**Visual Annotation of Landmarks for Vitreoretinal Surgery**

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**Introduction**

- Provides registration between pre-operative and intra-operative images using feature detection and matching to create a transformation
- Allows for tracking of specific landmarks in a video feed from a source image
- Uses OpenCV Library and CISST framework, and integrates with existing projects (Fast Template Tracker)

**The Problem**

- Pre-operative fundus scans of the retina is obtained. Surgeons annotate specific spots that they want to look at during surgery
- During vitreoretinal surgery, surgeons look through a microscope while manipulating tools with their hands.
- Surgeon has limited mobility of tools in retina, and has to mentally keep track of what they do inside the retina
- Programs can help to relieve surgeons’ mental load by detecting and highlighting the previously annotated points on the video feed

**The Solution**

- Overlay important points so that surgeon can be aware of them when panning around the retina
- Combine (slow) SURF tracker with (fast, but imprecise) Template Tracker (existing solution implemented by Rogerio Richa)

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**Outcomes and Results**

- Each transformation calculation takes 200-500ms
- Valid transformation (transformation grid conforms with expected rotation, scale and movement) every 4-10 calculations
- Ability to switch between SURF Tracker and Template Tracker based on confidence level of transformation

**Future Work**

- Improve on the speed of algorithm
- Image processing on video feed to aid in feature detection
- Improve quality of feature detection (SURF) under low-light conditions

**Lessons Learned**

- Designing a process to fit within an existing object (CISST framework) may be difficult since the other object may be too rigid to change or difficult to debug

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