High Dexterity Intraocular Manipulation

LABORATORY FOR
**Computational
Sensing + Robotics**

AMIRo —
Research Lab

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Forceps

Fiberoptic light

Epiretinal membrane removal

https://www.ophthalmologyexpertservices.com/blog/2019/epiretinal-membrane

www.3dsystems.com/haptics-devices/touch.

Constrained Inverse Kinematics

I²RIS (2 DoF)   SHER (5 DoF)

DC servo motor

I²RIS

Distal end of SHER

SHER base coordinate system

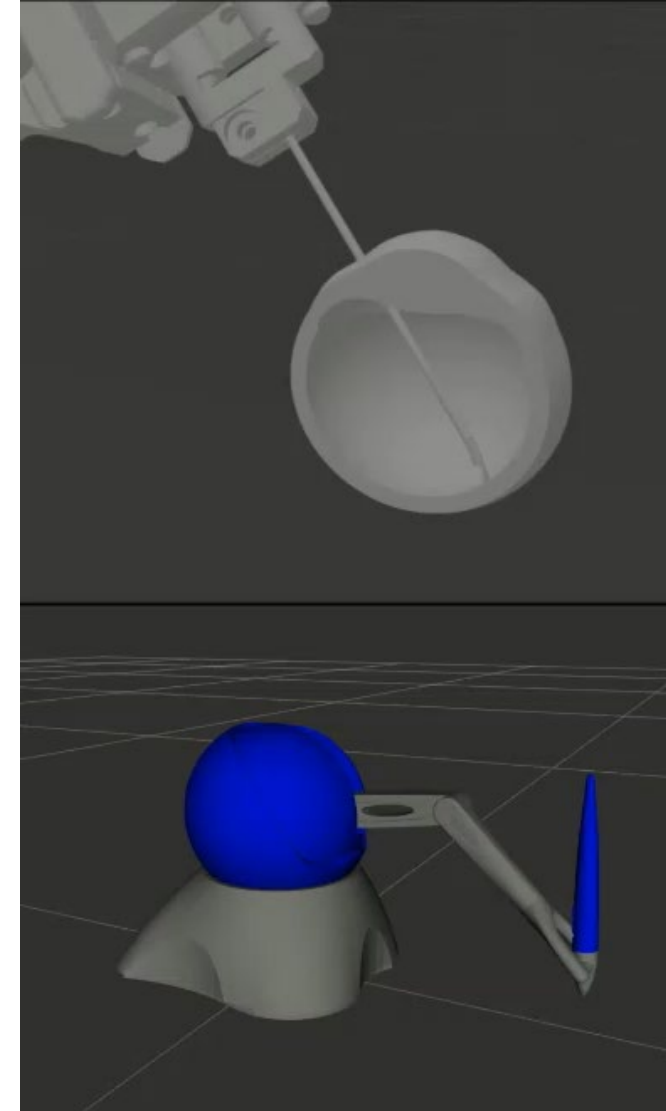z y x

Pitch Roll

+
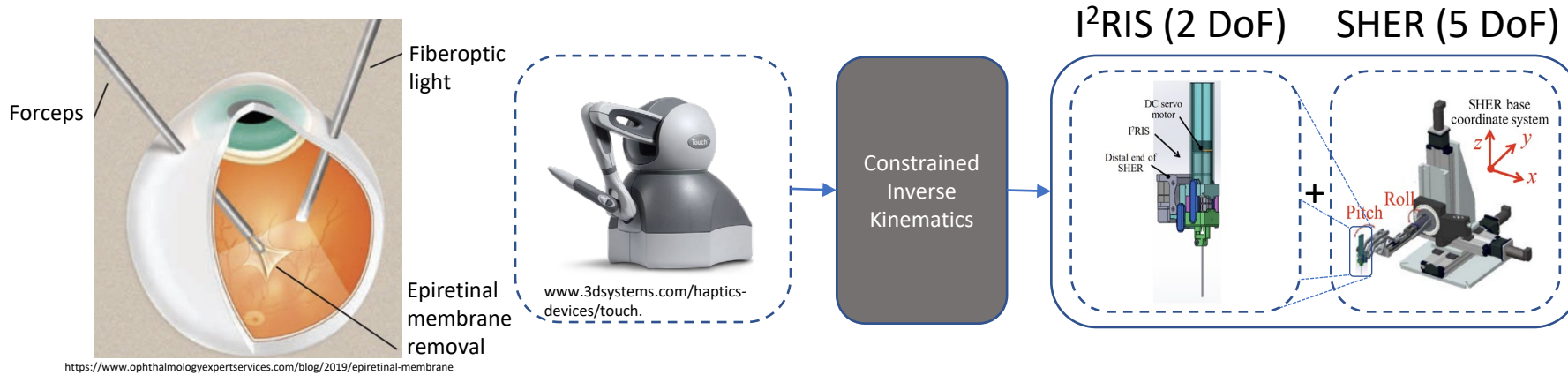
Motivation:

   Vitreoretinal membrane peeling requires high dexterity & force sensitivity

Goal:

   Cooperatively control SHER robot and I²RIS snake robot in simulation

Results:

1.   Generated the kinematics model of the combined system

2.   Formulated force model for normal force on end effector

3.   Developed control of the robot with:
   - optimization based inverse kinematics
   - constraints for end effector position and orientation

4.   Simulated the system to follow planned trajectories

5.   Tested in Gazebo simulation with control input from Phantom Omni

Gazebo Simulation