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MOTIA: Mapping of Cataracts Through an Interactive Approach

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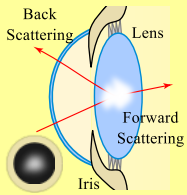
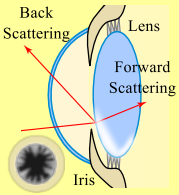
Can we create a device that makes people aware of their early cataract condition?

CATARACT TYPES

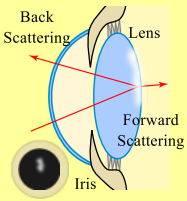
We address early stages of Nuclear Cataracts



Cortical



Subcapsular



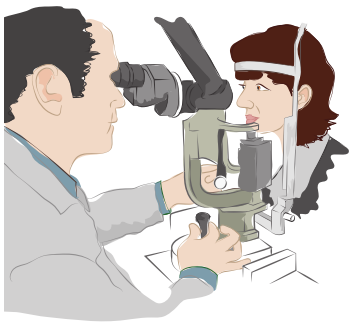
INNOVATIONS

- Opacity Map
- Subperture Attenuation Map
- Subaperture Contrast Tests
- Local Point-Spread-Functions
- Individual Simulations

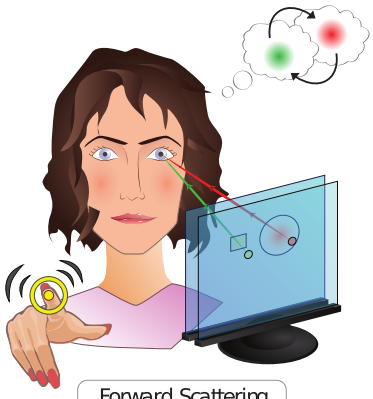
LIMITATIONS

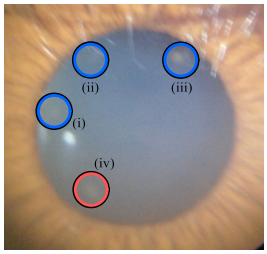
- Active participation
- High contrast display

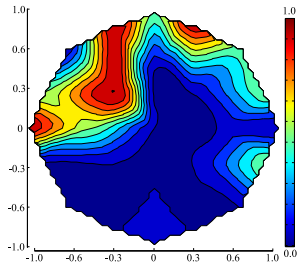
Slit-Lamp



Our Interactive Solution







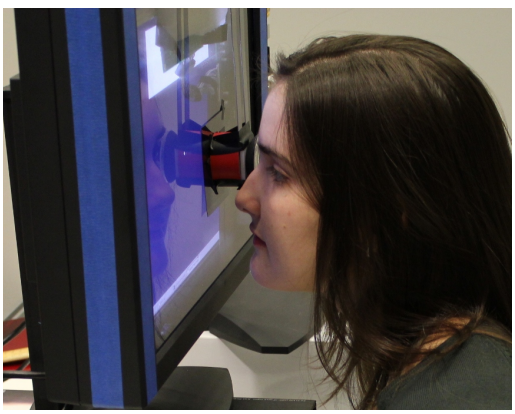
We introduce a novel interactive method to assess cataracts in the human eye by crafting an optical solution that measures the perceptual impact of forward scattering on the foveal region. Current solutions rely on highly-trained clinicians to check the back scattering in the crystallin lens and test their predictions on visual acuity tests. Close-range parallax barriers create collimated beams of light to scan through sub-apertures scattering light as it strikes a cataract. User feedback generates maps for opacity, attenuation, contrast and local point-spread functions. The goal is to allow a general audience to operate a portable high-contrast light-field display to gain a meaningful understanding of their own visual conditions. The compiled maps are used to reconstruct the cataract-affected view of an individual, offering a unique approach for capturing information for screening, diagnostic, and clinical analysis.

Simulation of a cataract-affected view

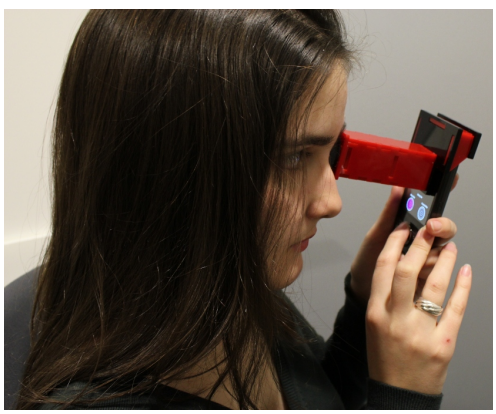
ACCURACY

Our current cell phone-based prototype has an accuracy of .39mm in position and .12mm^2 in size of the cataract blobs on the opacity map and a scanning resolution of .138mm. Our best prototype reaches a resolution of .047mm and an accuracy of .010mm in position.

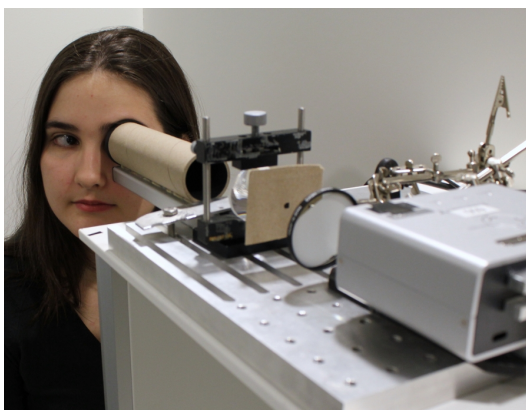
Current Prototypes



Stack of LCDs. Resolution of 461um.



Cell phone plus lens. Resolution: 138um.



DLP Projector plus lens. Resolution: 47um