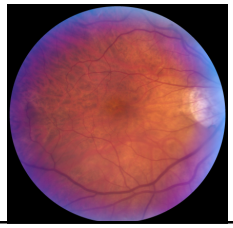
Visual Annotation of Clinically Important Anatomical Landmarks for VitreoRetinal Surgery

Project Update

Vincent Ng

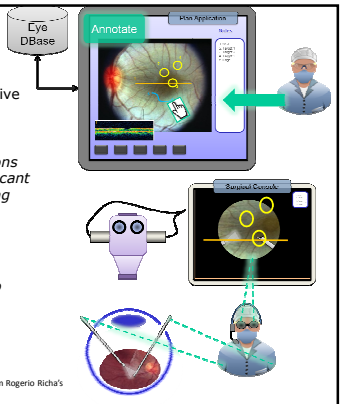
Retina Project Overview

- Registration
  - Preoperative images to intraoperative images
  - Overlay of landmarks on live microscopic feed
- Requirements
  - Image Matching/Tracking



Images courtesy of Rogerio Richa

Relevance

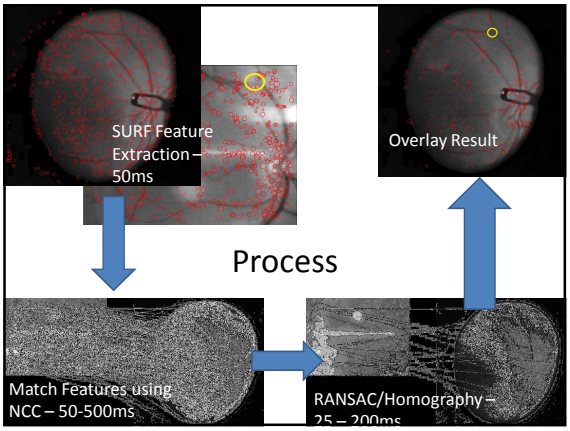


Surgeon annotates preoperative image

Problem:
Mentally track notes & locations during surgery, adding significant load to the already challenging surgical task.

Solution:
Annotations overlay on video

Slide taken from Rogerio Richa's presentation



Milestones & Progress

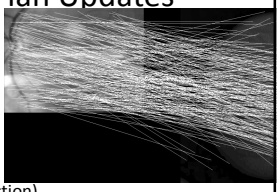
Working SURF detection/matching program, preop/intraop processing	✓ Week of March 14th
Validation using test/non-surgical data	?
Integrating program onto platform	✓ Week of March 28th
Validation using real intra-operative data	Week of April 25th
Real-time tracking through speedup	Week of April 25th

Dependencies

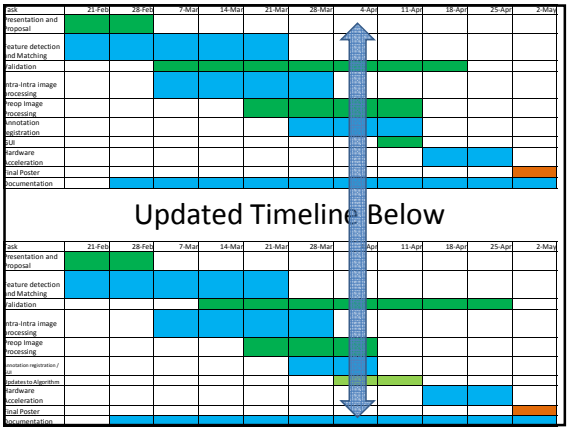
Access to platform (machine, microscope)	✓
Fundus image for phantom	✓
Intraoperative data from surgeons	✓

Results/Video

Next steps / Plan Updates

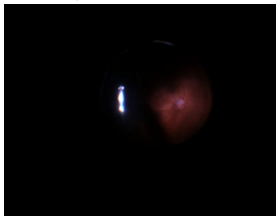


- Speedup
  - Image size reduction
- Phantom/Real data testing
- Algorithm Updates
  - NCC
    - Takes too long
  - Homography (planar projection)
    - Too many degrees of freedom
  - Determine optimal settings
    - SURF Hessian threshold
    - NCC threshold
    - Number of SURF feature points per landmark



Difficulties so far/future

- Validation
  - How?
  - Sensitivity of tracking to change?
- Speed
  - 200ms – slow ?
- Real data



What's Next

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What's Next: Deliverables

- Minimum
  - Utilize, understand and implement SURF
  - Test/Validate program using manually picked annotations as ground truth
  - Data: Surgical and non-surgical
- Expected
  - Simple GUI that marks annotation for surgeon
  - Initial image processing for real surgery data
- Maximum
  - Deploy solution into OR.
  - Integrate fundus/OCT data to surgeon's screen

Documentation

- Updates to the wiki
- Documented Code
  - Comments
  - Well structured, portable (CISST Filters)

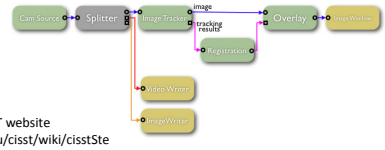

Image taken from CISST website https://trac.lcsr.jhu.edu/cisst/wiki/cisstStereoVisionTutorial

Questions?

- Thank You