CLAIMS

1. Display device (1) for displaying an image (2) to a user having a visual impairment, the display device (1) comprising:

a pixelated display (3) comprising a plurality of pixels (4), each pixel comprising a plurality of subpixels;

an eye-tracking system (7) for tracking a position of an eye of a user relative to the pixelated display (3);

a microlens array (8) provided on the pixelated display (3); and

a processor (6);

wherein the processor is configured to:

determine, based on a focal length of the eye, a location of a virtual image plane (10), the virtual image plane corresponding to a viewing location of the eye (5) and comprising a plurality of virtual pixels;

relate, for each subpixel (13), the subpixel to a corresponding virtual pixel (14) of the virtual image plane (10) by determining a path of a light ray emitted by the subpixel (13) to the corresponding virtual pixel (14),

determine, for each subpixel, a first value of the subpixel (13) by comparing a value of the subpixel (13) to a value of its corresponding virtual pixel (14),

operate each subpixel (13) based on the determined first value to display a corrected image on the pixelated display.

2. Display device (1) according to claim 1, wherein the processor is further configured to:

determine, based on a detected change a change in a location of the eye to a second viewing location, a second location of the virtual image plane (10);

relate, for each subpixel (13), the subpixel to a second virtual pixel of the virtual image plane when the virtual image plane is in the second location;

determine, for each subpixel (13), a second value of the subpixel by comparing the value of the corresponding subpixel to a value of the second virtual subpixel;

operate each subpixel based on the determined second value to display an updated corrected image on the pixelated display.

3. Display device (1) according to claim 1 or claim 2, wherein the display device (1) is configured to provide a feedback to the user to prompt the user to change a position of the pixelated display (3).

4. Display device (1) according to any of the preceding claims, wherein the eye-tracking system (7) is configured to track a gaze of the eye (5) of the user to determine at which part of the pixelated display (3) the user is gazing.

5. Display device (1) according to claim 4, wherein the corresponding subpixel (13) is located in the part of the pixelated display (3) at which the user is gazing.

6. Display device (1) according to any of the preceding claims, wherein the display device (1) is further provided with an optical gap layer (17) between the pixelated display (3) and the microlens array (8), wherein the optical gap layer defines an optical gap between the pixelated display and the microlens array.

7. Display device (1) according to claim 6, wherein the focal length of the microlenses (9) in the microlens array (8) is equal to the size of the optical gap (18).

8. Display device (1) according to claim 6 or claim 7, wherein the optical gap (18) comprises a secondary microlens array.

9. Display device (1) according to any of the preceding claims, wherein the microlenses (9) are rectangular or square microlenses (9).

10. Display device (1) according to any of the preceding claims, wherein the display device (1) further comprises a protection layer (19) on top of the microlens array (8).

11. Display device (1) according to one or more of the preceding claims, wherein the pixelated display (3) is provided in a smart phone case.

12. Method for displaying an image (2) to a user having a visual impairment, the method comprising:

determining, based on a focal length of an eye of the user, a location of a virtual image plane (10), the virtual image plane corresponding to a viewing location of the eye (5) and comprising a plurality of virtual pixels;

relating, for each subpixel (13) of a pixelated display, the subpixel to a corresponding virtual pixel (14) of the virtual image plane (10) by determining a path of a light ray emitted by the subpixel (13) to the corresponding virtual pixel (14),

determining, for each subpixel, a first value of the subpixel (13) by comparing a value of the subpixel (13) to a value of its corresponding virtual pixel (14),

operating each subpixel (13) based on the determined first value to display a corrected image on the pixelated display.

13. A computer readable medium comprising instructions which, when executed, cause a processor to perform the method according to claim 12.

14. Smart phone case comprising a display device (1) according to any of claims 1-11 and adapted for operating the display device (1) according to the method according to claim 12.