which contains a first image capturing device 44 and a second image capturing device 46. In the second example of the apparatus 40, both the first image capturing device 44 and the second image capturing device 46 utilise standard (50 mm) lenses. In such an instance, both the first image capturing device 44 and the second image capturing device 46 may have a field of view 50 of between 120° – 160° . In this second example, it is apparent that the fields of view of the first image capturing device 44 and the second image capturing device 46 do not overlap. In the instance when the fields of view do not overlap, image filling methods may be employed to join the visual representation 104 in first image 102 to the second image 106 in the composite image 98. Distortion correction may still be applied to the composite image 98.

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Figure 5 shows a third example of apparatus 40. The apparatus 40 includes a main body 42 which contains a first image capturing device 44 and a second image capturing device 46. In the third example of the apparatus 40, both the first image capturing device 44 and the second image capturing device 46 may utilise lenses, such as, for example, standard (50 mm), wide-angle, fish eye and the like. The first image capturing device 44 need not utilize an identical lens with the second image capturing device 46. However, in this instance, the field of view of the first image capturing device 44 and the second image capturing device 46 does not depend solely on the lens. This is because the first image capturing device 44 and the second image capturing

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device 46 may swivel/pan. In this instance the fields of view may or may not overlap.

Figure 6 shows a fourth example of apparatus 40. The apparatus 40 includes
5 a main body 42 which contains a first image capturing device 44 and a
second image capturing device 46. In the fourth example of the apparatus 40,
both the first image capturing device 44 and the second image capturing
device 46 may utilise lenses, such as, for example, standard (50 mm), wide-
angle, fish eye and the like. The first image capturing device 44 need not
10 utilize an identical lens with the second image capturing device 46. In this
instance, the field of view of the first image capturing device 44 and the
second image capturing device 46 also does not depend solely on the lens.
This is because the first image capturing device 44 and the second image
capturing device 46 may include software to digitally swivel/pan the respective
15 fields of view from a first state 52 to a second state 54. In the instance the
fields of view may or may not overlap.

Referring to Figures 2 and 9A – 9C, there is provided an alternative method
60 for processing a composite video image. The method 60 includes obtaining
20 a first image 202 of a scene (62) through a first lens 203 of a first image
capturing device 204. The first image capturing device 204 may be similar to
the apparatus 40 as mentioned earlier. This is depicted in window 200 of
Figure 9A. The first lens 203 of the first image capturing device 204 may be of
a type such as, for example, standard (50 mm), wide-angle, fish eye and the
25 like. The first image capturing device 204 may have either a fixed or variable
field of view.

A visual representation 206 for directing a receiver's attention to at least one
portion of the scene is overlaid on a preview image 208 (64). The preview
30 image 208 may be cropped 210 from the first image 202. The visual
representation 206 is shown to be a cross hair, but may also be, for example,
an arrow, a cross, a pointer and the like. The visual representation 206 may
be moved about in the preview image 208 using controls on the first image
capturing device 204. Alternatively, the preview image 208 may be shown on

a touch-sensitive display and the visual representation 206 is moved about using a sense of touch on the touch-sensitive display.

5 The first image capturing device 204 is focus-locked (66) on at least one portion of the first image 202 (a flower pot as shown in Figure 9). The focus-lock enables movement of the visual representation (68) when a field of view of the first image capturing device 204 is varied. Varying the field of view of the first image capturing device 204 is depicted in window 250 of Figure 9A. In window 250, the first image capturing device 204 has been moved from the position as shown in window 200. The first image capturing device 204 may detect movement using for example, an electronic compass for detecting horizontal panning using bearings, an inertial meter for detecting vertical tilting, a tilt sensor for detecting vertical tilting, optical flow analysis for detecting specific pixel movements and the like. When movement is detected, variation
10 15 in the field of view is correspondingly ascertained.

Based on a comparison of window 200 and window 250, it can be seen that the field of view of the first image capturing device 204 has shifted left-wards (panning). Consequently, the flower pot in the first image 202 is moved to the right, but due to the focus-lock, the flower pot in the first image 202 appears to
20 be stationary. This is shown in Figure 9C. It can be seen from Figure 9C that the visual representation 206 is moved leftwards compared to its position in Figure 9B. The effect is similar to the overlay with the visual representation 206 being stationary while the first image 202 is moved rightwards. Alternatively, the focus-lock may entail capturing a still image of the flower pot
25 in the first image 202, with movement of the visual representation 206 being controlled by movement of the first image capturing device 204.

The user of the first image capturing device 204 may pan the first image capturing device 204 leftwards to cause the visual representation 206 to move leftwards. It can be seen that such a process is intuitive in nature. While the example shown relates to panning of the first image capturing device 204, it should be noted that the method 60 also covers tilting of the first image capturing device 204.
30

Subsequently, a composite image identical to the preview image 208 is generated (70) that includes both the first image 202 and the visual representation 206. Finally, the composite image may be transmitted to the receiver (72). The receiver is thus able to view the composite image 98 in which the user of the first image capturing device 204 is able to indicate features within the first image 202 which aid in communication with the receiver.

Whilst there has been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention.

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CLAIMS

1. A method for processing a composite video image, the method including:
 - 5 obtaining a first image of a scene through a first image capturing device, the first image including a visual representation for directing a receiver's attention to at least one portion of the first image;
obtaining a second image of an appearance of a user of a second image capturing device through the second image capturing device;
 - 10 generating a composite image that includes both the first image and the second image, the first image making up a substantial proportion of the composite image with the second image being located at a position to create a perception that the user is making the visual representation to the receiver; and
 - 15 transmitting the composite image to the receiver.
2. The method as claimed in claim 1, wherein the first image capturing device and second image capturing device include a lens of a type selected from the group consisting of: standard (50 mm), wide-angle and fish eye.
- 20 3. The method as claimed in claim 1, wherein at least one of the first and second image capturing devices have a fixed field of view.
4. The method as claimed in claim 1, wherein at least one of the first and
25 second image capturing devices have a variable field of view.
5. The method as claimed in claim 1, wherein the visual representation is of a form selected from the group consisting of: an arm, a hand, a finger, and an object used for pointing.
- 30 6. The method as claimed in claim 1, wherein the visual representation is visually enhanced using wavefront coding to enable it to appear as an optically focused object.

7. The method as claimed in claim 1, wherein a first field of view of the first image capturing device and a second field of view of the second image capturing device do not overlap.
- 5 8. The method as claimed in claim 1, wherein a first field of view of the first image capturing device and a second field of view of the second image capturing device overlap.
9. The method as claimed in claim 1, wherein the second image is
10 obtained simultaneously when obtaining the first image.
10. The method as claimed in claim 1, wherein the first image capturing device and the second image capturing device are integrated in a single apparatus, the single apparatus selected from the group consisting of: a
15 handheld media player, a mobile phone, a handheld digital camera, and a webcam.
11. The method as claimed in claim 1, wherein the composite image undergoes gaze correction before transmission to the receiver, a gaze
20 corrected image being akin to the user of the second image capturing device looking upon the scene of the first image.
12. The method as claimed in claim 1, wherein the second image is either
25 a face or an upper torso of the user of the second image capturing device.
13. A method for processing a composite video image, the method including:
obtaining a first image of a scene through a first lens of a first image capturing device;
30 using a preview image of the first image and overlaying a visual representation for directing a receiver's attention to at least one portion of the scene on the preview image;
the first image capturing device being focus-locked at least one portion of the first image;

the focus-lock enabling movement of the visual representation when a field of view of the first image capturing device is varied;

generating a composite image that includes the visual representation;
and

5 transmitting the composite image to the receiver.

14. The method as claimed in claim 13, wherein the first lens is of a type selected from the group consisting of: standard (50 mm), wide-angle and fish eye.

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15. The method as claimed in claim 13, wherein the first image capturing device has either a fixed or variable field of view.

16. The method as claimed in claim 13, wherein the visual representation
15 is of a form selected from the group consisting of: an arrow, a cross hair, a pointer and a cross.

17. The method as claimed in claim 13, wherein the variation of the field of view of the first image capturing device is detected using techniques for
20 detecting movement of the first image capturing device selected from the group consisting of: an electronic compass for detecting horizontal panning using bearings, an inertial meter for detecting vertical tilting, a tilt sensor for detecting vertical tilting, and optical flow analysis for detecting specific pixel movements.

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18. The method as claimed in claim 13, wherein the focus-lock maintains a position of at least one portion of the first image in the preview image.

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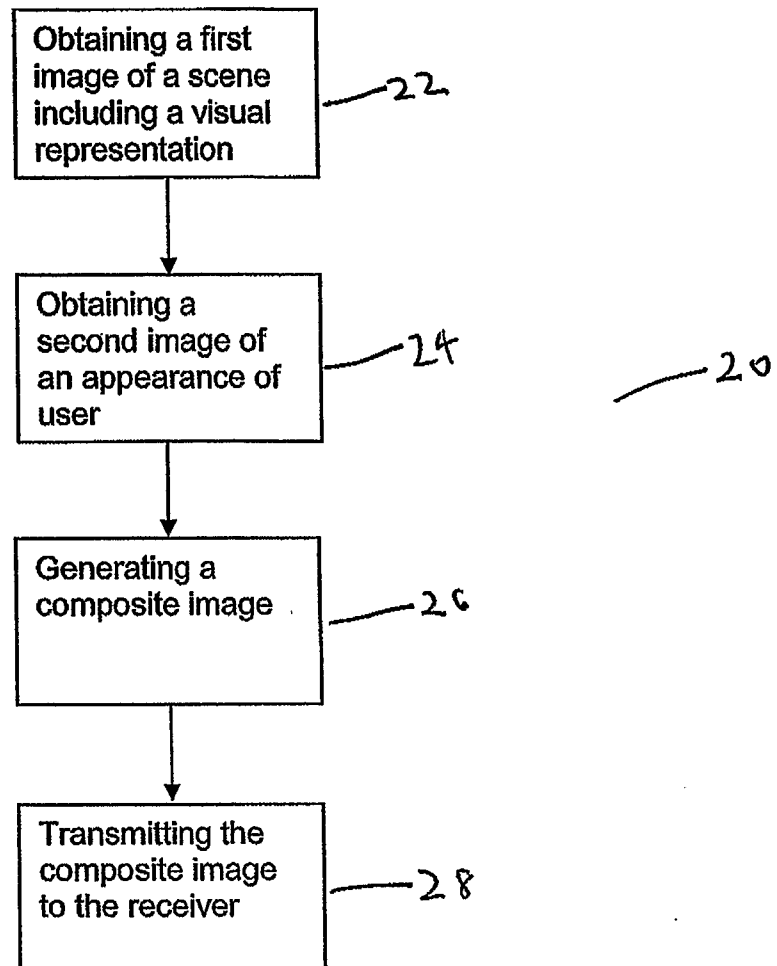


Figure 1

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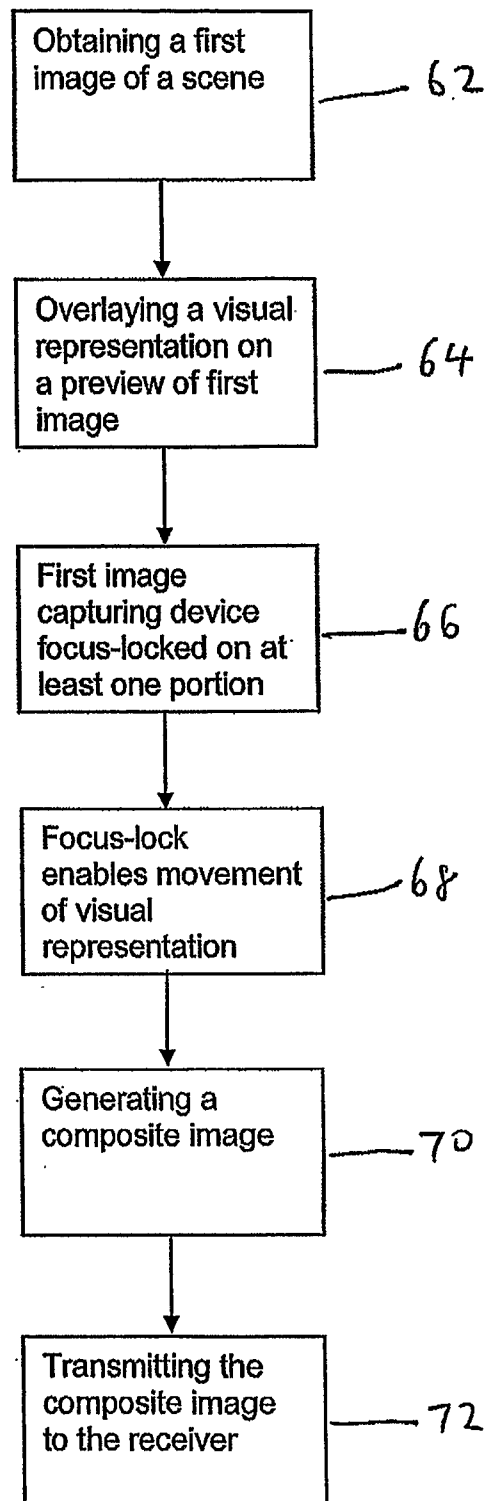


Figure 2

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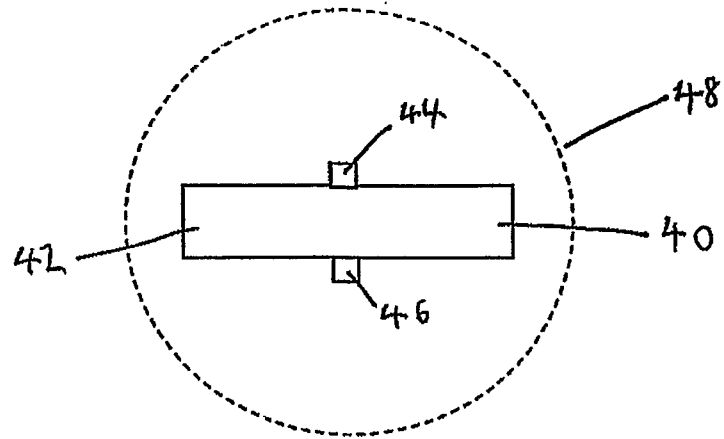


Figure 3

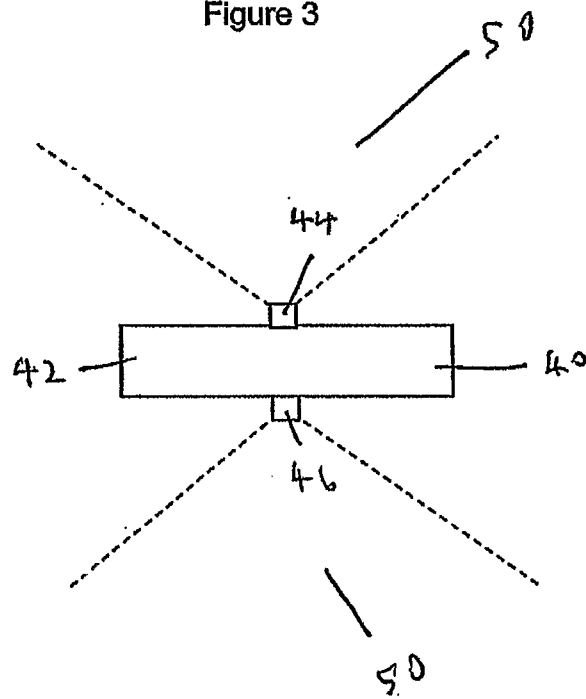


Figure 4

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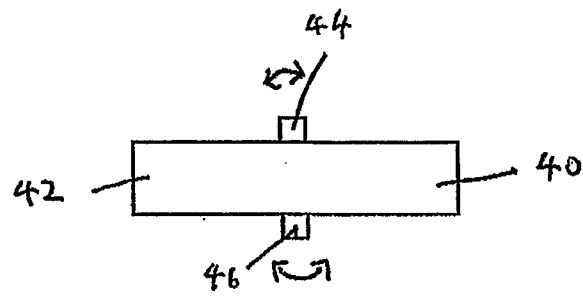


Figure 5

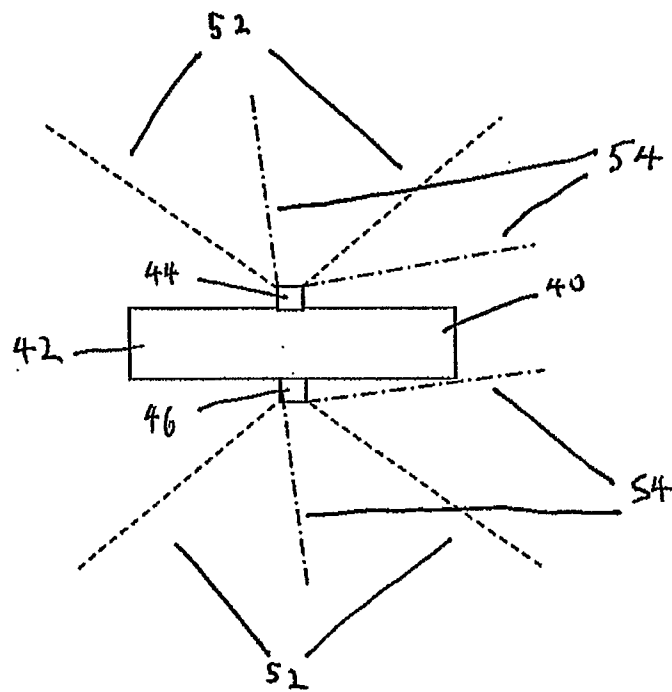


Figure 6

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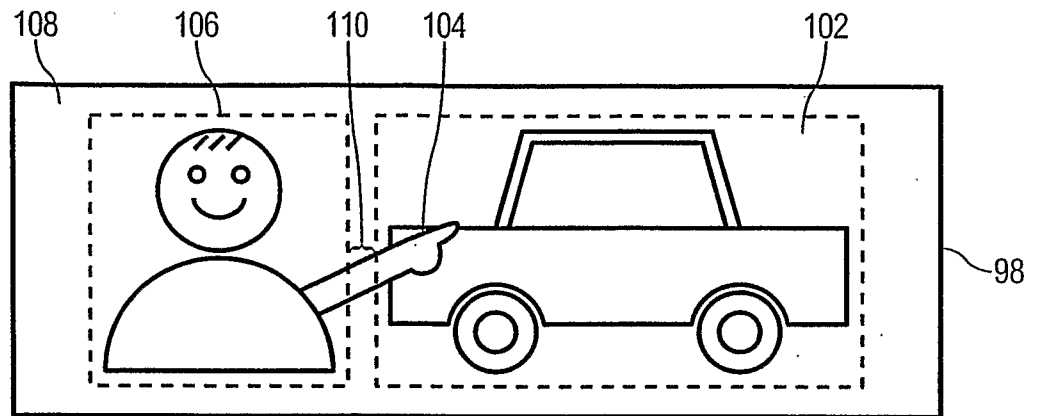


Figure 7

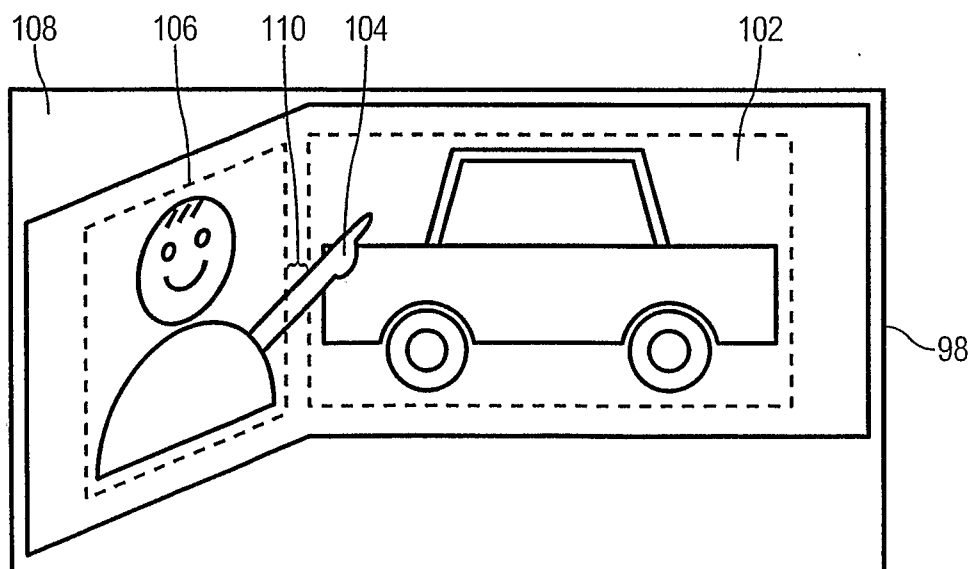


Figure 8

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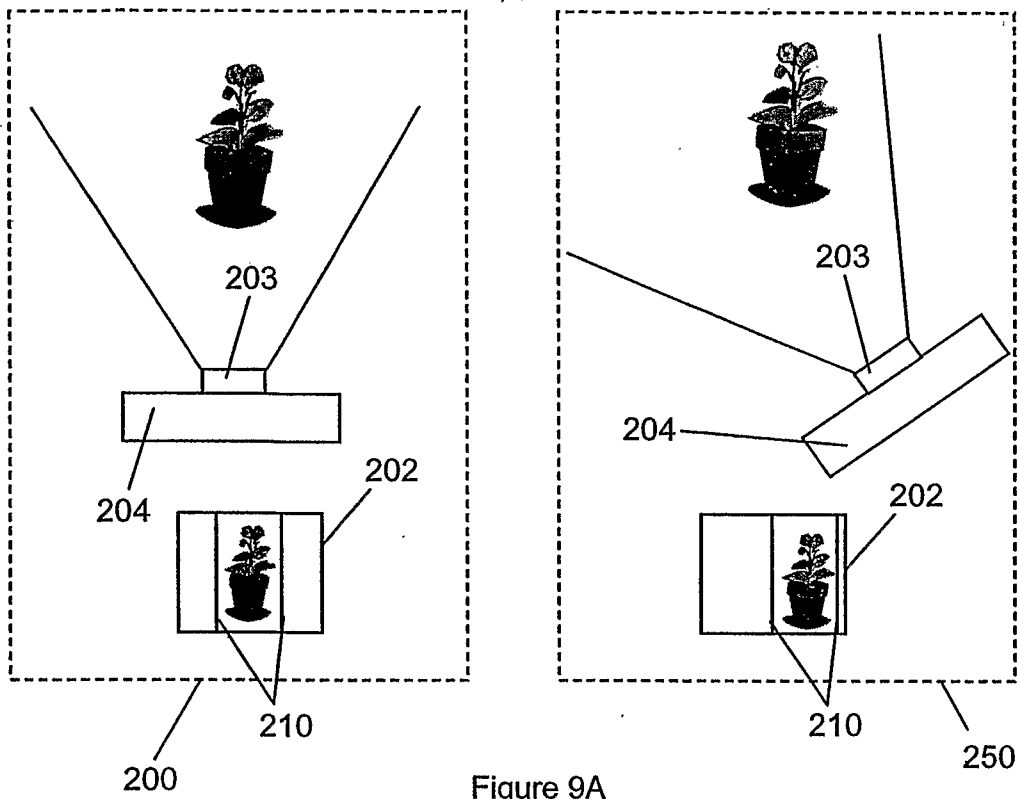


Figure 9A

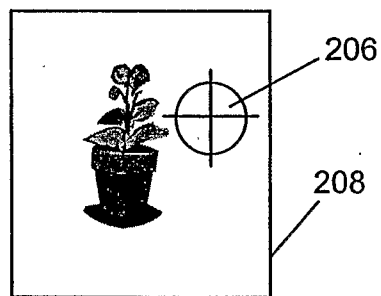


Figure 9B

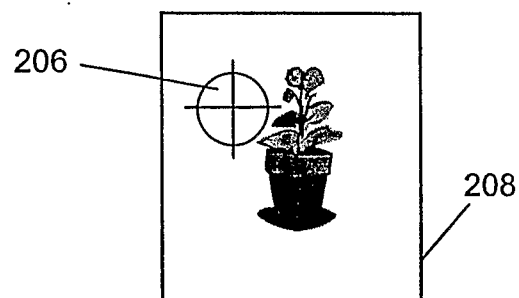


Figure 9C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG2008/000331

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

H04N 5/272 (2006.01)

G03B 13/00 (2006.01)

H04N 7/14 (2006.01)

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)

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)

EPODOC, WPI - keywords (video, first image, second image, representation, focus-lock) and similar terms

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 5781174 A (UYA et al.) 14 July 1998 Abstract; column 8 line 5 – column 9 line 10; figures 3, 5, 12–13	1–10, 12 11 13–18
Y A	US 6806898 B1 (TOYAMA et al.) 19 October 2004 Abstract; column 2 lines 35–67; figures 2, 6A–6D, 9A–9E	11 1–10, 12–18
A	US 2007/0109398 A1 (TEO) 17 May 2007 See whole document	1–18
A	US 2007/0098380 A1 (SPIELBERG) 3 May 2007 See whole document	1–18



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
24 November 2008

Date of mailing of the international search report
27 NOV 2008

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SG2008/000331

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:
SEE SUPPLEMENTAL BOX 1

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.:

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.

Supplemental Box 1

(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are 2 different inventions as follows:

- Claims 1–12 are directed to a method for processing a composite video image. It is considered that *“obtaining a first image of a scene through a first image capturing device, the first image including a visual representation for directing a receiver's attention to at least one portion of the first image; obtaining a second image of an appearance of a user of a second image capturing device through the second image capturing device; generating a composite image that includes both the first image and the second image, the first image making up a substantial proportion of the composite image with the second image being located at a position to create a perception that the user is making the visual representation to the receiver and transmitting the composite image to the receiver”* comprises a **first distinguishing feature**.
- Claims 13–18 are directed to a method of processing a composite video image. It is considered that *“obtaining a first image of a scene through a first lens of a first image capturing device; using a preview image of the first image and overlaying a visual representation for directing a receiver's attention to at least one portion of the scene of the preview image; the first image capturing device being focus-locked at least one portion of the first image; the focus-locking enabling movement of the visual representation when a field of view of the first image captured is varied; generating a composite image that includes the visual representation and transmitting the composite image to the receiver”* comprises a **second distinguishing feature**.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

Each of the abovementioned groups of claims has a different distinguishing feature and they do not share any feature which could satisfy the requirement for being a special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a priori*.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SG2008/000331

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
US	5781174	JP	6113203
US	6806898	NONE	
US	2007/0109398	US	7292261
		US	2008/0118183
US	2007/0098380	JP	2007128077
		US	7409149
		US	2008/0226274
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			
END OF ANNEX			