Claims

1. An augmented reality device, comprising:

a projection system comprising:

a light engine comprising a pixel, wherein the pixel comprises an emission surface;

a microlens coupled to the emission surface of the pixel; and

a projection lens configured to refract a first light emitted by the pixel, wherein the first light has a first pupil length defined by a distance between a first end and a second end of the first light; and

a waveguide comprising:

an input coupler configured to incouple the first light at a first bounce length that is equivalent to the first pupil length.

2. The device of claim 1, wherein the waveguide further comprises:

a substrate comprising a first surface and a second surface opposing the first surface, wherein the input coupler is disposed over the first surface or the second surface; and

an output coupler disposed over the substrate, the output coupler configured to emit a plurality of output beams, the plurality of output beams at least comprising a first output beam and a second output beam, the first output beam having a first distance and the second output beam having a second distance, wherein the first distance and the second distance are equivalent to the first bounce length.

3. The device of claim 1, wherein the microlens refracts the first light at a first cone angle.

4. The device of claim 1, wherein the projection lens refracts the first light at a first input angle.

5. The device of claim 1, wherein the first end of the first light is incoupled into the waveguide at a first point and the second end of the first light is incoupled into the waveguide at a second point.

6. The device of claim 5, wherein the first end the first light contacts the second point after completing one bounce.

7. The device of claim 1, wherein the first end of the first light aligns with the second end of the first light while inside the waveguide.

8. An augmented reality device, comprising:

a projection system comprising:

a light engine comprising a plurality of pixels, the plurality of pixels comprising:

a first pixel configured to emit a first light at a first spectrum; and

a second pixel configured to emit a second light at a second spectrum;

a plurality of microlenses comprising:

a first microlens coupled to a first emission surface of the first pixel; and

a second microlens coupled to a second emission surface of the second pixel;

a projection lens configured to refract the first light and the second light, wherein the first light has a first pupil length and the second light has a second pupil length; and

a waveguide comprising:

an input coupler configured to incouple the first light and the second light, wherein the first light is incoupled at a first bounce length equivalent to the first pupil length and the second light is incoupled at a second bounce length equivalent to the second pupil length.

9. The device of claim 8, wherein the waveguide further comprises:

a substrate comprising a first surface and a second surface opposing the first surface, wherein the input coupler is disposed over the first surface or the second surface; and

an output coupler formed on the substrate, the output coupler configured to emit a plurality of output beams, the plurality of output beams at least comprising a first output beam and a second output beam, the first output beam comprising a first end and a second end, the second output beam comprising a third end and a fourth end, wherein the second end of the first output beam and the third end of the second output beam are aligned.

10. The device of claim 8, wherein the first microlens refracts the first light at a first cone angle and the second microlens refracts the second light at a second cone angle.

11. The device of claim 8, wherein the projection lens refracts the first light at a first input angle and the second light at a second input angle.

12. The device of claim 8, wherein a first end of the first light is incoupled into the waveguide at a first point and a second end of the first light is incoupled into the waveguide at a second point, a third end of the second light is incoupled into the waveguide at a third point and a fourth end of the second light is incoupled into the waveguide at the second point.

13. The device of claim 12, wherein the first end of the first light and the third end of the second light contact the second point after completing one bounce.

14. The device of claim 12, wherein the first end of the first light aligns with the second end of the first light while inside the waveguide and the third end of the second light aligns with the fourth end of the second light while inside the waveguide.

15. The device of claim 12, wherein the second point is aligned with an inner edge of the input coupler.

16. The device of claim 8, wherein the first spectrum and the second spectrum are different from one another.

17. The device of claim 8, wherein the first pupil length and the second pupil length are different from one another.

18. The device of claim 8, wherein the first bounce length and the second bounce length are different from one another.

19. The device of claim 9, wherein each output beam of the plurality of output beams are outcoupled at a first outcouple angle.

20. A method of projecting a light comprising:

emitting a light from a pixel into a microlens;

refracting the light from the microlens into a projection lens, wherein the light has a first cone angle;

refracting the light from the projection lens into an input coupler of a waveguide, wherein the light has a pupil length, the pupil length is defined by a distance between a first end of the light and a second end of the light, wherein the second end of the light is emitted at an inner edge of the input coupler; and

reflecting the light within the waveguide towards an output coupler of the waveguide, wherein the light has a bounce length, wherein the bounce length and the pupil length are equivalent.