OCULI: Smartphone-based Screening Application and Low-Cost Lens that Identifies the Risk for Cataracts

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Problem Statement: Cataract is the leading cause of blindness according to the latest assessment by the World Health Organization (WHO). Majority of cases are from third-world countries where access to professional tools and doctors is limited. However, traditional equipment have limitations such as cost, regular maintenance, difficulty to use/interpret results without specialists. Design Goal: In order to try and solve these challenges, my objective is to design a low-cost smartphone-based screening tool that identifies the risk for cataracts. Procedures: Oculi is made of two components: (1) a low-cost lens that allows anyone to take pupil images (2) a smartphone application that displays a report of detailed cataract screening results. In order to take the pupil images, the subjects were first taken in a dark room for the pupils to dilate naturally. Then, the lens is placed 30cm/1ft from the subject's eye to capture red reflex images. Then, these images are fed to the application that uses machine learning to analyze the images and find anomalies in the pupil. Results: After evaluating data, images obtained using the Oculi lens were 66% closer to gold standard values. Images obtained using ophthalmoscope were 33% closer to gold standard values. For the accuracy of the Oculi algorithm, after running 25 iterations on 256 images, the model accuracy was 94%. Conclusion: Oculi is a two-part device that is portable, inexpensive, and simple to use. These advantages can prevent the continual loss of vision notifying individuals the health of their eye from early on.

Awards Won: