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Frequency domain diffuse optical tomography with a single source and detector via high-speed hypocycloid scanning

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High-speed spatial frequency domain imaging (SFDI) with temporally modulated light

Matthew Applegate & Darren Roblyer

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- 1 Introduction to SFDI

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- ② How we're using it

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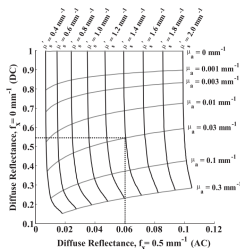
- ① Introduction to SFDI
- ② How we're using it
- ③ Temporally modulated SFDI
- ④ Conclusion and Future directions

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Demodulation techniques

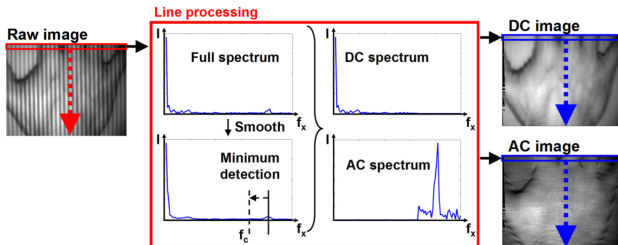
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 - Two spatial frequencies
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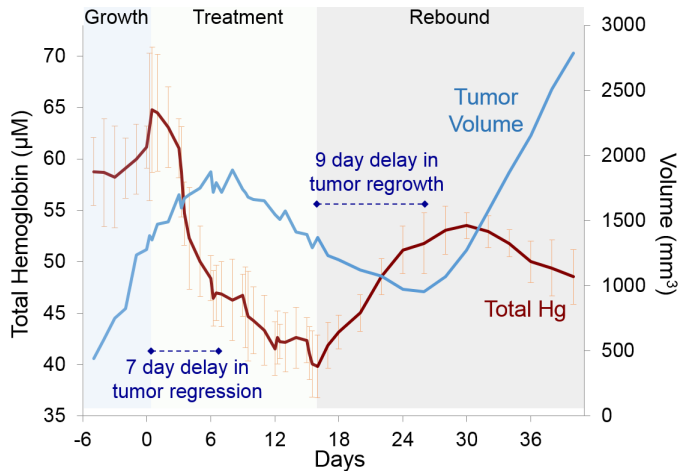
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Hemoglobin response to treatment

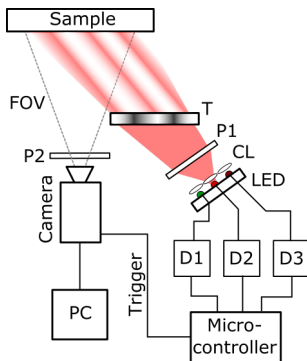


Temporally modulated SFDI

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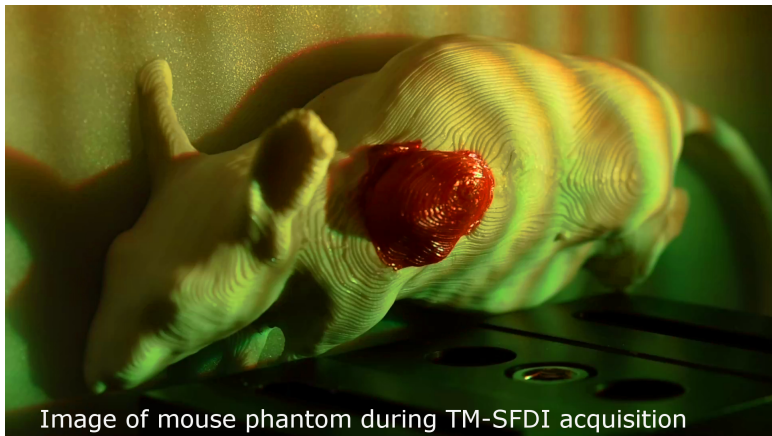
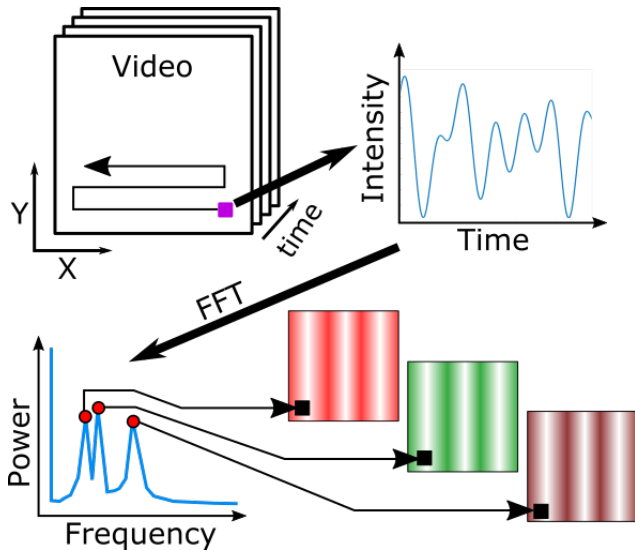


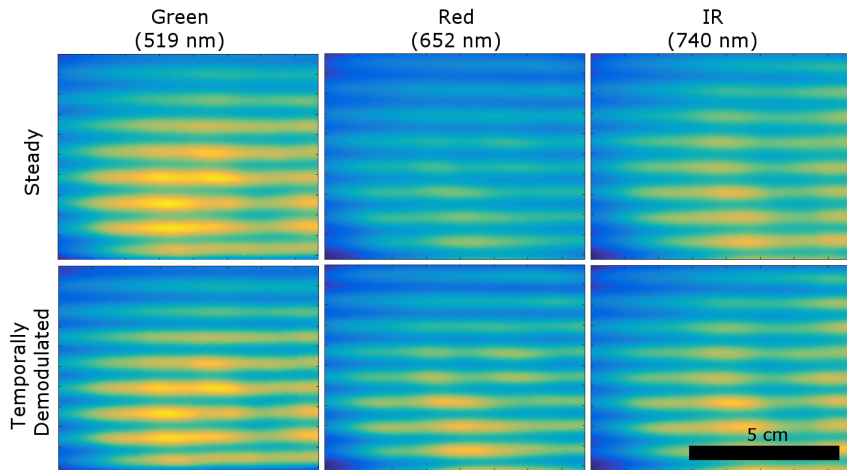
Image of mouse phantom during TM-SFDI acquisition

Video

Processing

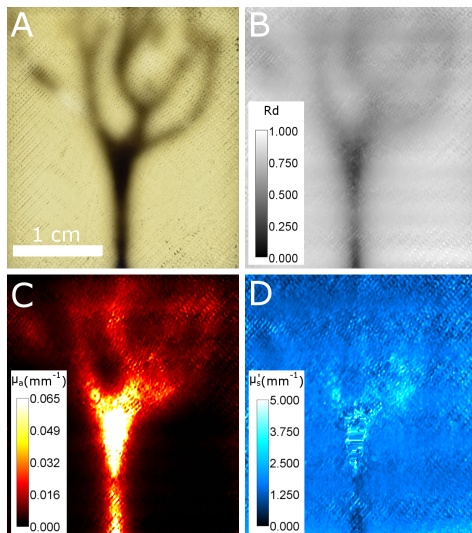


Temporal demodulation

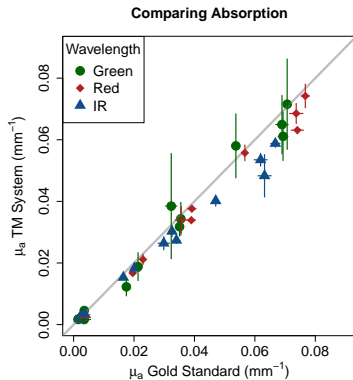
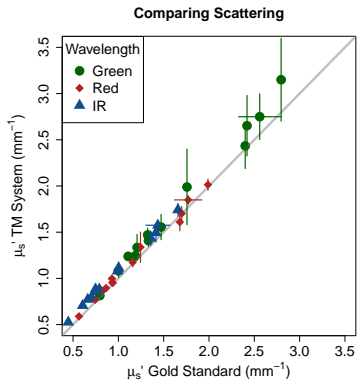


- 10x8 cm field of view
- 3 wavelengths (519 nm, 652 nm, 740 nm)
- Temporal frequencies of 6,8,12 Hz
- 55 frames per second video
- 128 images per scan
- **2.4 s acquisition time (compared with about 30 s for standard device)**

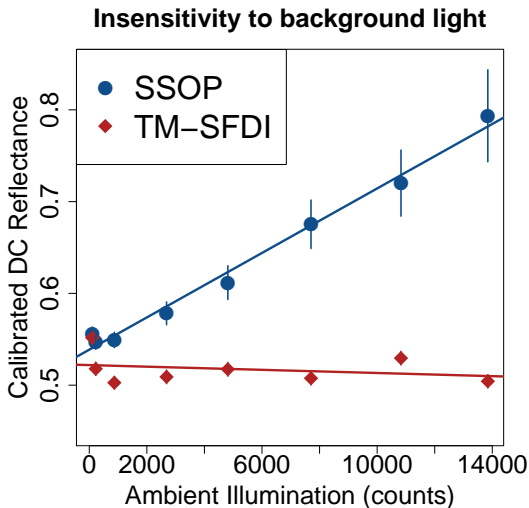
Image of biomimetic phantom



Accuracy



Effect of ambient light



Conclusion & Future directions

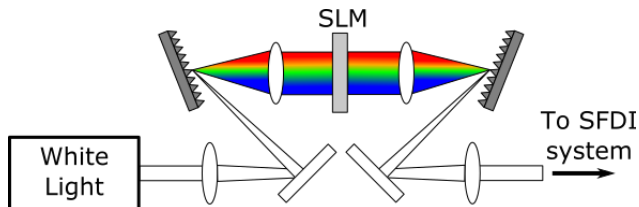
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 - Clean separation of excitation wavelengths
 - Accurate, multi-wavelength SFDI
 - 10x improvement of imaging speed
 - Not affected by background light
 - **Additional wavelengths can be added without increasing acquisition time**

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Acknowledgements

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