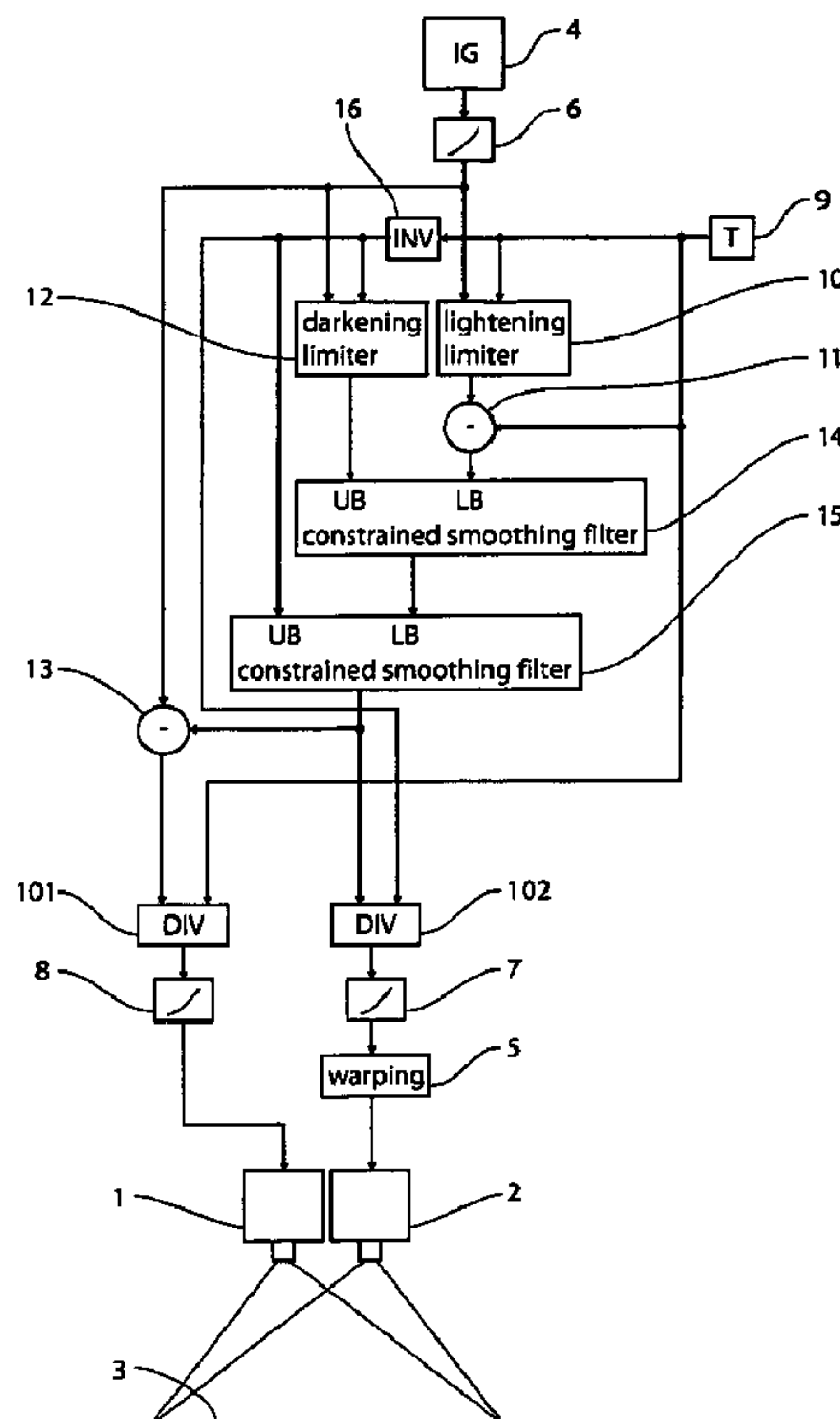




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(54) **Titre : PROJECTION A DOUBLE SUPERPOSITION**
(54) **Title: DOUBLE STACKED PROJECTION**



(57) **Abrégé/Abstract:**

A method for producing a first output image and a second output image for being projected by a first projector and a second projector, respectively, is disclosed. The method comprises: providing a source image comprising a plurality of pixels, each pixel



(57) Abrégé(suite)/Abstract(continued):

having a source value, providing an inverted threshold value for each pixel of the plurality of pixels, and generating thereof a temporary image comprising a temporary value for each pixel of the plurality of pixels. The method further comprises: generating the first output image comprising a first output value for each pixel of the plurality of pixels, the first output value being generated from the temporary value and the source value for each pixel, and generating the second output image comprising a second output value for each pixel of the plurality of pixels, the second output value being generated from the temporary value.

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(54) Title: DOUBLE STACKED PROJECTION

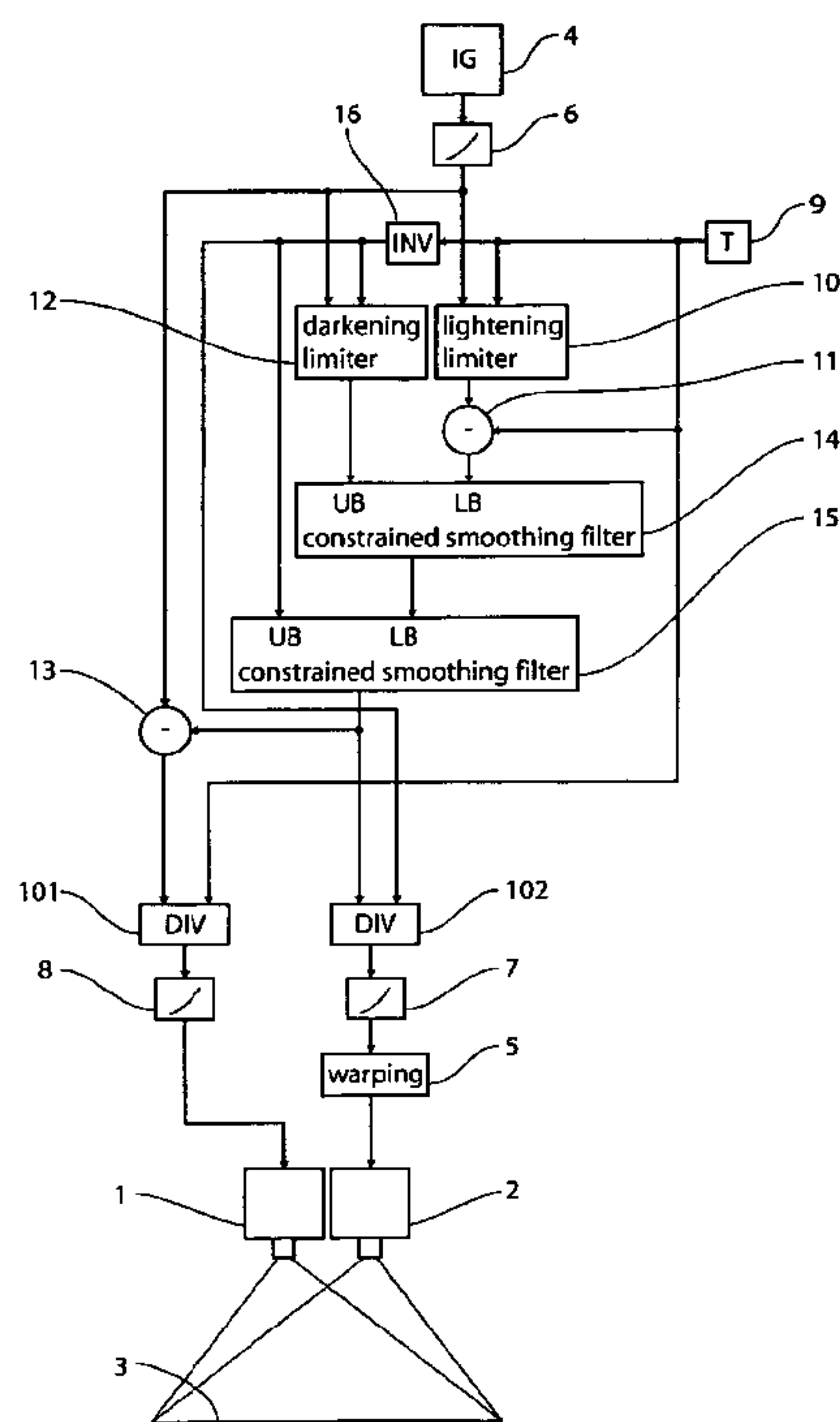


FIG. 2

(57) Abstract: A method for producing a first output image and a second output image for being projected by a first projector and a second projector, respectively, is disclosed. The method comprises: providing a source image comprising a plurality of pixels, each pixel having a source value, providing an inverted threshold value for each pixel of the plurality of pixels, and generating thereof a temporary image comprising a temporary value for each pixel of the plurality of pixels. The method further comprises: generating the first output image comprising a first output value for each pixel of the plurality of pixels, the first output value being generated from the temporary value and the source value for each pixel, and generating the second output image comprising a second output value for each pixel of the plurality of pixels, the

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DOUBLE STACKED PROJECTION

BACKGROUND OF THE INVENTION

5 Modern super high resolution 4K digital cinema projectors designed for normal sized
cinema screens have a resolution ideal also for very large screens but lack the
brightness needed for these. Double stacking projectors are an effective way of in-
creasing brightness, but traditional double stacking is difficult at such high resolu-
10 tions because the tolerance in the alignment of projected images becomes very
small and is hard to meet during presentations due to thermal induced movements
in the mechanical and optical parts and vibrations from the audio system. In other
applications like temporary projection set-ups, home cinemas etc., alignment of
double stacked projectors may be difficult to maintain even when working at much
lower resolutions.

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“Double stacking” of projectors, i.e. overlaying the images of two projectors project-
ing the same image, is a well known way to increase brightness. However, it is also
well known that traditional double stacking requires high maintenance of the align-
ment of the projectors to maintain image quality.

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In 4K projection, traditional double stacking is not considered an option, because it
would be impossible to keep the sharpness and detail on par with that of a single 4K
projector throughout a presentation. This is unfortunate for giant screen theatres,
because while 4K projectors lend themselves well to giant screens in terms of reso-
25 lution, available projectors generally do not have enough light for giant screens, so
stacking would seem desirable to double the light output.

OBJECT OF THE INVENTION

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An object of the invention is to present a double stacking system that overcomes the
above mentioned difficulty and presents other advantages. Exemplary applications
may be giant screen cinemas, simulators, conference presentations, staging, exhib-

its, outdoor projection, traditional cinemas, home cinemas, and other applications where brightness of a projected image is a consideration.

An object of the present invention is also to present a novel image processing system for double stacked projector configurations that overcomes the above mentioned maintenance difficulties and provides for a high quality, low-maintenance double stacking system even for 4K projection.

SUMMARY OF THE INVENTION

An image processing circuit comprising thresholding limiters and constrained smoothing filters splits a source image into two images, which, when projected overlaid on a projection surface by a pair of double-stacked projectors, together form an image essentially identical to the source image, but where one image has significantly less high frequency components. The invention presents advantages over traditional double stacking in aspects of projector alignment, content copy protection, banding artefacts and equipment costs.

GENERAL DESCRIPTION

The above objects are according to a first aspect of the present invention met by a method for producing a first output image and a second output image for being projected by a first projector and a second projector, respectively, the method comprising:

- (a) providing a source image comprising a plurality of pixels, each pixel having an source value,
- (b) providing a threshold value for each pixel of the plurality of pixels, in a first alternative
- (d) generating a temporary image comprising a temporary value for each pixel of the plurality of pixels, the temporary value being generated in a process equivalent to:
 - (i.i) determining a first maximum value as the maximum of the source value and its corresponding threshold value for each pixel,
 - (i.ii) determining an intermediate value by subtracting the corresponding threshold value from the first

