

CLAIMS:

1. A method of generating luminance uniformity in a rear projection display system, the method comprising:

calculating luminance generated by a projector on a rear projection screen relative to a design eye position in front of the rear projection screen;

determining a baseline luminance value for each primary color according to the calculated luminance, wherein luminance of all locations on the rear projection screen is corrected toward the baseline luminance value;

determining an allocation between an optical filter and electronic correction to perform the correction to the baseline luminance value;

measuring luminance at a number of calibration points on the rear projection screen, wherein the calibration points are at fixed azimuth and elevation locations on the rear projection screen;

adjusting, according to the allocation and the luminance at the calibration points, the electronic correction for a color image to produce a corrected color image for projection from the projector; and

projecting, from the projector, the corrected color image through the optical filter, wherein the optical filter is configured to dim specified areas within the corrected color image according to the allocation.

2. The method of claim 1, wherein determining the allocation between the optical filter and electronic correction comprises:

allocating all luminance correction that is common to all three primary colors to the optical filter; and

allocating all remaining required luminance correction to electronic correction on a per primary color basis.

3. The method of claim 1 or 2, wherein determining the allocation between the optical filter and electronic correction comprises:

determining a cutoff value for luminance correction by the optical filter according to spatial location on the rear projection screen beyond which all luminance correction is performed electronically;

determining, below the cutoff value, a corresponding remaining luminance correction value to be performed by the optical filter; and

determining, based on the luminance correction value of the optical filter, a final luminance correction value for the electronic correction on a per primary color basis.

4. The method of any of claims 1-3, wherein electronic correction is performed according to an alpha plane of the projector.

5. The method of any of claims 1-4, wherein adjusting the electronic correction further comprises creating a number of correction maps corresponding to primary colors generated by the projector based on measured luminance and color at each of the calibration points.

6. The method of any of claims 1-5, wherein the baseline luminance value for each primary color comprises the minimum luminance for each primary color, and wherein percentage correction applied at each point on the screen is a ratio between the luminance at that point and the baseline luminance value.

7. The method of any of claims 1-6, wherein calculating luminance generated by the projector is performed during calibration of the projector.

8. The method of any of claims 1-7, wherein the optical filter comprises an opacity that varies spatially according to a calculated pattern based on the allocation.

9. A system of generating luminance uniformity in a rear projection display system, the system comprising:

- a storage device that stores program instructions;
- one or more processors operably connected to the storage device and configured to execute the program instructions to cause the system to:
 - calculate luminance generated by a projector on a rear projection screen relative to a design eye position in front of the rear projection screen;
 - determine a baseline luminance value for each primary color according to the calculated luminance, wherein luminance of all locations on the rear projection screen is corrected toward the baseline luminance value;
 - determine an allocation between an optical filter and electronic correction to perform the correction to the baseline luminance value;
 - measure luminance at a number of calibration points on the rear projection screen, wherein the calibration points are at fixed azimuth and elevation locations on the rear projection screen;
 - adjust, according to the allocation and the luminance at the calibration points, the

electronic correction for a color image to
produce a corrected color image for projection
from the projector; and

an optical filter positioned in a light path of the
projector, wherein the optical filter is configured to dim
specified areas within the corrected color image according
to the allocation.

10. The system of claim 9, wherein determining the
allocation between the optical filter and electronic
correction comprises:

allocating all luminance correction that is common to
all three primary colors to the optical filter; and

allocating all remaining required luminance correction
to electronic correction on a per primary color basis.

11. The system of claim 9 or 10, wherein determining the
allocation between the optical filter and electronic
correction comprises:

determining a cutoff value for luminance correction by
the optical filter according to spatial location on the
rear projection screen beyond which all luminance
correction is performed electronically;

determining, below the cutoff value, a corresponding
remaining luminance correction value to be performed by the
optical filter; and

determining, based on the luminance correction value
of the optical filter, a final luminance correction value
for the electronic correction on a per primary color basis.

12. The system of any of claims 9-11, wherein electronic
correction is performed according to an alpha plane of the
projector.

13. The system of any of claims 9-12, wherein adjusting the electronic correction further comprises creating a number of correction maps corresponding to primary colors generated by the projector based on measured luminance and color at each of the calibration points.

14. The system of claim 13, wherein data collected for each of the calibration points based on their azimuth and elevation location is mapped back to raster space of the projector.

15. A computer program product for generating luminance uniformity in a rear projection display system, the computer program product comprising:

- a computer-readable storage medium having program instructions embodied thereon to perform the steps of:

- calculating luminance generated by a projector on a rear projection screen relative to a design eye position in front of the rear projection screen;

- determining a baseline luminance value for each primary color according to the calculated luminance, wherein luminance of all locations on the rear projection screen is corrected toward the baseline luminance value;

- determining an allocation between an optical filter and electronic correction to perform the correction toward the baseline luminance value;

- measuring luminance at a number of calibration points on the rear projection screen, wherein the calibration points are at fixed azimuth and elevation locations on the rear projection screen;

- adjusting, according to the allocation and the luminance at the calibration points, the electronic

correction for a color image to produce a corrected color image for projection from the projector; and
calculating, based on the allocation, a pattern of spatially varied opacity for the optical filter.