Claims

1. A projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system is implemented such that constellations of points in the individual images, each superimposed in a respective common point in the overall image by the multi-channel optics, differ depending on what distance the respective common point in the overall image has to the multi-channel optics.

~~2.~~ ~~The projection display according to claim 1,~~ wherein the multi-channel optics comprises a two-dimensional assembly of projection optics in a projection optics plane essentially ~~perpendicular~~ parallel to the imaging plane, wherein the two-dimensional ~~projection optics~~ assembly of projection optics is configured ~~to~~ such that each projection optics of the two-dimensional assembly maps ~~one allocated~~a respective individual image of the imaging system assigned to the respective projection optics ~~each~~ along a respective optical axis ~~in the direction of~~towards the projection surface, such that the mappings of the individual images are superimposed ~~to the overall image~~ in the projection surface so as to obtain the overall image.

2. The projection display according to claim 2, wherein

the imaging system is implemented as a static mask statically generating the individual images at the sub-areas so that the projection surface is located at a fixed position relative to the projection display, with the static mask being configured so that the individual images are individually distorted such that

or

the imaging system is implemented as a digital imaging system configured to distort the individual images relative to an input image to be displayed such that

the constellations of points in the individual images, each superimposed in a respective common point in the overall image by the multi-channel optics, differ depending on what distance the respective common point in the overall image has to the multi-channel optics.

3. The projection display according to claim 2, wherein the projection optics comprises decentration with respect to the allocated sub-areas, wherein a center pitch of the projection optics is smaller than a center pitch of the allocated sub-areas, so that the overall image superimposed in the projection surface is real.

4. The projection system according to claim 2, wherein the projection optics comprises decentration with respect to the allocated sub-areas, wherein the center pitch of the projection optics is larger than or equal to the center pitch of the allocated sub-areas, so that the overall image superimposed in the projection surface is virtual.

5. The projection display according to claim 2, wherein the projection optics is centered with respect to the allocated sub-areas and has a collimating effect.

6. The projection display according to claims 3, 4 or 5, wherein the projection optics assembly further comprises an overall lens that is downstream with respect to the two-dimensional assembly of projection optics and cooperates with the two-dimensional assembly of projection optics that is implemented to refocus collimated beams from the projection optics in a focal plane of the overall lens, wherein the projection optics are centered with respect to the allocated sub-areas and have a collimating effect, or to focus divergent/convergent beams from the projection optics in an effective focal plane resulting by decentration between the projection optics on the one hand and the sub-areas on the other hand and focusing by the downstream overall lens.

7. The projection display according to claim 6, wherein the overall lens is implemented as optics with variable focal length, so that an average projection distance can be adjusted.

8. The projection display according to claim 7, wherein the optics with variable focal length is a zoom objective or a liquid lens.

9. The projection display according to claim 2, wherein each projection optics comprises a lens vertex decentered with respect to the aperture of the respective projection optics, wherein a center pitch of the lens vertex is larger or smaller than the center pitch of the allocated sub-areas, so that the lenses effect a projection of the individual image of the respective sub-area along optical axes running divergently or convergently.

10. The projection display according to one of claims 2 to 9, wherein a distance between the sub-areas and the respective projection optics essentially corresponds to a focal length of the respective projection optics.

11. The projection display according to one of claims 2 to 10, wherein a distance between the sub-areas and the respective projection optics essentially corresponds to a focal length of the respective projection optics, but such that the projection lenses remote from the axis have a larger focal length for correcting a defocus due to the larger image distance of these channels.

12. The projection display according to one of claims 1 to 11, wherein the imaging system is further implemented such that the constellations additionally differ depending on the solid angle region in which, seen from the multi-channel optics, the respective common point lies, in order to compensate mapping errors of the multi-channel optics.

13. The projection display according to claim 12, wherein the imaging system is further implemented such that the constellations differ additionally depending on the solid angle region in which, seen from the multi-channel optics, the respective common point lies such that mapping errors of the multi-channel optics can be compensated individually for each channel.

14. A projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system is implemented such that constellations of points in the individual images, each superimposed in a respective common point in the overall image by the multi-channel optics, differ depending on what distance the respective common point in the overall image has to the multi-channel optics,

14. ~~The projection display according to one of claims 1 to 13,~~ wherein the imaging system is implemented such that the difference between the constellations depending on the distance of the respective common point in the overall image to the multi-channel optics is reflected mainly in a centric extension between the constellations, so that first constellations of points in the individual images, each superimposed by the multi-channel optics in a respective common point in the overall image that is less distant to the multi-channel optics than a respective common point in the overall image where points of second constellations in the individual images are superimposed by the multi-channel optics assembly, are laterally more extended with respect to the second constellations.

15. The projection display according to one of claims 1 to 14, wherein the imaging system is implemented, for homogenizing the illuminance across the overall image, to vary the sum of the luminosities of the points of the constellations in the imaging plane depending on the distance of the respective common point in the overall image to the multi-channel optics to which the points of the respective constellations are superimposed by the multi-channel optics, namely by luminosity variation of the points and/or variation of the number of sub-areas contributing a respective point to the respective constellation.

16. A projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system is implemented such that constellations of points in the individual images, each superimposed in a respective common point in the overall image by the multi-channel optics, differ depending on what distance the respective common point in the overall image has to the multi-channel optics,

~~15.~~ ~~The projection display according to one of claims 1 to 14,~~ wherein the imaging system is implemented, for homogenizing the illuminance across the overall image, to vary the sum of the luminosities of the points of the constellations in the imaging plane depending on the distance of the respective common point in the overall image to the multi-channel optics to which the points of the respective constellations are superimposed by the multi-channel optics, namely by luminosity variation of the points and/or variation of the number of sub-areas contributing a respective point to the respective constellation.~~.~~

~~16.~~ ~~The projection display according to claim 15,~~ wherein the imaging system is implemented such that the luminosity variation of the points and/or the variation of the number of sub-areas contributing a respective point to the respective constellation is such that points of sub-areas of channels remote from the axis contribute less to the overall image.

17. The projection display according to one of claims 1 to 16, wherein the imaging system is implemented to generate the individual images from pixel array data representing the overall image, namely by pre-distorting the pixel array data so that distortion of the overall image in the projection surface is corrected due to tilting the same relative to the imaging plane.

18. The projection display according to one of the previous claims, wherein the image system is a reflective imaging system or a transmissive imaging system with rear illumination or a reflective background or an emissive imaging system.

19. The projection display according to one of the previous claims, wherein the image system is a transmissive imaging system that is implemented to display the individual images by lateral variation of transmissivity, wherein the projection display comprises a light source and a field lens or field lens array, and the field lens is arranged at a distance to the individual images so that Köhler illumination of the multi-channel optics is realized.

20. The projection display according to claim 19, further comprising a further field lens for canceling the telecentric illumination.

21. The projection display according to one of the previous claims, wherein at least part of the imaging system is implemented passively, such as in the form of a finely structured mask.

22. The projection display according to one of the previous claims, wherein the imaging system and the multi-channel optics are implemented such that identical individual images from different sub-areas are superimposed in the projection surface in a pixel-precise manner.

23. The projection display according to one of the previous claims that is implemented to receive an image to be projected with a first gray/color scale resolution, wherein the imaging system is implemented to display the individual images with a second gray/color scale resolution that is smaller than the first gray/color scale resolution, wherein the projection display is implemented to control the sub-areas at an image point of the image to be projected depending on a gray/color scale value of the image to be projected, such that the individual images in the overall image, at a position corresponding to the image point, sum up to a gray/color scale corresponding to the gray/color scale value.

24. The projection display according to one of claims 1 to 21, wherein the imaging system and the projection optics assembly are implemented such that the mappings of the individual images are superimposed in the projection surface with a sub-pixel offset so that the overall image superimposed in the imaging plane has a higher resolution than the individual images.

25. The projection display according to one of claims 1 to 24, wherein the imaging system allows one or several of the following user adjustment options independent of one another:

a) changing the sub-images such that a change of an average projection distance of the projection surface to the multi-channel optics with a respective translatory shift in the position of the projection surface results,

b) changing the sub-images such that a change of tilting of the projection surface with respect to the imaging plane results,

c) changing the sub-images such that a change of tilting of the projection surface with respect to the imaging plane results, by simultaneously adapting a trapezoidal distortion correction for compensating the distortion of the overall image in the projection surface due to tilting of the same relative to the imaging plane,

d) changing the sub-images such that a change of bending of the projection surface relative to a plane-parallel orientation to the imaging plane results, and

e) changing the sub-images such that a change of bending of the projection surface with respect to the imaging plane results, by simultaneously adapting a distortion correction for compensating the distortion of the overall image in the projection surface due to local mapping variations due to the bending of the same relative to the plane-parallel orientation to the imaging plane.

26. The projection display according to one of claims 1 to 25, further comprising a camera and an adjuster, wherein the adjuster is implemented to regulate the projection surface into which the multi-channel optics superimpose the individual images to the overall image, in an iterative process and by controlling the imaging system, so that the same displays a test image, such that the projection surface is approximated to an actual projection surface.

27. The projection display according to one of claims 1 to 26, wherein the projection optics are arranged in the projection optics plane at a pitch p_{pL} and the constellations of points in the individual images, each superimposed in a respective common point in the overall image by the multi-channel optics, differ depending on what distance the respective common point in the overall image has to the multi-channel optics, in terms of a pitch distance of the points according to

$$p_{1,2} = \frac{F \cdot p_{pL}}{L_{1,2}} + p_{pL}$$

wherein L_1 and L_2 are distances of two different common points in the overall image and p_1 and p_2 are the resulting pitch distance of the points in the respective constellation of points superimposed in the two different common points and F is distance between the projection optics plane and the imaging plane.

~~27~~28. Method for displaying an overall image, comprising:

generating individual images in a distribution of sub-areas of an imaging plane; and

mapping, by one channel of a multi-channel optics each, one allocated sub-area of the imaging plane each, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and generation of the individual images is performed such that constellations of points in the individual images, each superimposed by the multi-channel optics in a respective common point in the overall image, differ depending on what distance the respective common point in the overall image has to the multi-channel optics.~~,~~

wherein the multi-channel optics comprises a two-dimensional assembly of projection optics in a projection optics plane essentially parallel to the imaging plane, wherein the two-dimensional assembly of projection optics is configured such that each projection optics of the two-dimensional assembly maps a respective individual image of the imaging system assigned to the respective projection optics along a respective optical axis towards the projection surface, such that the mappings of the individual images are superimposed in the projection surface so as to obtain the overall image.

~~28~~29. Projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system and the multi-channel optics are implemented such that a manifestation of a contribution of each channel to the overall image varies locally across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics~~.~~,

wherein the multi-channel optics comprises a two-dimensional assembly of projection optics in a projection optics plane essentially parallel to the imaging plane, wherein the two-dimensional assembly of projection optics is configured such that each projection optics of the two-dimensional assembly maps a respective individual image of the imaging system assigned to the respective projection optics along a respective optical axis towards the projection surface, such that the mappings of the individual images are superimposed in the projection surface so as to obtain the overall image

~~28~~30. Projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system and the multi-channel optics are implemented such that a manifestation of a contribution of each channel to the overall image varies locally across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics~~.~~,

~~29. The projection display according to claim 28,~~ wherein the imaging system and the multi-channel optics are implemented such that a number of superimposed channels vary locally across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics.

31. Projection display comprising

an imaging system that is implemented to generate individual images in a distribution of sub-areas of an imaging plane of the imaging system; and

a multi-channel optics that is configured to map one allocated sub-area of the imaging system each per channel, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and the imaging system and the multi-channel optics are implemented such that a manifestation of a contribution of each channel to the overall image varies locally across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics,

~~30. The projection display according to claims 28 or 29,~~ wherein the imaging system and the multi-channel optics are implemented such that a first set of channels is implemented to limit the superposition to an overall image to a first portion of the overall image that is located within a first interval of distances to the multi-channel optics, and a second set of channels disjunct to the first is implemented to limit the superposition to the overall image to a second portion of the overall image that is located within a second interval of distances to the multi-channel optics, comprising distances that are larger than all distances of the first interval, and that constellations of points in the individual images, superimposed respectively by the first set of channels of the multi-channel optics in a respective common point in the first portion in the overall image, result essentially by a centric extension having a first ratio of extension from a constellation of locations where a projection of aperture centers of the channels of the first set is arranged, and constellations of points in the individual images, superimposed respectively by the second set of channels of the multi-channel optics in a respective common point in the second portion in the overall image, result essentially by a centric

extension having a second ratio of extension from a constellation of locations where a projection of aperture centers of the channels of the second set is arranged, and wherein the first ratio of extension is larger than the second ratio of extension.

~~31~~32. The projection display according to claim ~~30~~31, wherein the multi-channel optics is implemented such that channels of the first set are focused to smaller distances to the multi-channel optics than the channels of the second set.

~~32~~33. The projection display according to claims ~~30~~ 31 or ~~31~~32, wherein the imaging system is implemented such that constellations of points in the individual images, each superimposed by the channels of the first set of the multi-channel optics in a respective common point in the overall image, or constellations of points in the individual images, each superimposed by the channels of the second set of the multi-channel optics in a respective common point in the overall image, differ depending on what distance the respective common point in the overall image has to the multi-channel optics.

~~33~~34. A method for displaying an overall image, comprising

generating individual images in a distribution of sub-areas of an imaging plane; and

mapping, by one channel of a multi-channel optics each, one allocated sub-area of the imaging plane each, such that the mapping of the individual images is superimposed to an overall image in a projection surface,

wherein the projection surface is a non-planar free-form surface or tilted with respect to the imaging plane, and generation and mapping are performed such that a manifestation of a contribution of each channel to the overall image varies locally across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics~~.~~;

wherein the method comprises locally varying a number of superimposed channels across the overall image depending on what distance the respective common point in the overall image has to the multi-channel optics.

~~34~~35. A computer program comprising a program code for performing the method according to claims ~~27~~ 28 or ~~33~~ 34 when the program runs on a computer.