Docket #: S15-227

Light-field imaging using a gradient metasurface optical element

Stanford inventors have developed a method that allows for simultaneous 3D imaging with high resolution by using a multifunctional metalens to replace the conventionally used microlens array in light-field imaging. The invention can change the way light field microscopy is done today. Currently light field microscopy allows for simultaneous 3D imaging but sacrifices spatial resolution when compared to a conventional microscope. The metalens technology described in this invention allows for improved spatial resolution while at the same time being easy to integrate into existing light field imaging systems.

Applications

- Light-field imaging, Light field microscopy, Light field digital camera, Wearable devices, light field display

Advantages

- We have identified the following advantages of using a multiplexed metalens array over a conventional microlens array: 1. The metalens can achieve simultaneous 3D imaging at a higher spatial resolution. 2. The metalens can feature a larger numerical aperture. 3. Random spatial multiplexing of phase profiles of different microlenses in a composite metalens can suppress the higher diffracted order between focal spots, which used to be a problem in microlens array. 4. The metalenses are flat, ultrathin, and feature a small footprint, affording easy incorporation in microscope systems. 5. The metalenses are easily fabricate using conventional thin film deposition and patterning. 6. A metalens can be created on any substrate, e.g. a glass slide or a semiconductor wafer. 7. A phase plate function can be easily integrated into

the metalens design.

Patents

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