

# Cooperative Control Algorithm Design for Ophthalmic Microsurgical Robot

## Project Description

Currently, it is estimated that 45 million people worldwide are blind, with an increase of 1-2 million each year [1]. Vitreoretinal diseases are important causes of blindness taking up 20%. The physical tremor (about 108  $\mu\text{m}$  RMS [2]) from microsurgeon's hand limits the performance of clinical treatment. Medical robot is a promising assistant tool to cancel the tremor and complete the microsurgery, e.g. delivering drugs to a retinal vein in 60  $\mu\text{m}$  diameter. Cooperative control that the surgical tool is controlled by robot arm and operator's hand simultaneously is an efficient method to cancel the tremor and guarantee the quality of surgery.

## Your Task

Based on the existing project of iRAM!S [3], this task aims to realize cooperative control by constructing a virtual robot control environment based on dynamical robot experimental tools like Gazebo/V-Rep & testing several control algorithms to find the most dexterity one. These algorithms will be tested and analyzed on the physical robot developed by iRAM!S.

## Required Skills

- Interest in robotics and good programming skills in at least one programming language, e.g. MATLAB, C/C++, Python
- Experience with or interest in learning dynamical robot experimental platform

## References

[1] Global estimates of visual impairment: 2010

[2] Physiological tremor amplitude during retinal microsurgery

[3] <http://www6.in.tum.de/Main/ResearchiRAM!S>

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