

STEREOSCOPIC FUNDUS PHOTOGRAPHY WITH A SLIT LAMP: AN ECONOMICAL OPTION?

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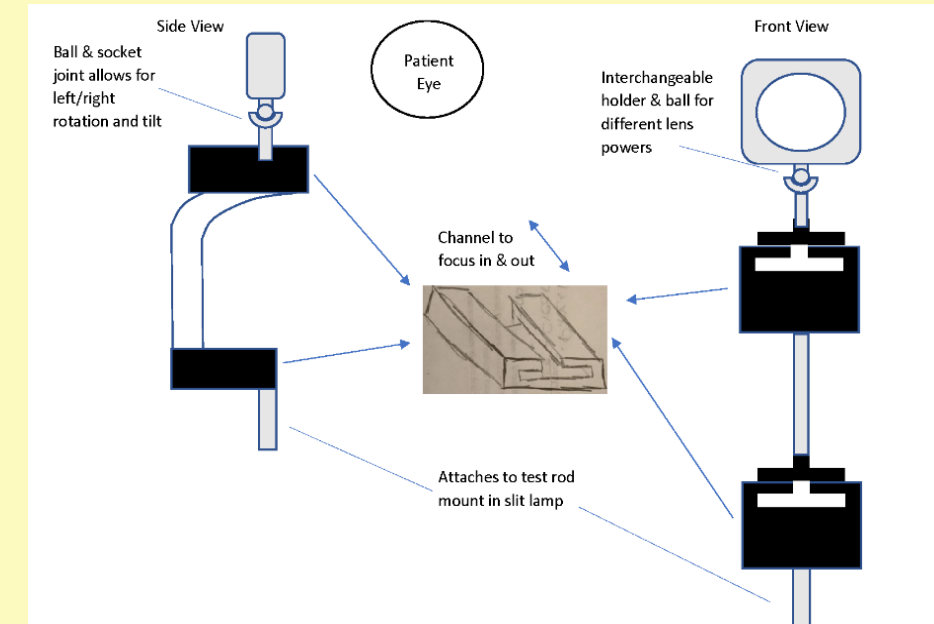
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Introduction

- Photodocumentation allows for early detection and monitoring of subtle, yet diagnostic ophthalmic changes over time.
- Utilizing stereoscopic fundus photography has been shown to enhance interobserver agreement in grading of cup-to-disc ratios.³
- Commercially available fundus cameras with stereoscopic capture options are cost- and space-prohibitive to the average optometrist.
 - Most exceed \$20,000
 - Most require 4ft x 4ft of space
- We propose a compact three-dimensionally printed stereoscopic slit lamp apparatus that, when used in conjunction with a slit lamp, smartphone, and condensing lens, produces economical stereoscopic fundus photos.

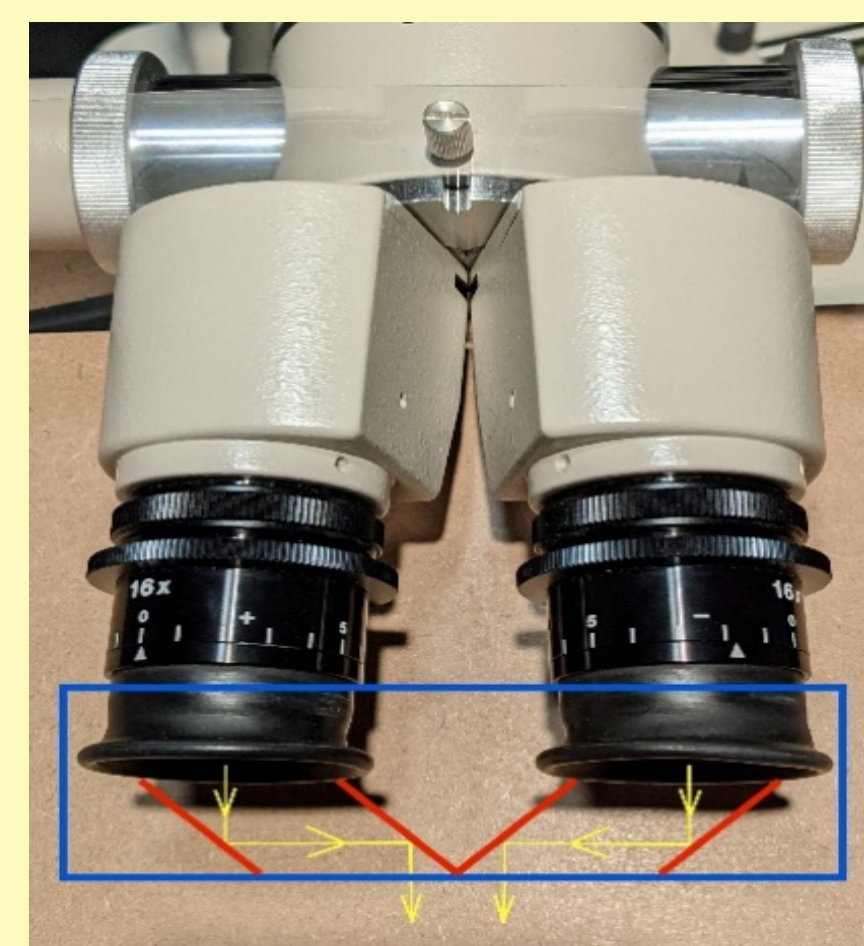
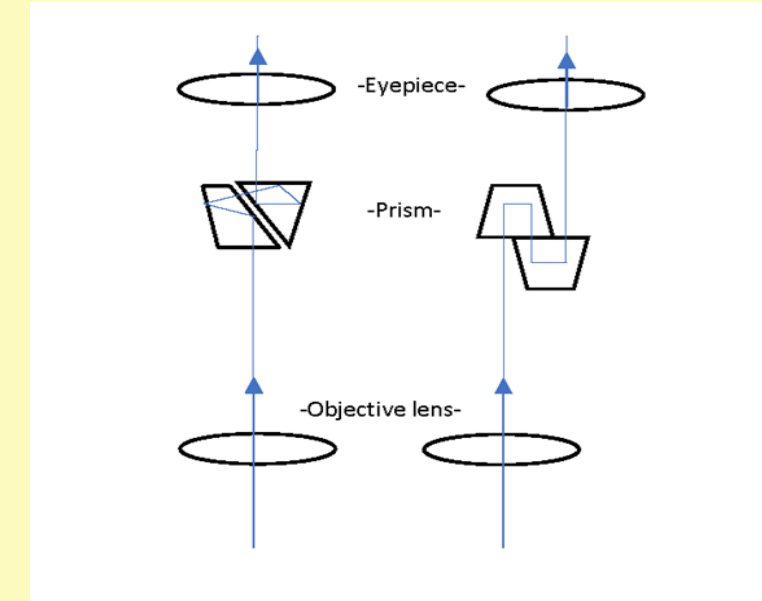
Methods

- The original design focused on a condensing lens mount attached to the test rod area of slit lamp. This design was not conducive to stereo photography.
- The final prototype utilized back surface mirrors to move the resulting images close together to be photographed and fused.
- Due to cost and simplicity, back surface mirrors were chosen instead of front surface mirrors and prisms.



Condensing lens mount design.

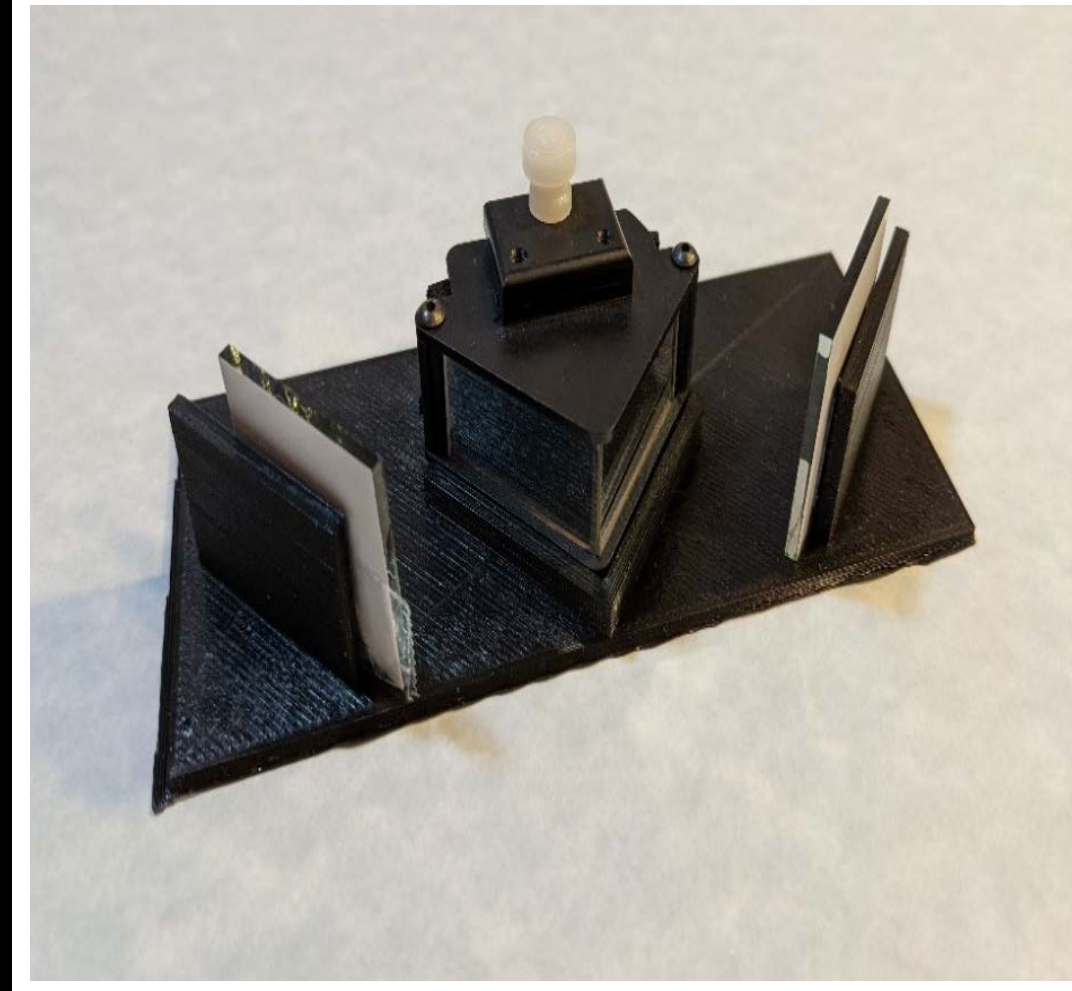
- Roof prisms (left) and Porro prisms (right) were considered to move the resulting images.



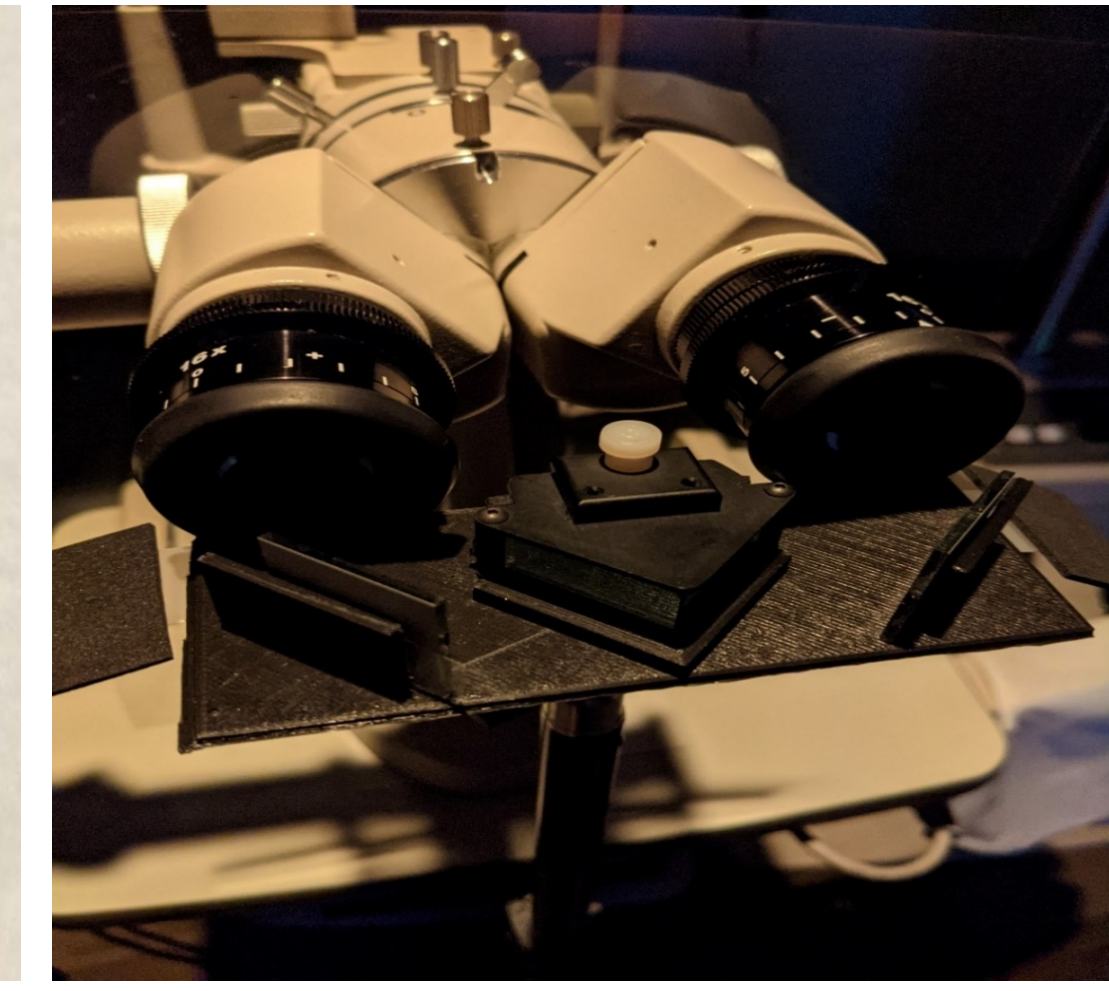
Final prototype mockup utilizing mirrors.

Results

The Prototype

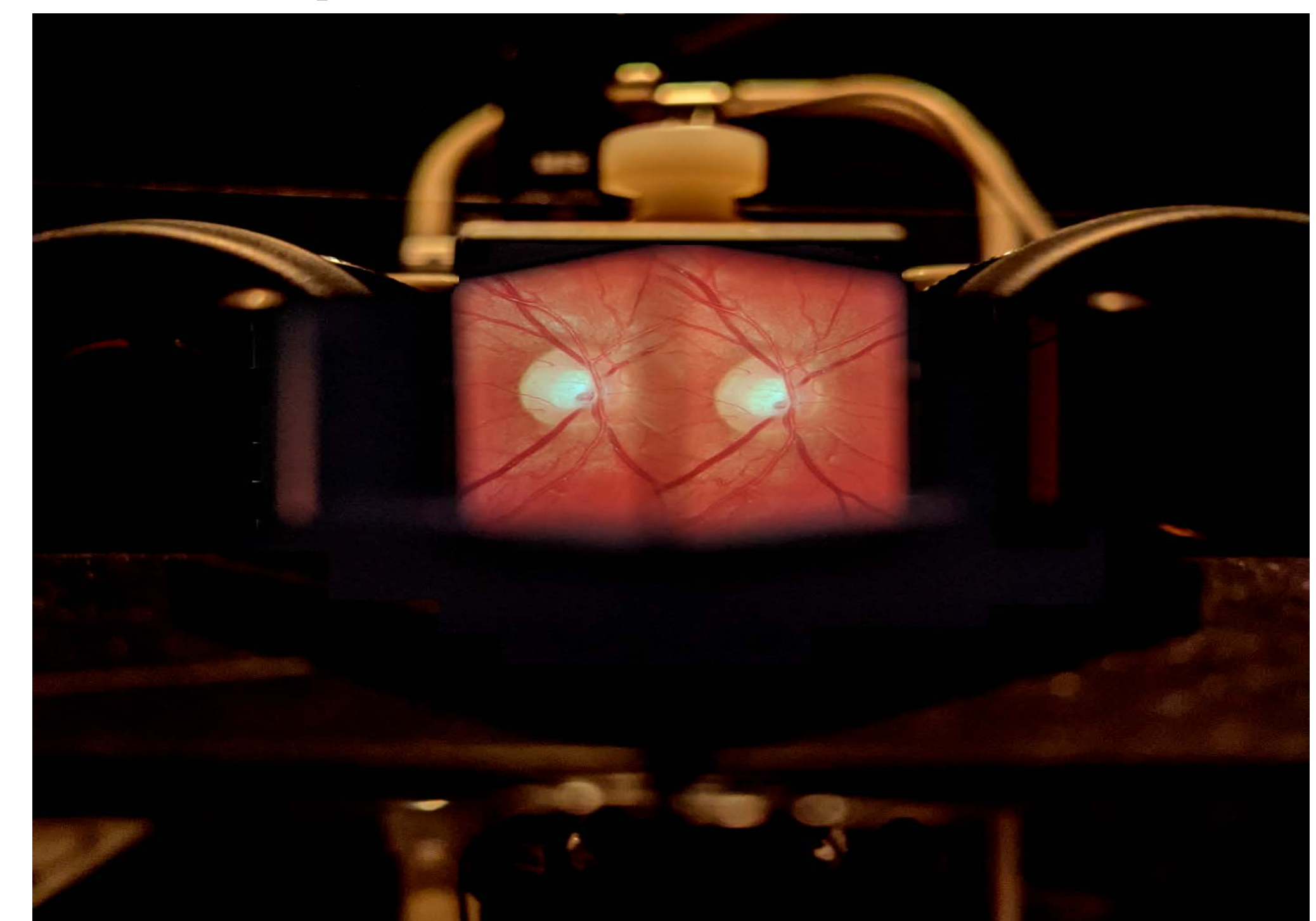


Front view of final stereoscopic apparatus prototype using back surface mirrors.



Final stereoscopic apparatus prototype aligned in front of slit lamp oculars.

Proof of Concept



View of optic nerve reference photo through final stereoscopic apparatus mounted in front of a slit lamp. The optic nerve will appear in-depth upon viewing with uncrossed fusion.

Conclusions

- Our device, once attached to a slit lamp, successfully captured two disparate images of an optic nerve head.
 - Estimated prototype material cost: \$40
 - Prototype + fundus mount + smartphone mount: \$1000
 - 95% less cost than commercial fundus camera
- Future prototypes should include:
 - More stable and enclosed stereoscopic apparatus to minimize flexure and stray light
 - Front instead of back surface mirrors to increase image quality
- Further research is needed to investigate if the prototype, fundus lens mount, and smartphone mount in conjunction will function as intended
- Promising step towards enhancing standard of care worldwide, especially in underserved areas

References

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