

# Master/Bachelor Thesis:

Robotics and Embedded Systems  
 Department of Informatics  
 Klinikum rechts der Isars  
 Technische Universität München

## High Precision Stereo Tracking System Design – Microsurgical Tools for Ophthalmic Surgery

### Project Description

Ophthalmic operation needs highly precision and delicate motion, (see Fig. 1(a)). In order to achieve this, a lot of study and training courses are required for a talented surgeon. The robot has a potential to accomplish the same task, eg. the sub-retinal injection, which is to deliver drugs inside eye under retina. However, this also needs a steep learning curve for tele-operation robotic system. The autonomous robotic system can assist surgeon to finish the operation more effective and bring a better outcome.

However, how to track the surgical tools in surgeon's hand is the first step to understand the valuable skill from surgeon. The widely used stereo visual with two cameras is suitable for such tracking requirements(see Fig. 1(b)). However, most of commercial stereo visual tracking products do not meet these requirements. Thus we are very interested in developing a stereo visual tracking system for micro movement. In order to obtain a more robust tracking result, the pulse-modulated LED infrared emitter would be used as markers.

This kind of tracking system also has potential using in fruit flies trajectory recording(for the biologist) and other micro level movement recording(see Fig. 1(c)).

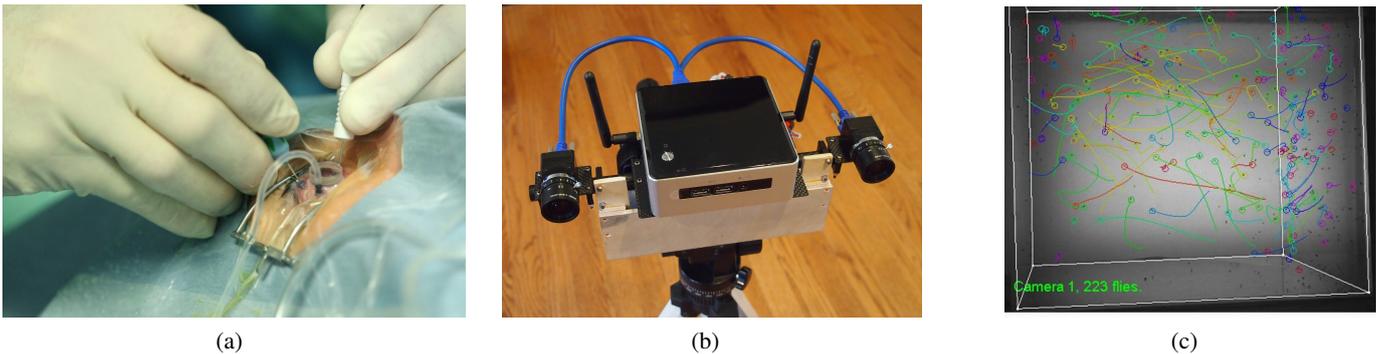


Figure 1: (a)The sub-retinal injection surgery which needs highly precision and delicate motion, (b)The stereo visual system with two cameras, and (c)The fruit flies trajectory recording.

### Your Task

The project will include following phases:

- Calculating the suitable parameters and selecting suitable cameras for the stereo system (we will help with the mechanical design and 3D printer).
- Programming a software based on triangulation location algorithm for calibrating the system and tracking markers, and also using Kalman Filter to reduce the noise of output data.
- Write and conclude the results.

This is a very interesting topic and containing both research and engineering knowledge. We will provide a amount of budget for the all hardware. If you are interested in any part of research or technology in this project, please contact me for further information or potential topics for thesis/seminar.

### Contacts

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