

PURPOSE

Raster scanning in optical coherence tomography (OCT) puts a lot of strain on the galvanometer scanners as they must abruptly accelerate and decelerate the scan mirrors. This limits the maximum scan rate at which they can be operated. For applications where very high scan rates are essential, e.g. 4D intra-surgical OCT, scan patterns which avoid sharp changes in scan direction are preferred [1, 2]. We demonstrate the use of spiral scan patterns for high speed swept source OCT (SS-OCT) and SS-OCT angiography (OCTA) of the human retina.

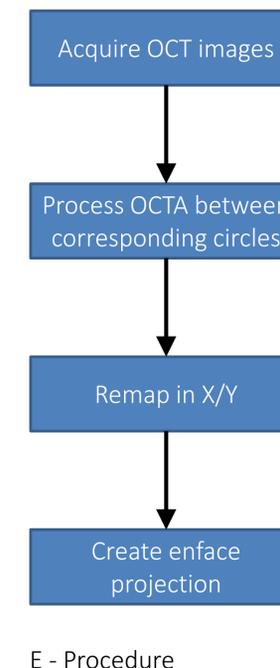
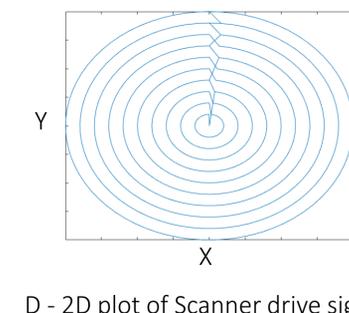
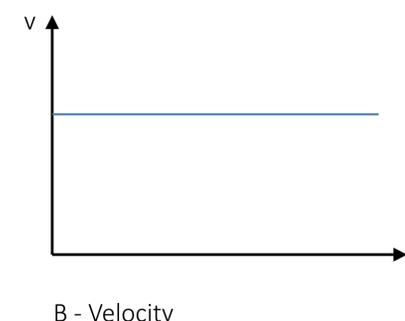
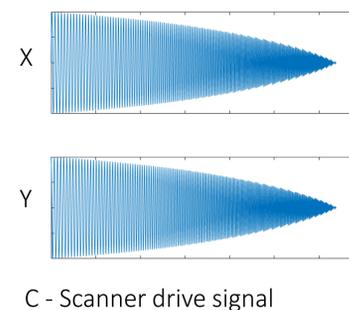
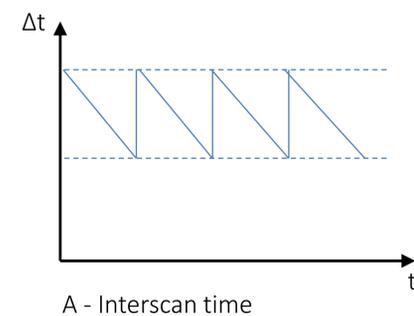
CONCLUSIONS

- Spiral scanning OCT angiography may enable live OCT angiography at video volume rates
- Combined with z-tracking, spiral scanning may enable large field of views which would otherwise be prohibited by limited imaging depth.

ACKNOWLEDGEMENTS

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METHODS



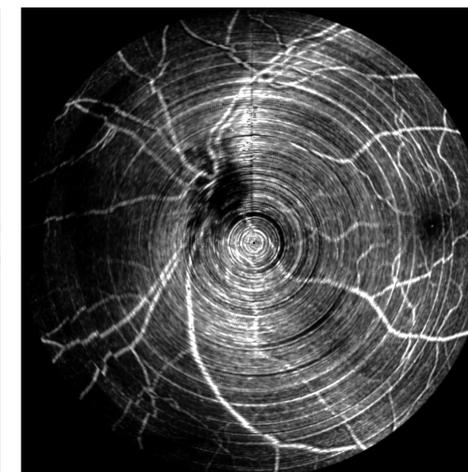
Scan pattern:

- 200 circles
- 2 repetitions
- 0 to 1000 A-scans per circle
- ➔ Equivalent to 400x400x2 A-scans raster scan

- Generated OCTA spiral scan pattern with:
 - Constant velocity {B}
 - Interscan time within one order {A}
 - Spatial equally distributed sampling
- Acquired OCTA scans of a healthy human retina
 - 1060 nm center wavelength
 - 70 nm tuning range
 - 100 kHz A-scan rate
 - 40 degree field of view
- Calculated circular OCTA flow B-scans
- Remapped OCT and OCTA data to a rectangular grid according to the X/Y scanner positions
- Created OCT and OCTA enface projection

RESULTS

- OCT enface projection of spirally scanned retina



- OCTA enface projection of spirally scanned retina

References

1. Duma, V., et al., "Experimental investigations of the scanning functions of galvanometer-based scanners with applications in OCT," Appl. Opt. 50, 2011.
2. Carrasco-Zevallos, O., et al., "Constant linear velocity spiral scanning for near video rate 4D OCT ophthalmic and surgical imaging with isotropic transverse sampling," Biomed. Opt. Express 9, 2018.