Computational glare-free imaging of the retina

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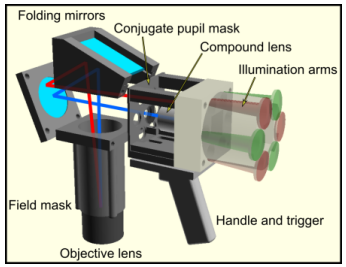
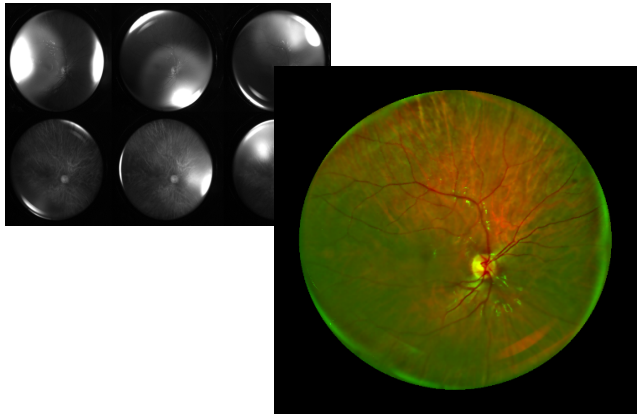
Abstract
Imaging of the retina is vital for saving sight. Complex imaging systems and careful alignment is normally required to prevent strong reflections from the cornea masking the weak image from the retina. We have employed a computational imaging technique to demonstrate the first system able to achieve imaging of a large fraction of the retina using a handheld device.





The prototype retinal imager employs agile illumination to computationally suppress corneal reflections

Project Description
We demonstrate a new method for retinal imaging with a wide field-of-view and computational suppression of glare reflections. The method is based in an agile illumination scheme that effectively extends the Gullstrand principle for wide field of view in the resulting glare-free processed images. We have experimentally demonstrated the method by developing a cost-effective and portable retinal imaging prototype, suitable with supine non-collaborative patients (such as premature infants), with a wide field of view of ~ 80°. Oximetric spectral classification of veins and arteries offers enhanced diagnosis of vascular diseases such as retinopathy of prematurity.

Project outcomes
- We have demonstrated glare-free imaging of the retina across a field of view of 80°
- Red-green imaging enables oximetric discrimination between arteries and veins
- The technique is suitable for general ophthalmic imaging and for paediatric ophthalmology, particular for retinopathy of prematurity