Metamaterial lens to reduce chromatic aberration and improve optical focus

Technology #cu12277

A fundamental problem that limits the quality of an optical lens is chromatic aberration. When passed through a lens, different wavelengths of light will have slightly different focal lengths; for a given focal plane, distinct colors will be out of sync with one another, leading to a blurry image. This technology presents a means to reverse the blurring effects of chromatic aberration using a custom-designed metamaterial lens. This metamaterial lens has a reverse chromatic aberration effect, essentially correcting inherent chromatic aberration. By coating a traditional lens with this technology, all wavelengths of light will focus together, leading to an ultra-sharp image.

Thin metamaterial lens improves focus through reverse chromatic aberration

Focal length decreases when higher frequency light passes through glass lenses. This causes lenses to focus different colors in different places, causing image distortions called chromatic aberration. In contrast to natural materials, metamaterial lenses can be engineered to exhibit focal lengths that increase with increasing frequency. The resulting reverse chromatic aberration can be exploited to correct natural chromatic aberration. Thus, images can be corrected without significantly increasing total lens thickness or modifying the image with software.

The inventors have developed a prototype, which they are currently testing.

Lead Inventor:

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Applications:

- Compact lenses and optical systems with reduced chromatic aberration and enhanced resolution.
- Optical systems capable of simultaneously focusing on multiple objects at different distances.
- Has the potential to improve lenses in microscopes, telescopes, cameras, video surveillance, and other imaging systems.

Advantages:

- Provides increased engineering flexibility to optical system designers beyond the capabilities of natural materials.
- Can be customized for optimal reduction of chromatic aberration in specific optical systems.
- Can correct chromatic aberration distortion of conventional lenses without appreciably increasing lens thickness.
- Does not require a post-hoc software correction of the image.

Patent information:

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Related Publications:


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