

# Microstructured Waveguide Illuminator

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## TECHNOLOGY DESCRIPTION

The invention is a technique for using waveguides and micro-optic structures to make advanced backlights, which controllably route light from one or more small area bright sources to emit from the surface of a relatively large panel.

## APPLICATIONS

The technique may be used to make inexpensive LED light fixtures (e.g., for office lighting) which can be electrically or mechanically controlled to adjust the direction and divergence of the emitted light. In another more advanced implementation, the technique may be used to provide active real time control of the direction of light emitted from a LC display, for improved energy efficiency, privacy, and potentially for glasses-free, multi-user 3-D display.

## ADVANTAGES

The invention makes use of periodic micro-optic structures in combination with a waveguide wherein the direction of light emission is controlled by the position of "extraction" microstructures relative to a periodic array of lenslets separate from the waveguide. The emission direction of the fixed structure is determined by the physical shape of the lenslets and the waveguide extraction microstructures. Also, the position of the lenslets relative to the waveguide extraction features, and so the direction of light emission, can be controlled by moving the entire lenslet array relative to the waveguide. This would allow for an inexpensive planar LED light fixture to have a user-controlled direction of emission and divergence angle. This control could be mechanical (i.e., using a pair of knobs or screws) or electro-mechanical (using a motor).

In a second, more complex, embodiment of the invention, the array of light extraction features would either be formed, or revealed, by electrical control over each element in the array. For example, a conventional LC panel might be modified to control the index over each area of the waveguide, so that an electrical pattern displayed on the LC panel would determine the direction of light emission in real time. This would allow for a LC display which sends light only towards a single viewer's face (to reduce the light energy needed to power the display, and provide for privacy), or to alternate projection to only the viewer's right or left eye (to enable a glasses-free 3D display). This version could be actively and automatically controlled using an inexpensive camera and real-time image processing to identify and track the position of the viewer's face (or eyes).

## INTELLECTUAL PROPERTY INFO

This technology is patent pending under PCT application with world-wide rights available.

## PATENT STATUS

| Country                  | Type                  | Number      | Dated      | Case     |
|--------------------------|-----------------------|-------------|------------|----------|
| United States Of America | Issued Patent         | 10,048,429  | 08/14/2018 | 2013-108 |
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## OTHER INFORMATION

### CATEGORIZED AS

- **Energy**
- Lighting
- **Engineering**
- Other

### RELATED CASES

2013-108-0

