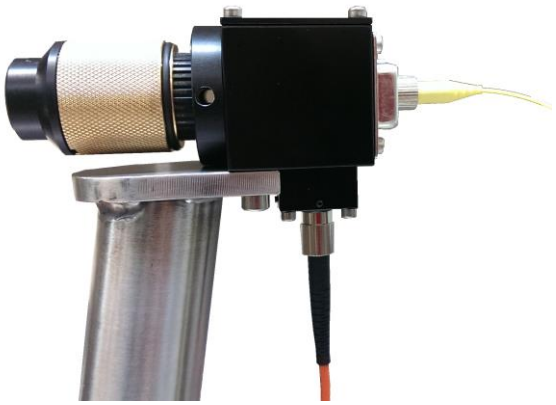

U-SLO

Ubiquitous Scanning Laser Ophthalmoscope

Project Summary

The aim of the project was to demonstrate the feasibility of a cheap miniaturized ophthalmoscope based on MEMS scanning mirrors, which is versatile, port- able and capable of 3D measurements of different structures of the fundus, including the optic nerve head. Such a device could be used by ophthalmologists, but also in general medical practice by trained medical staff (optometrists, nurses and opticians) for glaucoma screening.

To reduce the prevalence of blindness, the detection of eye diseases, like glaucoma, is very important. Glaucoma screenings are held regularly in all European countries, in order to diagnose a disease in a curable stage. Screenings are performed by paramedical staff and captured images of the optical nerve head (ONH) can be interpreted remotely by medical doctors, to decide on further examinations. For that kind of imaging one of the main diagnostic imaging methods is the SLO. Current goals are also to make the use and handling of these systems as convenient and easy as possible, while maintaining lower costs of the device components.

First feasibility tests were made with a checkerboard image as resolution target. The preliminary MEMS control allows a horizontal scan of ±3.2° and vertical scan of ±1.3° (in air), which results in an image size of 5x2mm, when focusing with a lens (f=50mm) on a target. The scans can be proceeded in fast (4Hz) and slow (1/20Hz) scanning mode. The displayed image was captured in a slow scanning mode (20s duration), because the control speed of the step signal is limited by the physical properties of the MEMS mirrors.

We successfully added an OCT system able to make a-scan.

We designed a miniaturized scanning laser ophthalmoscope (SLO), based on two micro-electro-mechanical-system (MEMS) mirrors. The imaging device has dimensions of 88mm x 48mm x 35mm. According to the optical simulation, the system is capable to scan a retina excerpt of 1.8mm x 1.8mm by operating the MEMS mirrors at a scanning angle of ±3.5° (in air).

Valorisation

The project was presented at Photonics Prague 2014, August 27-29, Clarion Congress Hotel Prague, Czech Republic (http://prague2014.photon-czsk.org/).

Future valorization are presentations for Ziemer Ophthalmic in Bienne, for Haag-Streit in Bern and for the Institut de Recherche en Ophtalmologie.

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