Novel method for controlling light polarization uses liquid crystals to create holograms

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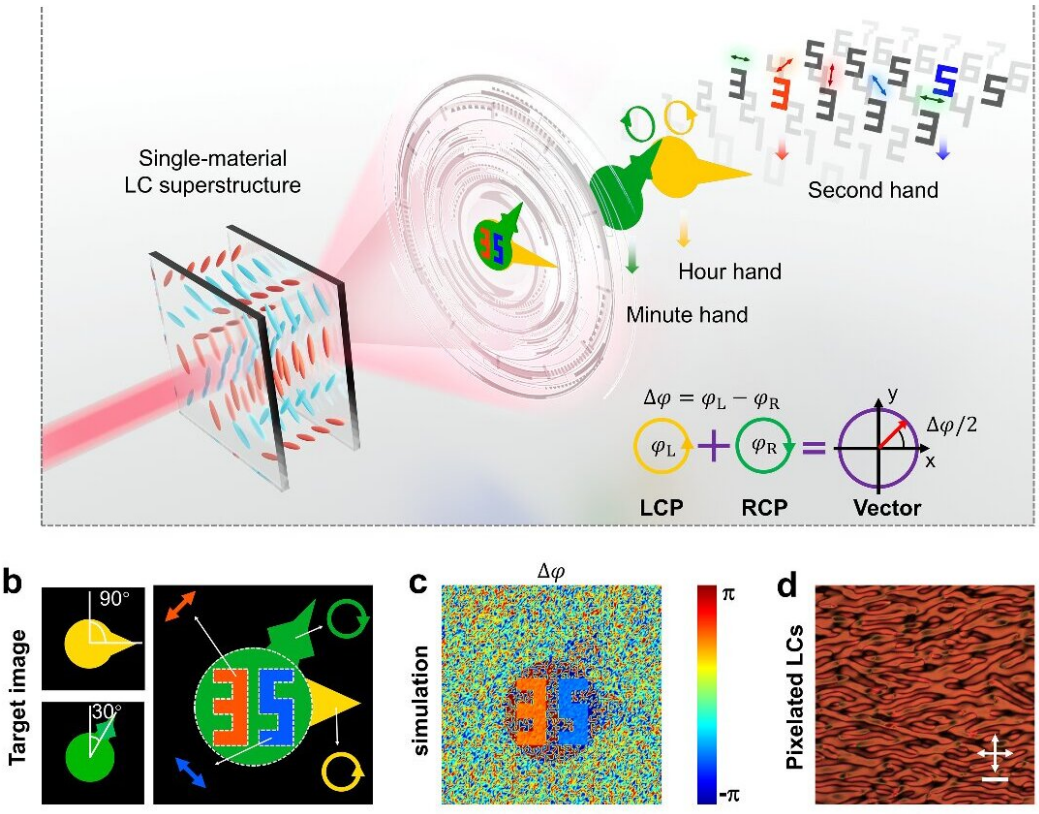


Vectorial LC-holographic clock. Credit: *eLight* (2024). DOI: 10.1186/s43593-024-00061-x

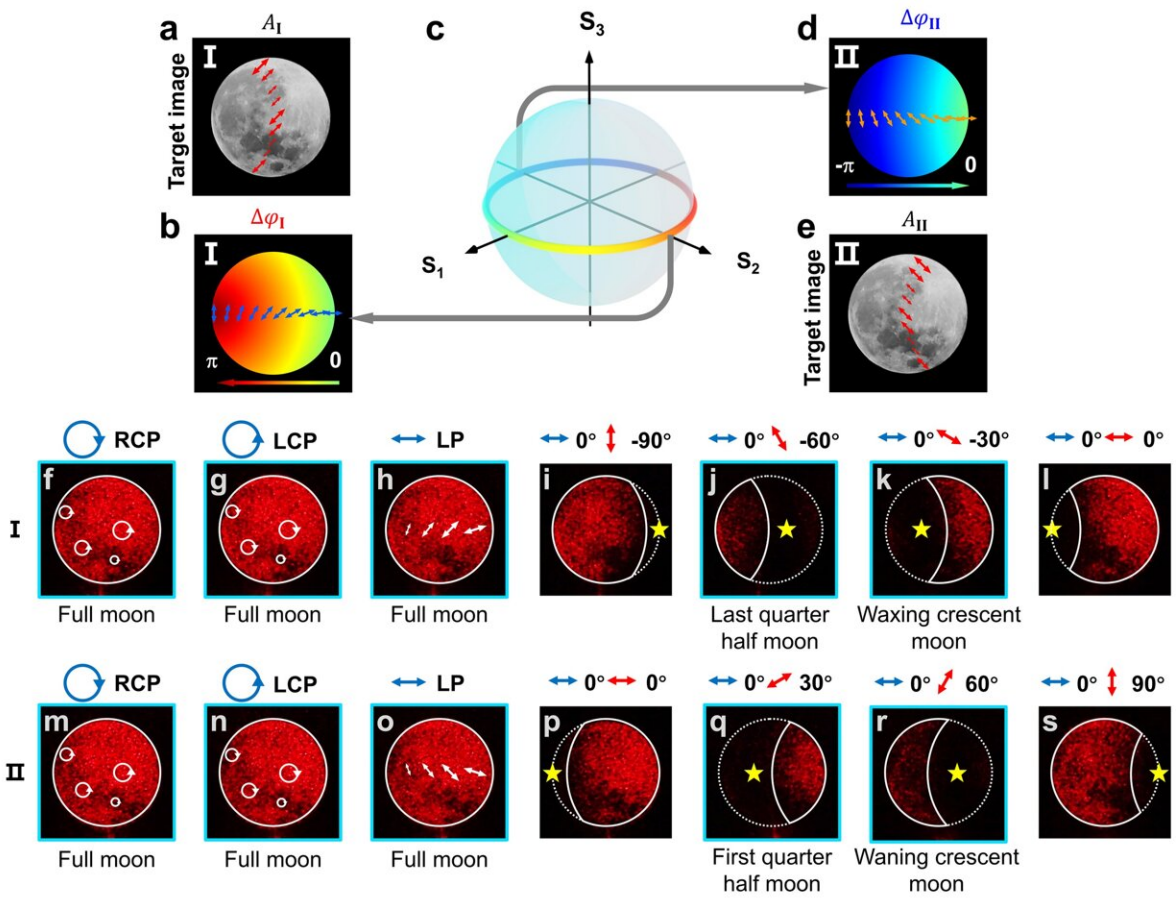
Researchers have made a significant breakthrough in controlling the polarization of light, a crucial property for various applications such as augmented reality, data storage, and encryption.

The new method, developed by a team of scientists, utilizes liquid crystals (LCs) to create holograms that can manipulate the polarization of light at different points. This represents a significant advancement over existing methods. The work is published in the journal *eLight*.

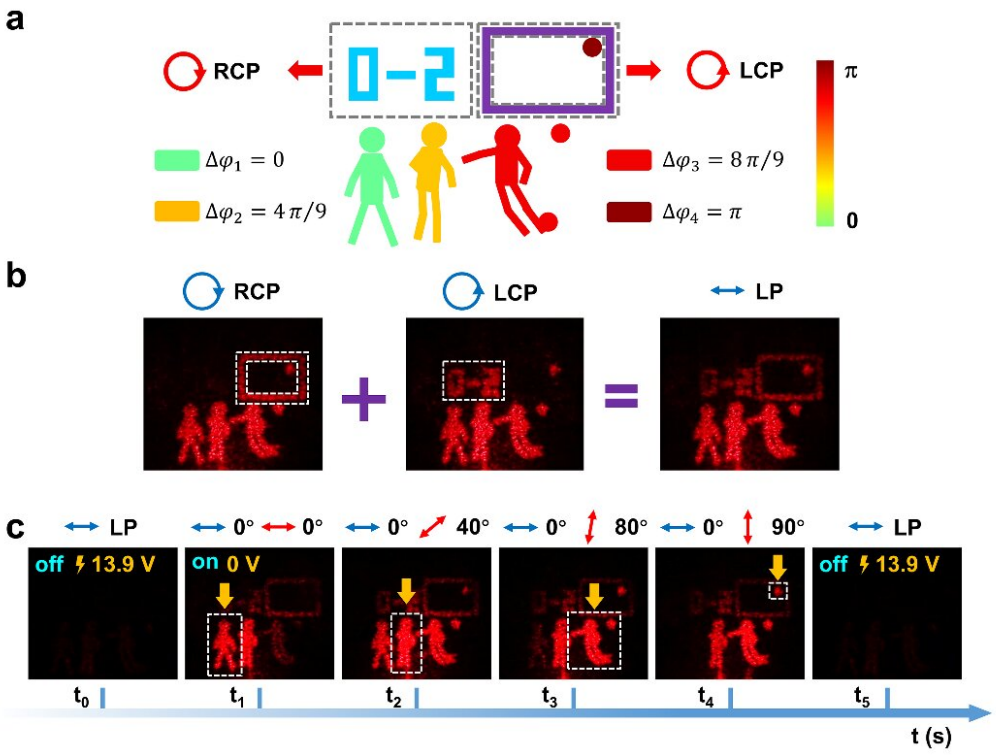
The traditional approach to vectorial holography, which involves manipulating both the polarization and intensity of light, often relies on metasurfacesâ€"structures engineered to control light waves. However, these metasurfaces are static and lack the flexibility needed for dynamic photonic applications.

This new method overcomes this limitation by employing a single layer of LCs. LCs are known for their ability to change their properties under an electric field, making them ideal for dynamic control. The researchers developed a novel encoding method that allows LCs to display versatile and tunable vectorial holography, where both polarization and amplitude can be controlled independently at different positions.

This innovation has the potential to revolutionize various fields. For instance, it could lead to more secure encryption methods by enabling the creation of complex, dynamic holograms that are difficult to replicate. Additionally, it could pave the way for higher-resolution displays and even active holographic video projections.



Vectorial LC-holographic lunar phases encoded with independently and continuously varied polarization and amplitude distributions. Credit: *eLight* (2024). DOI: 10.1186/s43593-024-00061-x



Electric-field and polarization addressable vectorial LC-holographic video. Credit: *eLight* (2024). DOI: 10.1186/s43593-024-00061-x

The research team is optimistic about the real-world impact of their work. They believe that this novel method, requiring no complex

fabrication processes, could readily be integrated into existing technologies, opening exciting possibilities for the future of displays, information encryption, and metasurface applications.

This is a significant development in the field of optics, and its potential applications are vast. The researchers' work highlights the power of combining advanced materials with innovative design techniques to achieve breakthroughs with far-reaching consequences.

More information: Ze-Yu Wang et al, Vectorial liquid-crystal holography, *eLight* (2024). DOI: 10.1186/s43593-024-00061-x