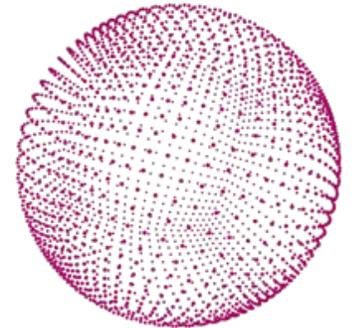
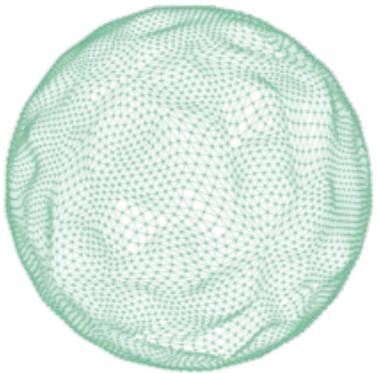
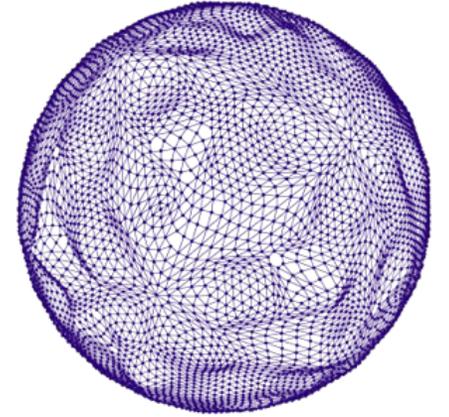
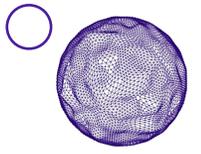
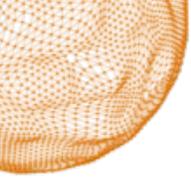


Technology card:

IALL

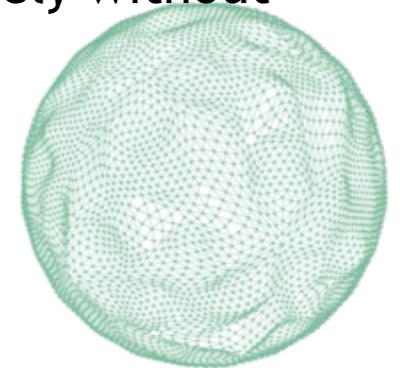
A tuneable thin lens based
on liquid crystals.

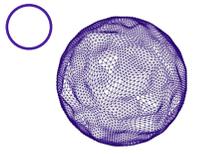




What does it do?

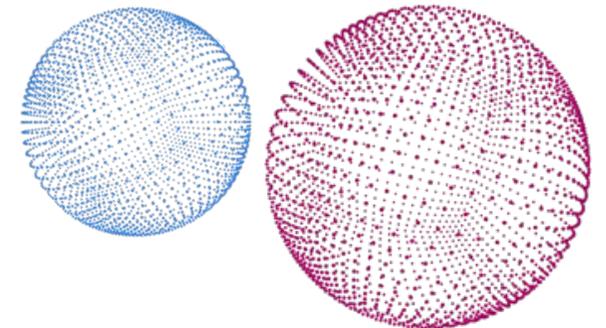
We have developed a new type of flat tuneable lenses based on liquid crystal technology with applications ranging from microscopes and telescopes to digital cameras and LIDAR. The developed lenses are unprecedented in diameter, quality, tuning range and speed, and simplicity in manufacturing and electronic driving. The lenses provide focal tunability without compromising image or light beam quality and completely without moving parts.

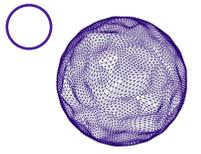




How does it work?

Focusing lenses work by delaying the light in the centre of the lens with respect to the light in the periphery. Hence light from afar focuses on a single point, like in a magnifying glass. A typical lens is thicker in the middle than at the edge since light travels faster in the air than in glass. With liquid crystals, the speed of light passing through the device changes depending on the electrical field applied. Using transparent, adequately designed electrodes, we can emulate a lens in a flat device. Changing the electrical field changes the lens profile and its focal distance.





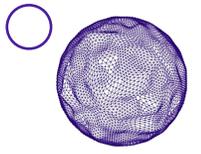
Unique characteristics

- Flat lens technology: active element only 1/10 of a human hair thick.
- Adaptive optics: The focal length may be changed within a wide tuning range.
- Simple manufacturing: Technology similar to simple LCD.
- Fast focusing: response time better than 0.1 seconds.
- Large lenses: the lens radius may be several centimetres.

Domains of impact?

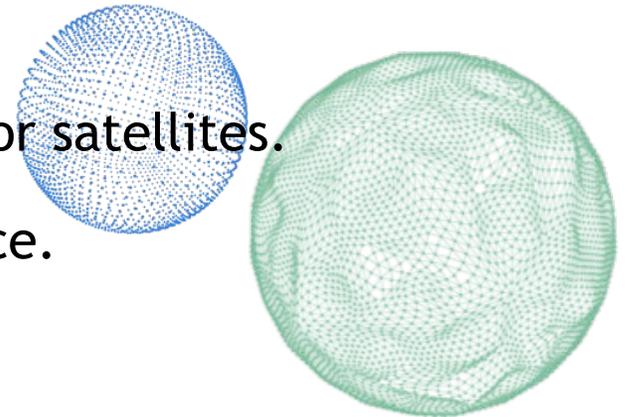
- Focusing surveillance camera.
- Microscope with no moving parts.
- Light weight zoom lenses with no moving part.
- Machine vision.
- OEM lenses for generic optics ranging from LIDAR and telescopes to eyewear.

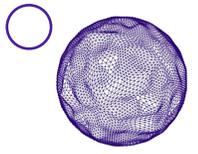




Potential societal issues that your technology can address.

- Technology innovation in a field of European strength, including intelligent manufacturing: production monitoring.
- Sustainable agriculture and forestry: Intelligent cameras for forest fire observation.
- Health: HQ, cost-effective, rugged medicare equipment.
- Earth surveillance: Lightweight, low power tuneable optics for satellites.
- Secure societies: Intelligent border and perimeter surveillance.





Student contact person and other possible info

- Morten Andreas Geday
morten.geday@upm.es
- Primary location(s):
 - Student contact: Universidad Politécnica de Madrid (Spain)
 - Research: Universidad Politécnica de Madrid (Spain)
- More information about the project:
<https://cemdatic.upm.es/2020/06/03/cemdatic-develops-a-new-type-of-flat-tunable-lense-with-different-applications/>
https://drive.google.com/file/d/1R99_1BJ7u23fZoaNIVhqRTedulgZOYuR/view?usp=sharing
<https://www.youtube.com/watch?v=0jTHmvBfT-g> (in Spanish)

