ERC | CISST

MICRON RANGE-OF-MOTION VISUALIZATION

Team-14

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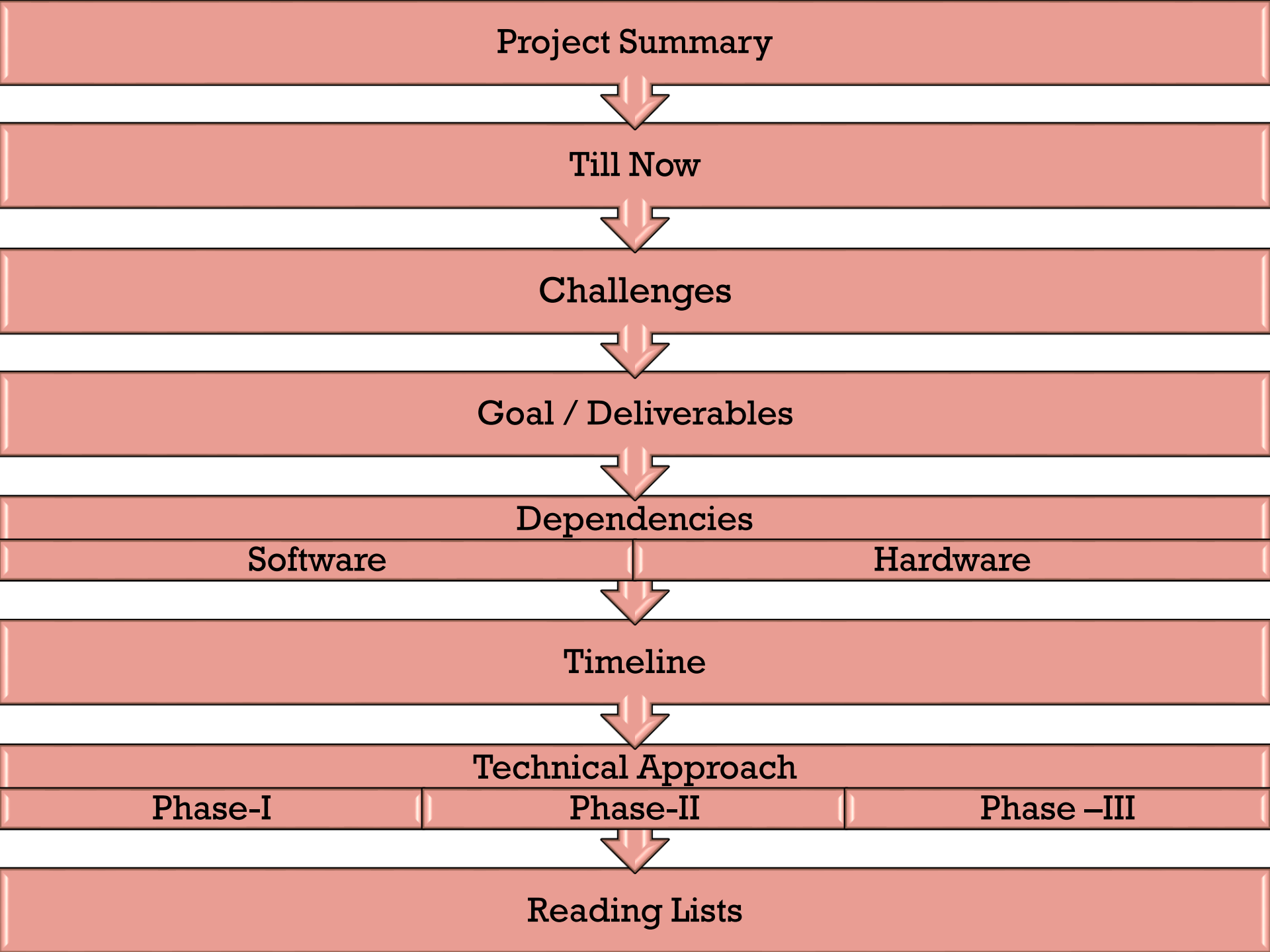

Project Summary
Till Now
Challenges
Goal / Deliverables
Dependencies
Software
Hardware
Timeline
Technical Approach
Phase-I
Phase-II
Phase –III
Reading Lists

SUMMARY

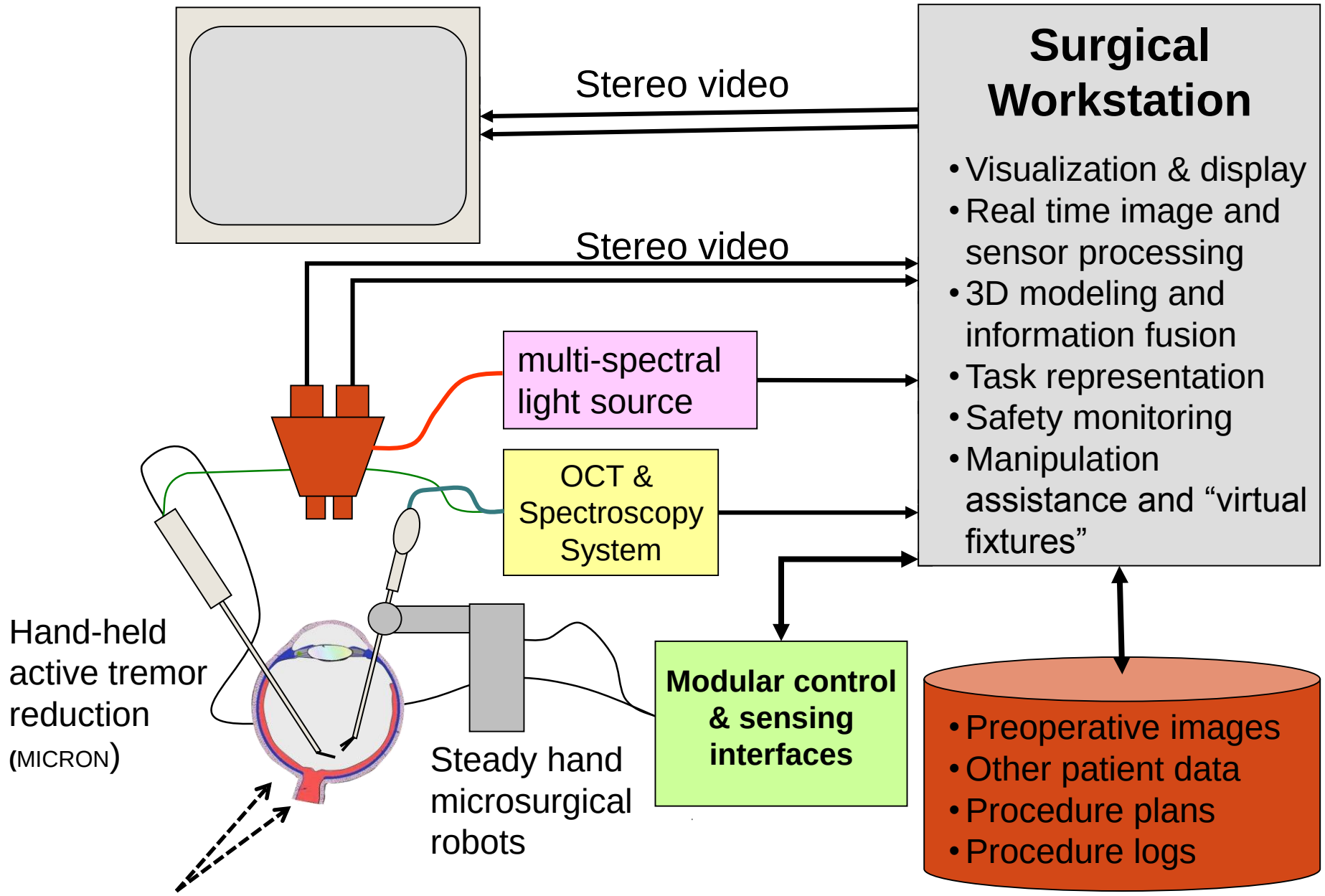
- Tools for Complex operations ?

  Micron !!!!

- What is it ?

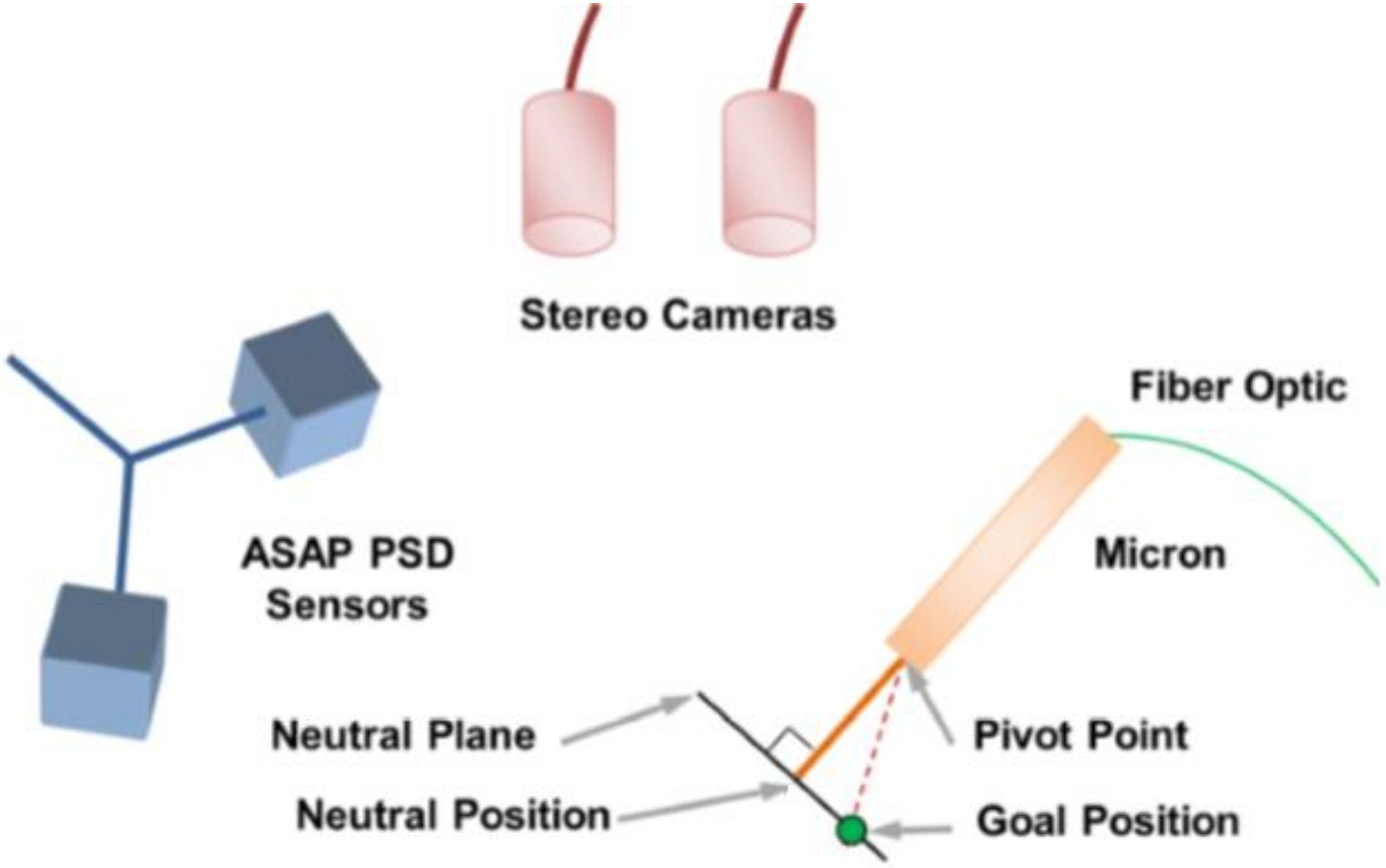
TILL NOW

- Sense the tremors
- Compensate the movement using the micron.



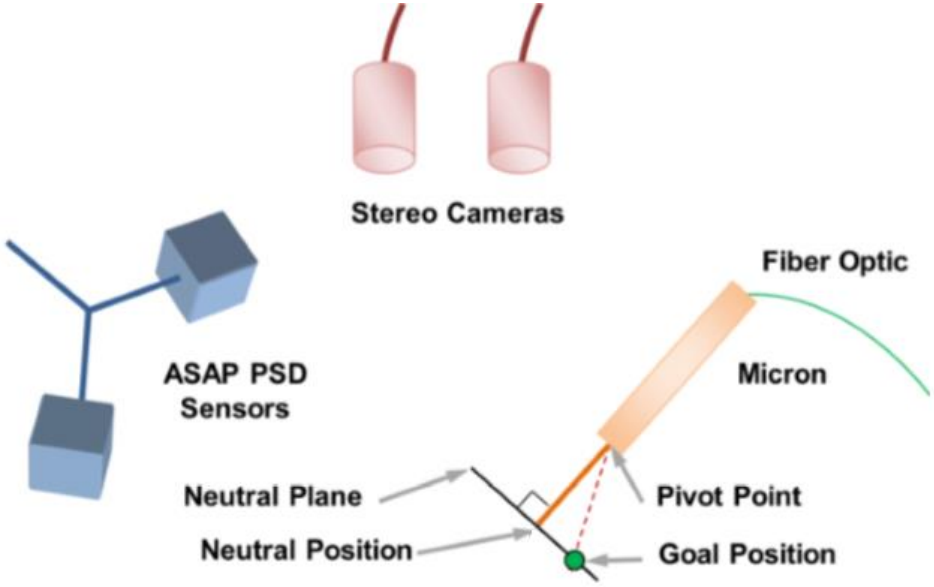
Provided by Marcin Balicki

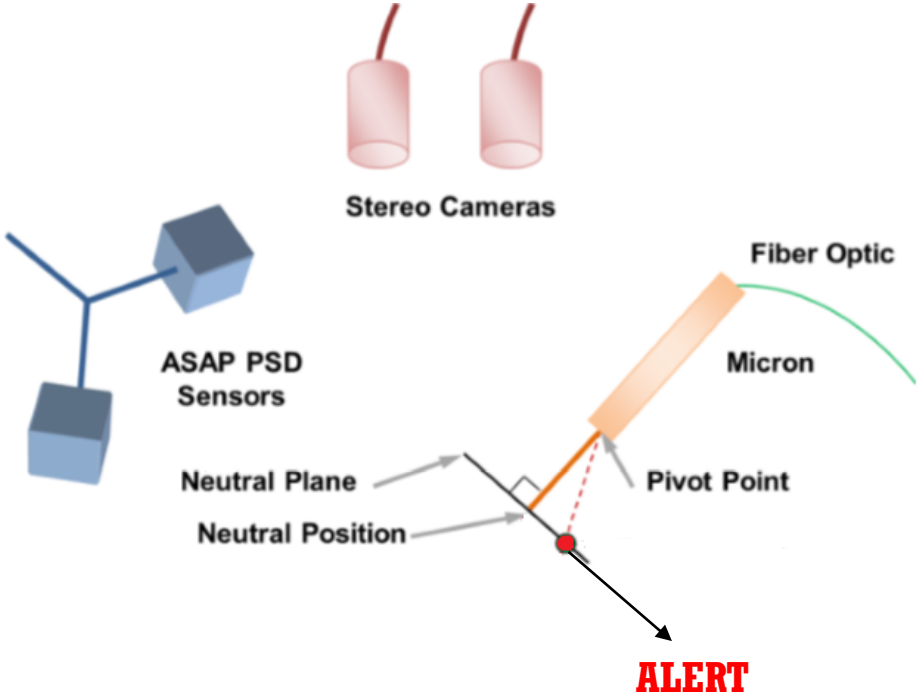
MICRON MOTION



CHALLENGES

- No graphical alert system was developed





DELIVERABLES

Minimum :

- Have the test application running and have some overlays displayed .
- Communicate with the micron and acquire the information for the state of motion.

DELIVERABLES

Expected :

- Develop a visual alert system that uses the acquired information for the state of micron .
- Get feedback from the surgeons.

DELIVERABLES

Maximum

- Perform accuracy experiments and try to improve the robustness.

SOFTWARE DEPENDENCY

- Cisst
- OpenSceneGraph/OpenGL
- Qt-Creater

HARDWARE DEPENDENCY

- Micron tool
- High processing PC
- Microscope
- Eye-Robot
- Video-Source

TIMELINE

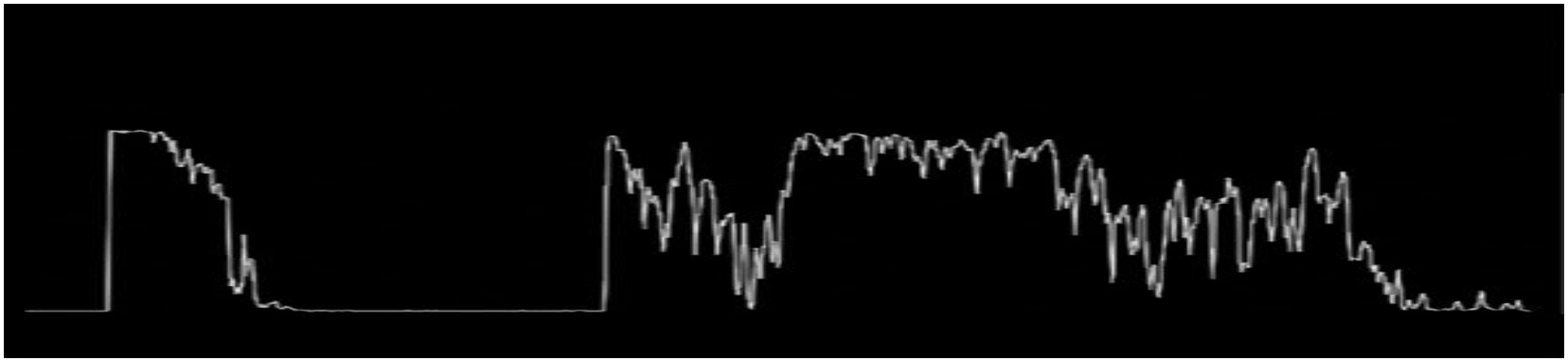
Week Starting with	Feb. 4	Feb. 11	Feb. 18	Feb. 25	Mar. 4	Mar. 11	Mar. 18	Mar. 25	Apr. 1	Apr. 8	Apr. 15	Apr. 22	Apr. 29	May 6
Understanding CISST and SteroVision libraries							Spring Break							
Setting up development Environment														
Understanding the Existing Framework														
Create a test Application														
Include some overlays														
Communicate with the micron and get the information														
Work on the simulator														
Feedback														
Alert system														
Feedback														
Debugging														
Improve the tracker														

PHASE-I

Dependency	Source	Status/Comments	What If ??	Due
PC or Laptop	Self	Acquired	Project Delayed	
Cisst and Stereo Vision Libraries	Open Source-Online	Installed	Custom Libraries	
OpenSceneGraph	Open Source-Online	Installed	Can use OpenGL	
Qt Creator - IDE	Open Source	Installed	Use other free IDEs available	
Material to understand Micron better	Dr.Russel Taylor	Acquired	Learn Myself	
Documentation of previous work	Marcin Balicki	Acquired	Learn myself	

PHASE I – TECHNICAL APPROACH

- Create a simple test application which will have some overlays like Ascan, Hscan, fps rate etc ..



PHASE-II

Dependency	Plan/Source	Status/Comments	What If ??	Due
Micron	Dr.Taylor	In Process/Wont need till the completion of PhaseI	Buy a new one	
Microscope	Dr.Taylor	In Process/Wont need till the completion of PhaseI	Buy a new one	
Eyerobot	Dr.Taylor	In Process/Wont need till the completion of PhaseI	Buy a new one	

PHASE II – TECHNICAL APPROACH

- Develop an alert system which will graphically warn the surgeon, if the micron is going out the range-of-motion

Procedure – Yet to Decide

PHASE III – NO DEPENDENCIES

PHASE IV – NO DEPENDENCIES

PHASE III, IV – TECHNICAL APPROACH

- Keep on testing the alert system physically, making the micron go out of the range of motion and check the efficiency.

READING LISTS

[1] B. C. Becker, S. Voros, R. A. MacLachlan, G. D. Hager, and C. N. Riviere, "Active Guidance of a Handheld Micromanipulator using Visual Servoing", in IEEE International Conference on Robotics and Automation, Kobe, Japan, May 12-17, 2009. pp. 339-344.

[2] B. Becker, R. MacLachlan, and C. Riviere, "State estimation and feedforward tremor suppression for a handheld micromanipulator with a Kalman filter", in EEE RSJ Int Conf Intell Robot Syst, 2011. pp. 5160-5165. NIHMSID: 345014.

[3] B. Becker, R. MacLachlan, L. Lobes, and C. Riviere, "Vision-Based Retinal Membrane Peeling with a Handheld Robot", in IEEE Int Conf Robot Autom, 2012. pp. 1075-1080. NIHMSID: 368417.

[4] B. Becker, S. Yang, R. MacLachlan, and C. Riviere, "Towards vision-based control of a handheld micromanipulator for retinal cannulation in an eyeball phantom", in Proc IEEE RAS EMBS Int Conf Biomed Robot Biomechatron, 2012. p. accepted for publication. NIHMSID: 368431.

READING LISTS

[5] B. Gonenc, M. A. Balicki, J. Handa, P. Gehlbach, C. N. Riviere, R. H. Taylor, and I. Iordachita, "Preliminary Evaluation of a Micro-Force Sensing Handheld Robot for Vitreoretinal Surgery", in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vilamoura, Algarve, Portugal, 7-12 October, 2012. pp. 4125-4130.

[6] R. MacLachlan, B. Becker, J. Cuevas-Tabarés, G. Podnar, L. Lobes, and C. Riviere, " Micron: an actively stabilized handheld tool for microsurgery", IEEE Trans Robot., vol. 28- 1, pp. 195-212, 2012. NIHMSID:345015.

[7] S. Yang, M. Balicki, R. A. MacLachlan, X. Liu, J. U. Kang, R. H. Taylor, and C. N. Riviere, "Optical Coherence Tomography Scanning with a Handheld Vitreoretinal Micromanipulator ", in IEEE Engineering in Medicine and Biology Conf, San Diego, Aug 28-Sep 1, 2012. pp. 948-951. NIHMSID: 383510.

[8] S. Yang, R. MacLachlan, and C. Riviere, "Design and analysis of 6 DOF handheld micromanipulator", in Proc IEEE Int Conf Robot Autom., St. Paul, MN, May 14-18, 2012. pp. 1946-51. NIHMSID: 368427.

READING LISTS

[9] B. Becker, R. MacLachlan, L. Lobes, G. Hager, and C. Riviere, "Vision-Based Control of a Handheld Surgical Micromanipulator with Virtual Fixtures", IEEE Transactions on Robotics, pp. Acepted Nov 27, 2012, 2013. NIHMSID: 429749.

[10] M. Balicki, J.-H. Han, I. Iordachita, P. Gehlbach, J. Handa, R. H. Taylor, and J. Kang, "Single Fiber Optical Coherence Tomography Microsurgical Instruments for Computer and Robot-Assisted Retinal Surgery", in Medical Image Computing and Computer Assisted Surgery (MICCAI 2009), London, September 20-24, 2009. pp. 108-115. PMID: 20425977

QUESTIONS?