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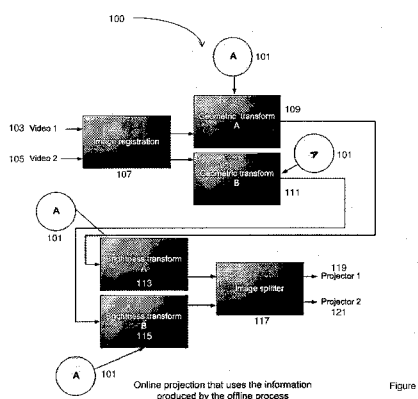


Figure 1

(57) **Abstract:** An online orthogonal projection system (100) is provided that includes at least two imaging input means (103, 105), a storage means (101), wherein the storage means (101) includes radiance, light intensity and geometric distortion factors, an image registration module (107), wherein the at least two imaging inputs (103, 105) are fed into the image registration module (107), at least two geometric transform modules (109, 111), wherein output from the image registration module (107) are fed into the at least two geometric transform modules (109, 111), wherein the storage means (101) is used to process geometric transformation, at least two radiance transform modules (113, 115), wherein output from the geometric transform modules (109, 111) are fed into the at least two radiance transform modules (113, 115), wherein the storage means (101) is used to process radiance transformation and an image splitter (117), wherein the image splitter (117) decomposes a resulting composite image into at least two component images to be displayed in a first projecting device (119) and a second projecting device (121), wherein a combination of both projections result in a final composite image, wherein the system is used with at least two projectors (119, 121) that are disposed such that both projectors (119, 121) are at a predetermined angle range of 85° to 95° from each projector.

AN ONLINE ORTHOGONAL PROJECTION SYSTEM

FIELD OF INVENTION

- 5 The present invention relates to an online projection system, more particularly relates to an online orthogonal projection system using two projecting devices.

BACKGROUND OF INVENTION

- 10 Complex multiple projectors require equally complex configuration setup especially when more than one screen is used and the projection is wide and continuous. Multiple screen projection usually involves tedious set up and calibration process during the setup and even more so when the configuration needs to be relocated. The problem is further compounded when it involves duplicated overlapping projection region between
15 2 videos from two projectors.

- U.S. 6755537 describes a method for globally aligning multiple projected images by forming a cluster from a set of projectors. It is known that each projector in the set includes a projector sub-system in a relationship to a camera sub-system. This method
20 is described as using a communications sub-system to broadcast ready messages. However, the drawbacks of this method are that the end image can only be received by sequentially receiving projections from the set of projectors used. This method can be error-prone if the communication sub-system receives a faulty ready message. The resulting image will be skewed if any communication message is broadcast
25 erroneously as the system is completely dependent on a centralized managing system.

Additionally, image and light uniformity may not also be consistent across individual display portions in a composite display. Light intensity can vary within each individual portion of a composite display resulting in irregularities in brightness. Overlap that can happen when multiple projections are used tends to cause some portions of the end
5 projection to be brighter than the rest of the image.

The existing prior art has not addressed these issues where there is a need for multiple projections to be produced without all the issues that have been highlighted above and in a dependable manner.

SUMMARY OF INVENTION

Accordingly there is provided an online orthogonal projection system, the system includes at least two imaging input means, a storage means, wherein the storage means includes radiance, light intensity and geometric distortion factors, an image registration module, wherein the at least two imaging inputs are fed into the image registration module, at least two geometric transform modules, wherein output from the image registration module are fed into the at least two geometric transform modules, wherein the storage means is used to process geometric transformation, at least two radiance transform modules, wherein output from the geometric transform modules are fed into the at least two radiance transform modules, wherein the storage means is used to process radiance transformation and an image splitter, wherein the image splitter decomposes a resulting composite image into at least two component images to be displayed in a first projecting device and a second projecting device, wherein a combination of both projections result in a final composite image, wherein the system is used with at least two projectors that are disposed such that both projectors are at a predetermined angle range of 85° to 95° from each projector.

There is also provided a method of geometrically transforming images and transforming radiance levels of images, the method includes the steps of registering at least two images in an online orthogonal projection system, geometrically transforming the at least two images using previously stored radiance, light intensity and geometric distortion factors in a storage means, transforming radiance levels of the at least two images using previously stored radiance, light intensity and geometric distortion factors of storage means and decomposing the at least two images to be displayed in the first and second projecting devices.

There is further provided a method of configuring an online projection system, the method includes the steps of calculating curve information for a curved background, ensuring that at least two projecting devices are used, wherein the at least two projecting devices are at a right angle to each other, decomposing a composite image
5 into a horizontal and a vertical component, wherein the composite image is projected from the at least two projecting devices, applying the calculated curve information to compensate for radiance and light intensity for a first projecting device, mirroring calculated radiance and light intensity compensation for a second projecting device, pre-distort an image with the calculated curve information in first projecting device,
10 mirroring the pre-distorted calculation for the second projecting device and storing radiance, light intensity and geometric distortion factors in a storage means.

The present invention consists of several novel features and a combination of parts hereinafter fully described and illustrated in the accompanying description and
15 drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and
5 thus are not limitative of the present invention, wherein:

Figure 1 is a diagram illustrating an embodiment of an online orthogonal projection system;

Figure 2 is a flowchart showing the steps taken in an embodiment of the present invention to configure an online projection system;

10 Figure 3 is a diagram illustrating 2 projecting devices that are arranged at a right angle to each other in an embodiment of the present invention;

Figure 4 is a sample of a curve calculation using an equation in an embodiment of the present invention;

15 Figure 5 is a diagram illustrating an embodiment of an orthogonal projection using two projecting devices;

Figure 6 is a diagram illustrating decomposed horizontal and vertical components of a projection in an embodiment of the present invention;

Figure 7 is a diagram illustrating a top-down view showing audience location in an embodiment of the present invention;

20 Figure 8 is a diagram illustrating an analysis of vertical and horizontal components of an embodiment of the present invention;

Figure 9 is a diagram illustrating a graphical representation of radiance reduction in an embodiment of the present invention;

Figure 10 is a diagram illustrating an unwrapped equivalent of a curved screen used in an embodiment of the present invention;

- 5 Figure 11 is a diagram illustrating radiometric pre-distortion from projecting device 1 and projecting device 2 in an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to an online orthogonal projection system. Hereinafter, this specification will describe the present invention according to the preferred
5 embodiments of the present invention. However, it is to be understood that limiting the description to the preferred embodiment of the invention is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

10

The following detailed description of the preferred embodiment will now be described in accordance with the attached drawings, either individually or in combination.

Figure 1 depicts an embodiment of the invention wherein an online orthogonal
15 projection system (100) includes at least two imaging input means (103, 105) that is fed into an image registration module (107) wherein the output of said image registration module (107) is split into two outputs and further fed into at least two geometric transform modules (109,111). A further description of a method of how the outputs are split is described further on in the description. A storage means (101) is used to store
20 radiance, light intensity and geometric distortion factors where these factors are included to pre-calculate curve information. The radiance, light intensity and geometric distortion factors are factored into these geometric transform modules (109, 111).

The output from the geometric transform modules (109,111) is fed into at least two
25 radiance transform modules (113,115) and the output of the same is further fed into an image splitter (117). The storage means (101) as described earlier is factored into these radiance transform modules (113,115). The method of the same will be

discussed later in this section. The image splitter (117) further decomposes a resulting composite image into at least two component images to be displayed in a first projecting device (119) and a second projecting device (121), wherein a combination of both projections result in a final composite image projected onto at least two projecting devices (119, 121) such as projector 1 (119) and projector 2 (121) as shown in Figure 1. Projector 1 (119) and projector 2 (121) are placed at a predetermined angle, within the range of 85° to 95°, to each other using a metal bar (301) with a scale in this system (100) as seen in Figure 3.

10 A method of geometrically transforming images and transforming radiance of the described system (100) in Figure 1 begins with the steps of registering at least two images in an online orthogonal projection system (100) and further geometrically transforming the at least two images using previously stored radiance factors, light intensity factors and geometric distortion factors in a storage means (101). The output of said image registration module (107) is split into two outputs in order to split a large width to length ratio into a relatively smaller ratio. For example in this embodiment, a panoramic image has a rectangular image with a larger width to length ratio (X:Y) which is 8:3, where this display is used for extended desktop for more horizontal space. This is also applied for panoramic image where the panoramic image is divided into two parts equally. If the panoramic image has a width to length ratio of X:Y, the two parts of the image would have ratio of $(X/2) : Y$ each. The two images are then fed as input into the geometric transform module A (109) and geometric transform module B (111) respectively.

25 The image registration module (107) registers an area of overlap wherein both geometric transform modules (109,111) have an overlap of a same part of an image. The area of overlap may be up to 15 % of total area of an original image.

The following step is to transform radiance levels of the at least two images using previously stored radiance, light intensity and geometric distortion factors of storage means (101) and decompose the at least two images to be displayed in the first and second projecting devices (119,121).

5

In order to use the system (100) as described previously, a method of configuring an online projection system (100) is first conducted. The method begins with the step of calculating curve information for a curved screen. The curve screen is placed in front of two walls that are used in an online projection system (100) where at least two
10 projecting devices (119,121) must be arranged such that the two projecting devices (119,121) are at a right angle to each other as seen in Figure 3. This configuration enables each of the projecting devices (119,121) to be projected to each side of a wall. The curve can then be calculated by considering factors such as radius, radian, height and hypotenuse. A sample curve calculation is done by plotting curve against distance
15 as seen in Figure 4. Distance between borders of the two walls is also calculated.

The orthogonal projection is shown in Figure 5 where both projecting devices (119,121) are at a right angle. This right angle placement causes the distortion to be compensated by the following method. The projection will appear to be as shown in
20 Figure 5 when the screen is placed in front of a corner of two walls. The projection is then decomposed into a horizontal and a vertical component. The curvature of the screen from the view of both projecting devices (119, 121) can be seen in Figure 6. A vertical component is projected from the first projector (119) and a horizontal component is projected from the second projector (121). A top-down view showing
25 audience location where wide-area content can be displayed in the screen is shown in Figure 7. Images from the vertical and horizontal components are analyzed and radiance reduction is applied to an image according to its relative position as shown in

Figure 8. As seen in figure 8, image intensity and radiance is matched between 1 and 3 as well as 2 and 4. These are complementary pairs in terms of image processing. The image processing method is as describe below.

- 5 The two images from the first projector (119) and the second projector (121) are respectively labeled as image 1 and image 2 as seen in Figure 5. In image 1, the overlapping region appears on the left side of image 1. For image 2, the overlapping region appears on the right side of image 2. For both these images, the radiance of each image is reduced according to the graph in Figure 9. For example, the radiance of
- 10 image 1 reduces according to the graph in Figure 9 from one edge of the overlapping region to the opposite edge of the overlapping region. The same method is applied in an opposing manner for image 2, wherein the radiance is reduced from one edge of the overlapping region to the opposite edge. The radiance is reduced by adjusting the brightness of the images 1 and 2. In image processing, intensity of both images is
- 15 adjusted according to the graph in Figure 9 and 10.

A graphical representation of radiance reduction is shown in Figure 9. The radiance reduction is done by applying an equation representing curvature of the screen as described earlier. The curvature is as seen in Figure 4. The equation of the curvature is

20 as follows:

$$\text{Curve, } y = (r^2 + h^2)^{1/2} - r$$

Accordingly, on the second projecting device (121), the curvature is symmetric to the first curvature, but curving at a different direction wherein when the two curves are put

25 together, the summation of the radiance at any point would equal to unity as shown in Figure 10. A graphical representation of the two projecting device images is shown in Figure 11, where grey areas (201, 204) represent constant radiance and light intensity.

Shaded areas (202,203) show a gradual change in light intensity and this gradient represents the amount of light intensity needed to be reduced based on location. The gradient of radiance and light intensity corresponds to curvature of screen as described in the earlier section. The curve information that has been obtained is further applied to
5 compensate for radiance and light intensity for the first projector (119) (as seen in Figure 1). This same step is then mirrored for the second projector (121).

Furthermore, geometric transformation compensation is done based on the same principle as the radiance and light intensity reduction principle. The images from both
10 projecting devices (119,121) are pre-distorted such that the warping distortion would compensate the distortion introduced by an irregular distance of the curved screen. These derived radiance, light intensity and geometric distortion factors are then stored in the storage means (101) to be retrieved when the online projection system (100) is configured and operational.

15

It is appreciated that a person skilled in the art would be aware that the present invention can be used for, but not restricted to, applications such as video, movie, camera and computer projections.

CLAIMS

1. An online orthogonal projection system (100), the system (100) includes:
 - i. at least two imaging input means (103, 105);
 - ii. a storage means (101), wherein the storage means (101) includes
5 radiance, light intensity and geometric distortion factors;
 - iii. an image registration module (107), wherein the at least two imaging inputs (103, 105) are fed into the image registration module (107);
 - iv. at least two geometric transform modules (109, 111), wherein output
10 from the image registration module (107) are fed into the at least two geometric transform modules (109, 111), wherein the storage means (101) is used to process geometric transformation;
 - v. at least two radiance transform modules (113, 115), wherein output from
15 the geometric transform modules (109, 111) are fed into the at least two radiance transform modules (113, 115), wherein the storage means (101) is used to process radiance transformation; and
 - vi. an image splitter (117), wherein the image splitter (117) decomposes a
20 resulting composite image into at least two component images to be displayed in a first projecting device (119) and a second projecting device (121), wherein a combination of both projections result in a final composite image,
wherein the system is used with at least two projectors (119, 121) that are disposed such that both projectors (119,121) are at a predetermined angle range of 85° to 95° from each projector.
- 25 2. The system (100) as claimed in claim 1, wherein the two projectors (119,121) are disposed at a 90° angle to each other with the use of a metal bar (301) with a scale.

3. A method of geometrically transforming images and transforming radiance levels of images, the method includes the steps of :
- i. registering at least two images in an online orthogonal projection system (100);
 - 5 ii. geometrically transforming the at least two images using previously stored radiance, light intensity and geometric distortion factors in a storage means (101);
 - iii. transforming radiance levels of the at least two images using previously stored radiance, light intensity and geometric distortion factors of storage means (101); and
 - 10 iv. decomposing the at least two images to be displayed in the first and second projecting devices (119,121).
4. A method of configuring an online projection system (100), the method includes the steps of:
- 15 i. calculating curve information for a curved background;
 - ii. ensuring that at least two projecting devices (119) are used, wherein the at least two projecting devices (119) are at a right angle to each other;
 - iii. decomposing a composite image into a horizontal and a vertical component, wherein the composite image is projected from the at least
 - 20 two projecting devices (119);
 - iv. applying the calculated curve information to compensate for radiance and light intensity for a first projecting device (119);
 - v. mirroring calculated radiance and light intensity compensation for a
 - 25 second projecting device (121);
 - vi. pre-distort an image with the calculated curve information in first projecting device (119);

- vii. mirroring the pre-distorted calculation for the second projecting device (121); and
- viii. storing radiance, light intensity and geometric distortion factors in a storage means (101).

5

5. The method as claimed in claim 4, wherein the curve can be calculated by considering factors such as radius, radian, height and hypotenuse.

10

6. The method as claimed in claim 4, wherein the curvature of projector 2 (121) is symmetric to the curvature of projector 1 (119).

7. The method as claimed as claim 4, wherein the calculated curve information is such that summation of radiance at any point of a curve must be equal to unity.

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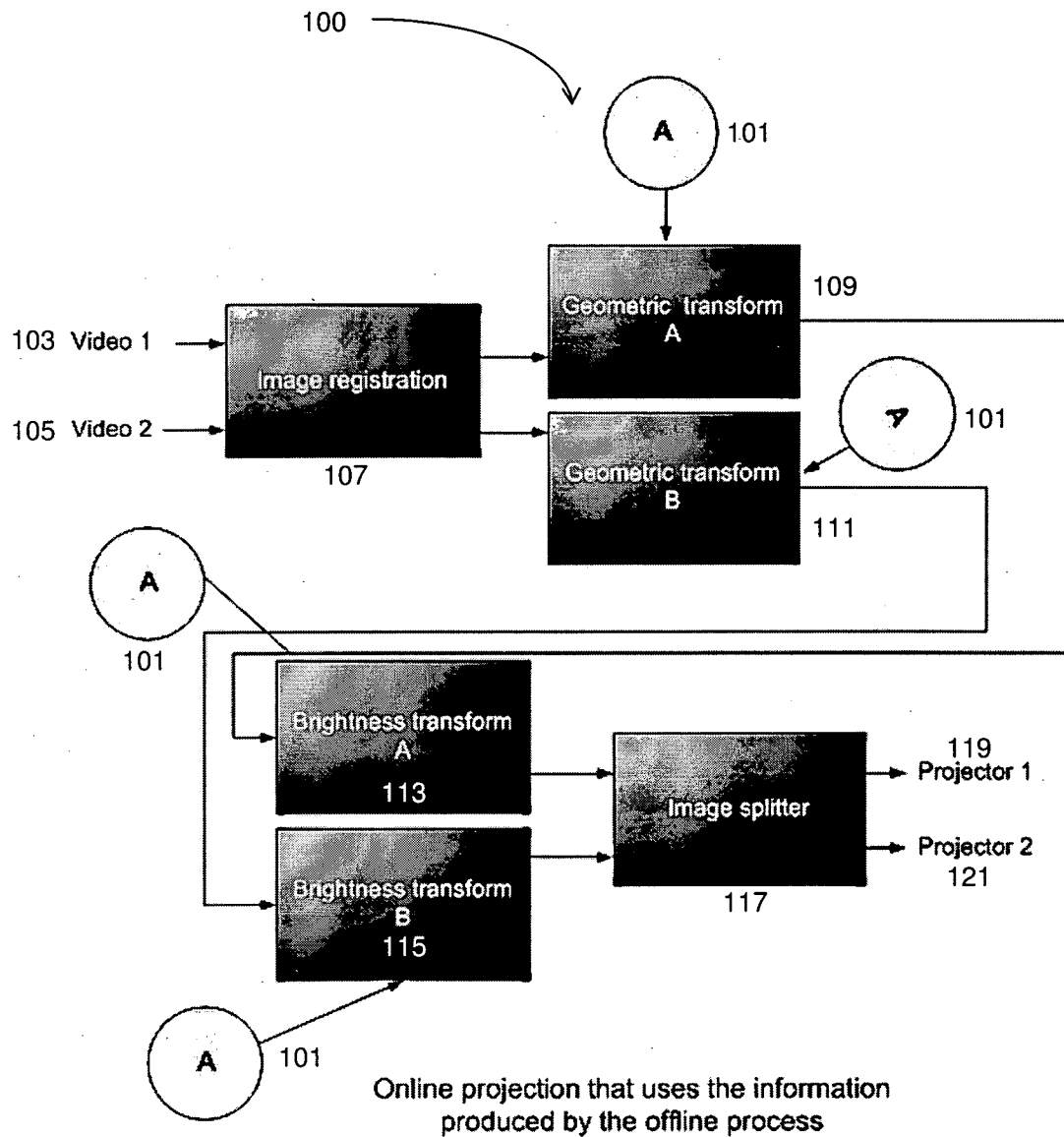


Figure 1

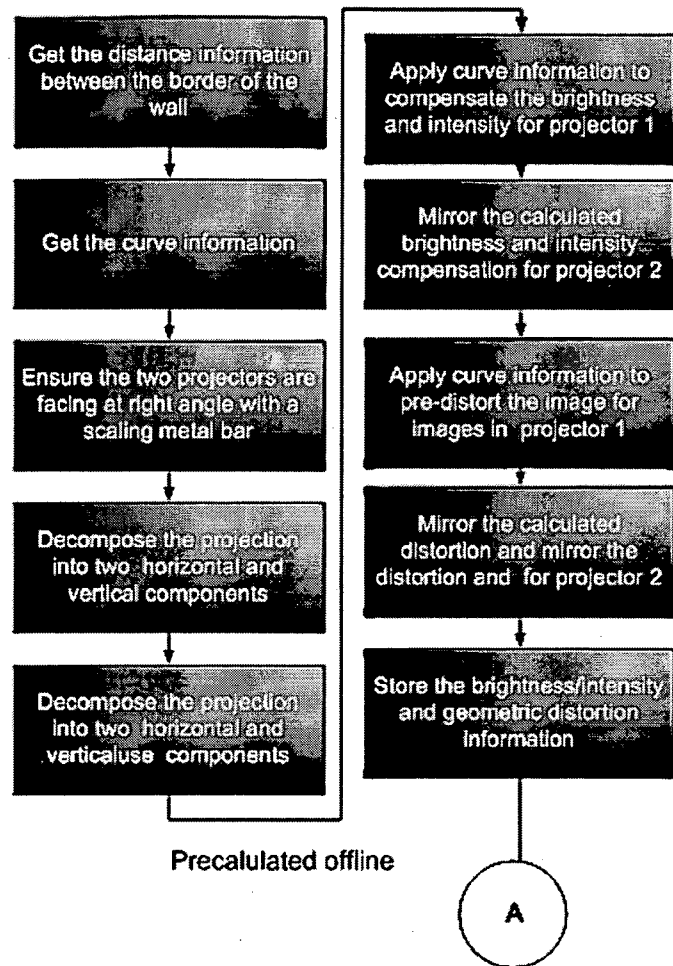


Figure 2

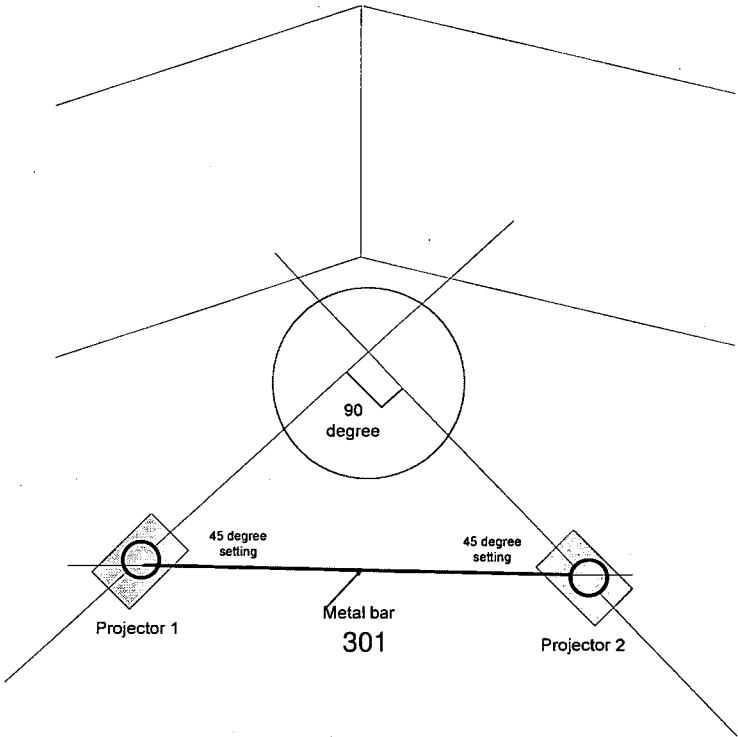
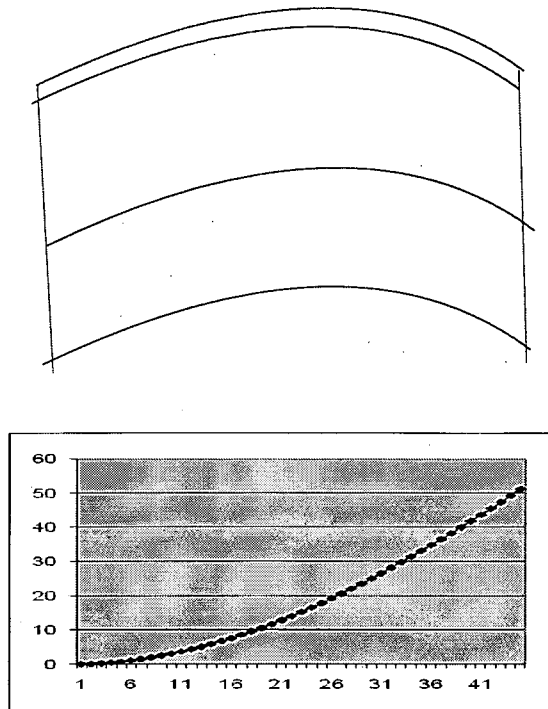


Figure 3



Degree	Radius	Radian	Height	Hipotenuse	Curve
1	123.5	0.017456	2.744	123.5305	0.03048
2	123.5	0.034911	5.488	123.6219	0.121876
3	123.5	0.052367	8.232	123.7741	0.274051
4	123.5	0.069822	10.976	123.9868	0.486784
5	123.5	0.087278	13.72	124.2598	0.759762
6	123.5	0.104733	16.464	124.5926	1.092589
7	123.5	0.122189	19.208	124.9848	1.484788
8	123.5	0.139644	21.952	125.4358	1.935802
9	123.5	0.1571	24.696	125.945	2.444998
10	123.5	0.174556	27.44	126.5117	3.011674
11	123.5	0.192011	30.184	127.1351	3.635061
12	123.5	0.209467	32.928	127.8143	4.314331
13	123.5	0.226922	35.672	128.5486	5.048596
14	123.5	0.244378	38.416	129.3369	5.836921
15	123.5	0.261833	41.16	130.1783	6.678322
16	123.5	0.279289	43.904	131.0718	7.571779
17	123.5	0.296744	46.648	132.0162	8.516233
18	123.5	0.3142	49.392	133.0106	9.5106
19	123.5	0.331656	52.136	134.0538	10.55377
20	123.5	0.349111	54.88	135.1446	11.64461
21	123.5	0.366567	57.624	136.282	12.78197
22	123.5	0.384022	60.368	137.4647	13.96471
23	123.5	0.401478	63.112	138.6917	15.19165
24	123.5	0.418933	65.856	139.9616	16.46165
25	123.5	0.436389	68.6	141.2735	17.77353
26	123.5	0.453844	71.344	142.6261	19.12614
27	123.5	0.4713	74.088	144.0183	20.51834
28	123.5	0.488756	76.832	145.449	21.94898
29	123.5	0.506211	79.576	146.9169	23.41695
30	123.5	0.523667	82.32	148.4211	24.92113
31	123.5	0.541122	85.064	149.9604	26.46044
32	123.5	0.558578	87.808	151.5338	28.03381
33	123.5	0.576033	90.552	153.1402	29.64018
34	123.5	0.593489	93.296	154.7785	31.27853
35	123.5	0.610944	96.04	156.4479	32.94786
36	123.5	0.6284	98.784	158.1472	34.64717
37	123.5	0.645856	101.528	159.8755	36.37553
38	123.5	0.663311	104.272	161.632	38.13199
39	123.5	0.680767	107.016	163.4156	39.91565
40	123.5	0.698222	109.76	165.2256	41.72563
41	123.5	0.715678	112.504	167.0611	43.56107
42	123.5	0.733133	115.248	168.9211	45.42114
43	123.5	0.750589	117.992	170.805	47.30504
44	123.5	0.768044	120.736	172.712	49.21199
45	123.5	0.7855	123.48	174.6412	51.14123

Figure 4

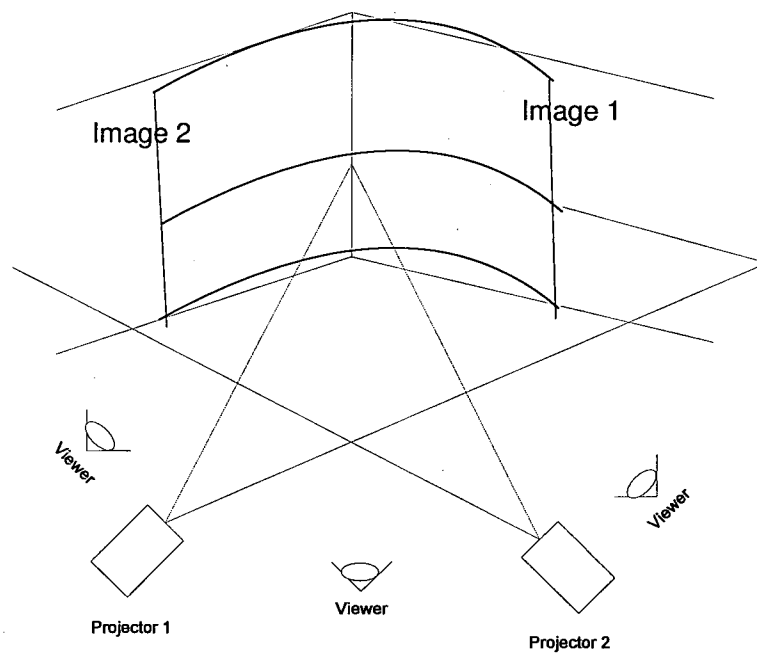


Figure 5

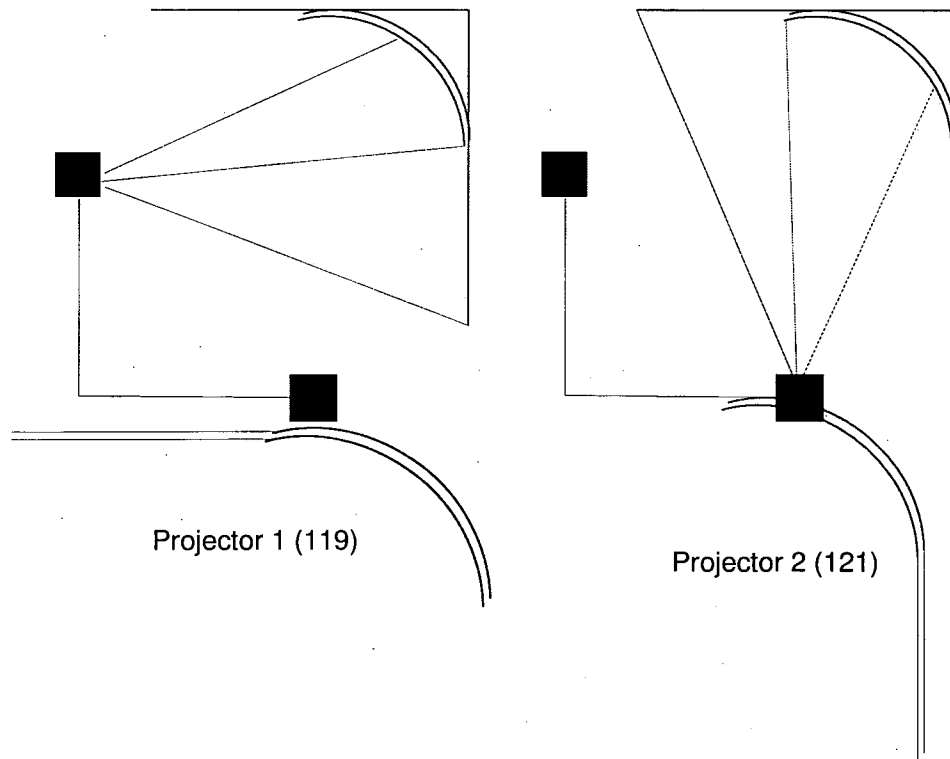


Figure 6

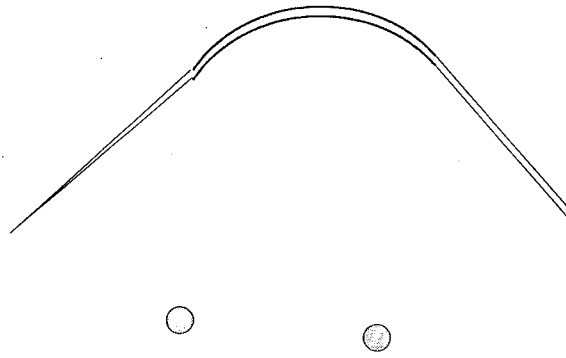


Figure 7

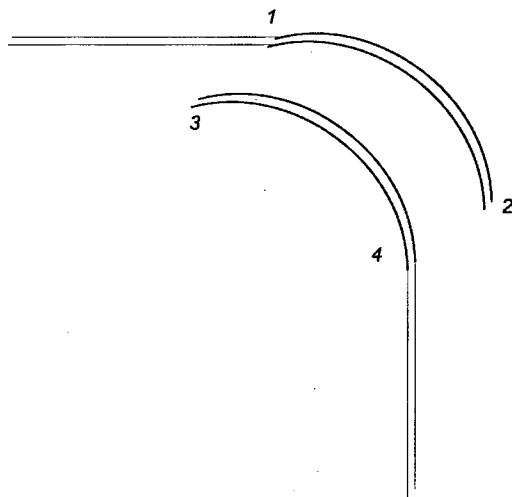


Figure 8

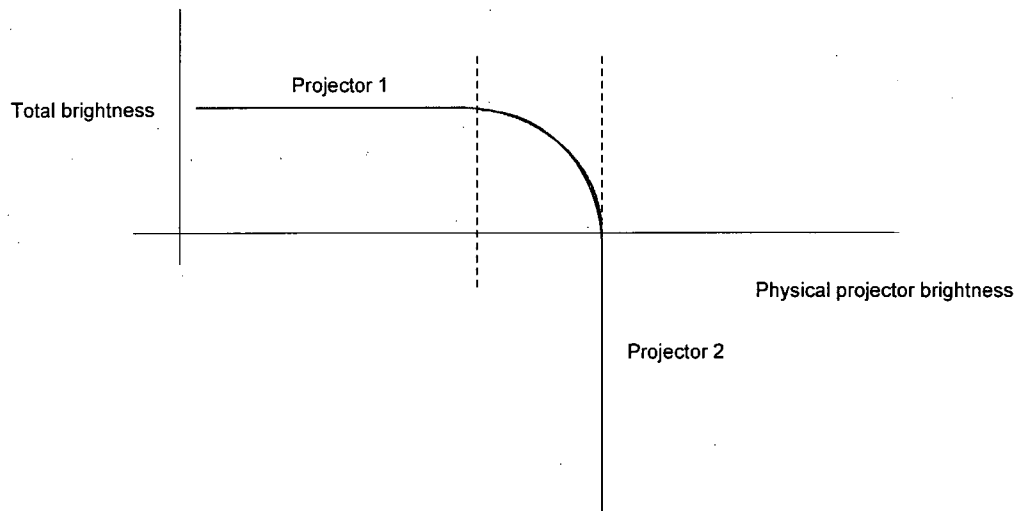


Figure 9

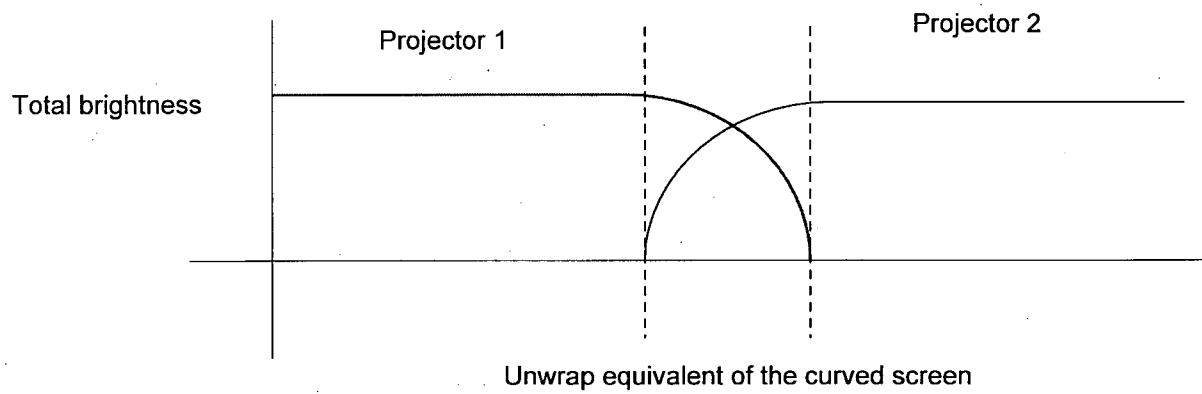


Figure 10

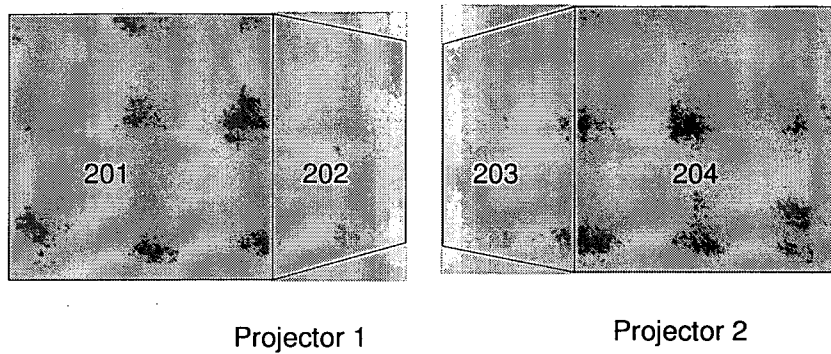


Figure 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2010/000091

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. G03B 21/00 (2006.01) G06T 1/00 (2006.01) H04N 9/12 (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) WPI, Epodoc, Esp@cenet, Google Patents, Patent Lens: keywords (projector, multiple, registration, radiance, compensation) 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.			
Y	US 6755537 B1 (RASKAR et al.) 29 June 2004 column 2 lines 63-67, column 3 line 57; Fig. 1 item 120, column 9 line 50- column 11 line 32	1-3			
Y	US 2002/0008697 A1 (DEERING) 24 January 2002 para. [0005, 0042-0049, 0142]	1, 3			
X	US 2006/0152680 A1 (SHIBANO) 13 July 2006 Para. [0008, 0015-0019, 0092]	4-7			
Y	para. [0006, 0015-0016, 0061-0065]	1-3			
☒ Further documents are listed in the continuation of Box C ☒ See patent family annex					
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> * 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 </td> <td style="width: 33%; vertical-align: top;"> "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 </td> <td style="width: 33%;"></td> </tr> </table>			* 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	
* 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 19 July 2010		Date of mailing of the international search report 30 JUL 2010			
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. +61 2 6283 7999		Authorized officer SURYA PRAKASH AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2101			

INTERNATIONAL SEARCH REPORT

International application No.

PCT/MY2010/000091

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6017123 A (BLEHA et al.) 25 January 2000 Whole document	1-7
A	US 6480175 B1 (SCHNEIDER) 12 November 2002 Whole document	1-7
A	US 7215362 B2 (KLOSE) 8 May 2007 Whole document	1-7
	Note: for claims 1, 3 : US 6755537 B1 can be combined with either of US 2002/0008697 A1 or US 2006/0152680 A1 to show lack of inventive step.	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2010/000091

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 refer to Supplemental Box No. 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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2010/000091

Supplemental Box No 1

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

Continuation of Box No: III

The specification does not comply with Section 40(4) because the claims do not relate to one invention only. I have found different inventions based on the following features that distinguish the claims from each other:

- **Claim 1-3** is directed towards an online system which comprises registering at least two images, transforming radiance levels and splitting image into two components before projecting them using projection devices. It is considered that registration of images, transformation of the radiance levels and decomposing image comprises a first distinguishing feature.
- **Claims 4-7** are directed towards configuring a projection system by calculating curve information of the curved background and applying that to compensate for radiance and light intensity. It is considered that compensating radiance and light intensity using calculated curve information of the background comprises a second distinguishing feature.

Unity of invention is only fulfilled when there is at least one "special technical feature" present in the claims. This is a feature that both:

- provides a technical relationship among all the claims; and,
- makes a contribution over the prior art.

In the above group of claims, the identified distinguishing features may have the potential to make a contribution over the prior art but are not common to all the claims and therefore cannot provide the required technical relationship. The only feature common to all of the claims and which provides a technical relationship among them is the compensation of radiance levels. However these features does not make a contribution over the prior art because these are disclosed in:

US 2006/0152680 A1 (SHIBANO) 13 July 2006.

Therefore in the light of this document there is no special technical feature present in the claims and the requirements for unity of invention are consequently not satisfied *a posteriori*.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/MY2010/000091

Information on patent family members

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	6755537	CN	1698359	EP	1606937	WO	2004084548
US	2002008697	AU	47523/01	EP	1295254	EP	1363238
		EP	1363239	US	2002070944	US	6771272
		US	2003206179	US	6924816	US	2002015052
		US	6940529	US	2002012004	US	7002589
		US	7079157	US	2007022965	US	7407610
		US	2001052326	US	2004216688	WO	0171665
US	2006152680	CN	1701597	EP	1606935	HK	1081777
		JP	2007148416	KR	20050062579	US	7131733
		WO	2004086755				
US	6017123	EP	0786687	JP	9211386		
US	6480175	NONE					
US	7215362	EP	1434434	US	2005083402		
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.							
END OF ANNEX							