

Telemanipulation and Telestration for Microsurgery

Checkpoint Presentation

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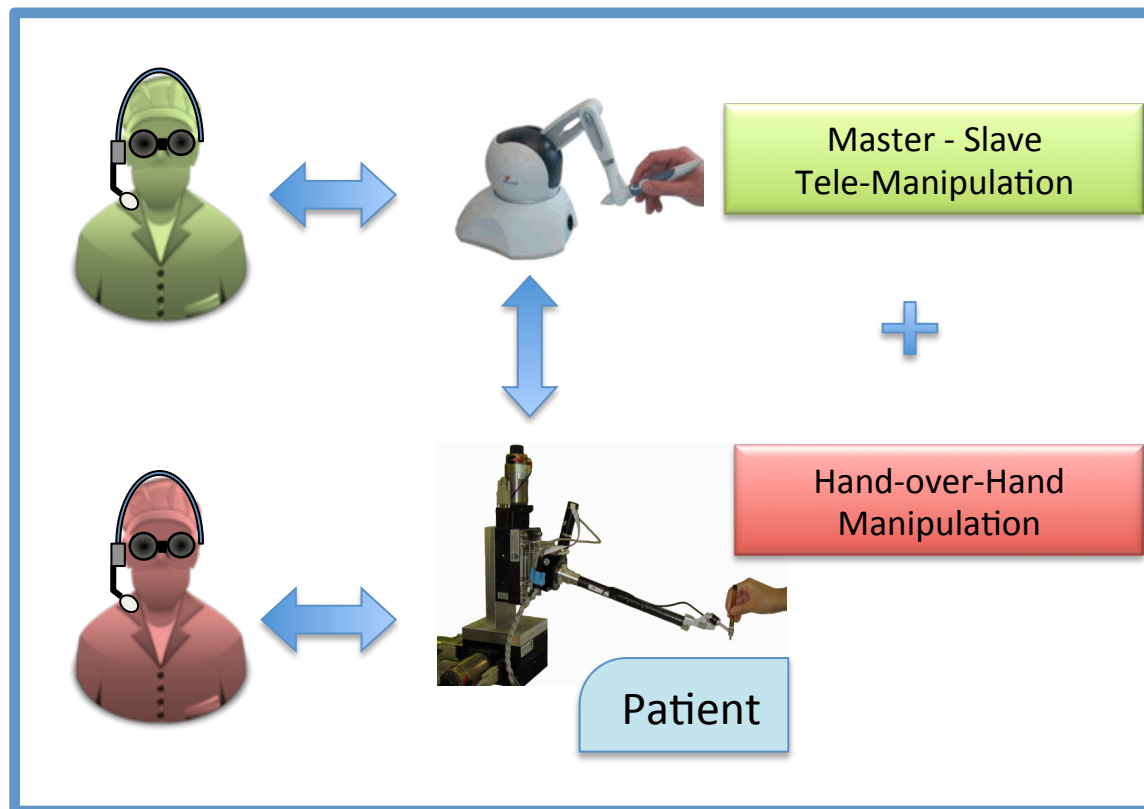
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Group 7

April 3, 2012

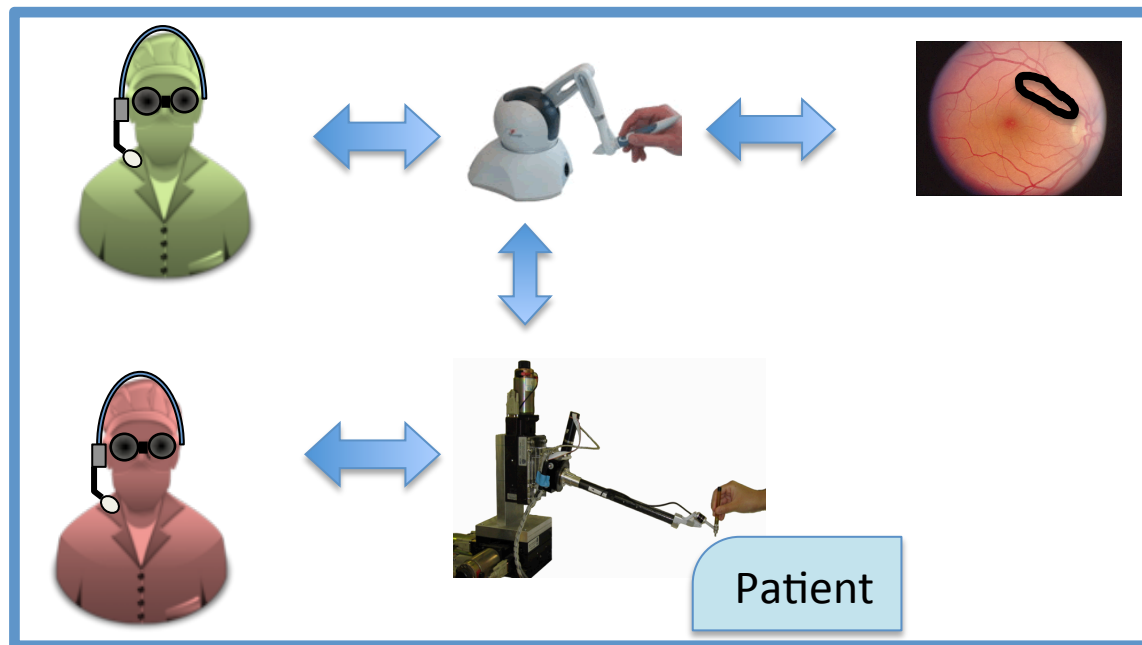
Project Overview

Telemanipulation



Project Overview Cont.

Telestration

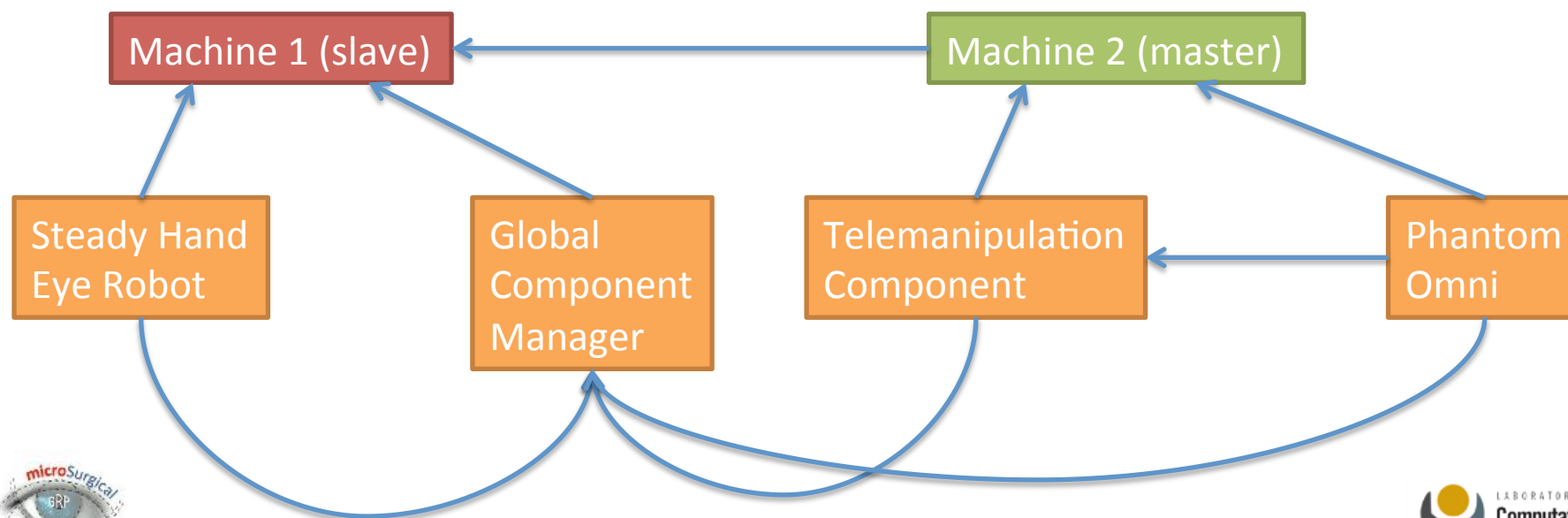


Where are we?

- Completed Milestones
 - Identification of telemanipulation error
 - Fix the telemanipulation error
 - Telestration framework (graphics with mouse)
- Overall: 1 week behind
 - Hardware problems with new 3D monitor set up

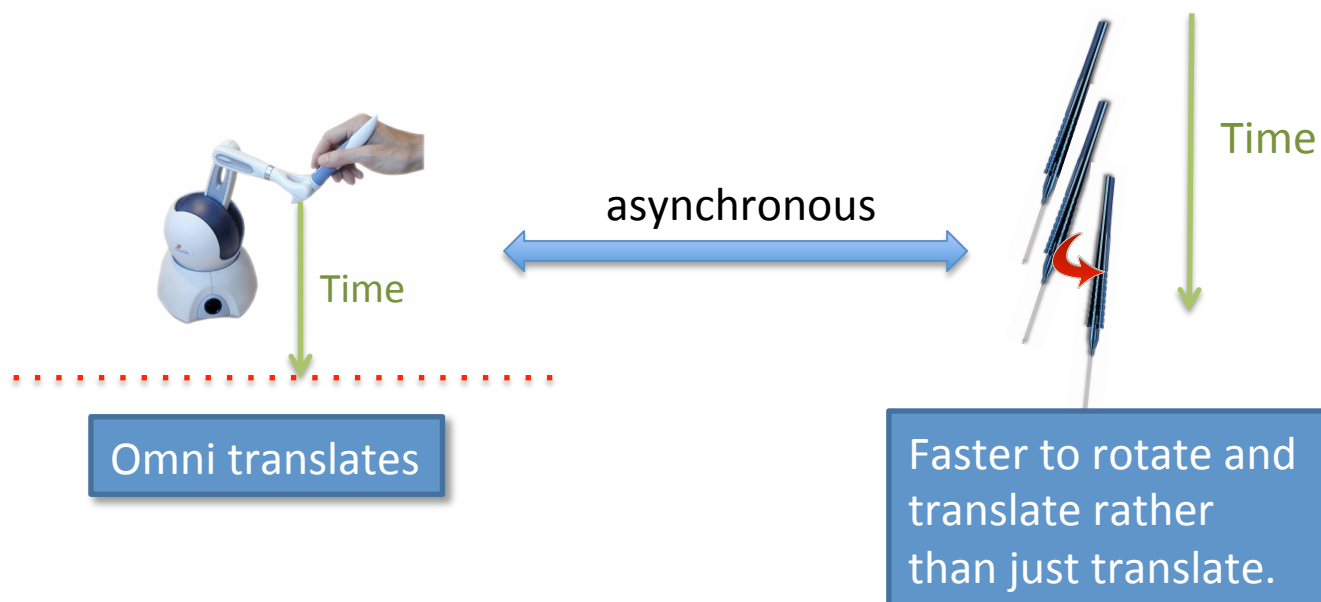
Milestone 1 – System Setup

- Understanding the system
- Getting everything connected properly



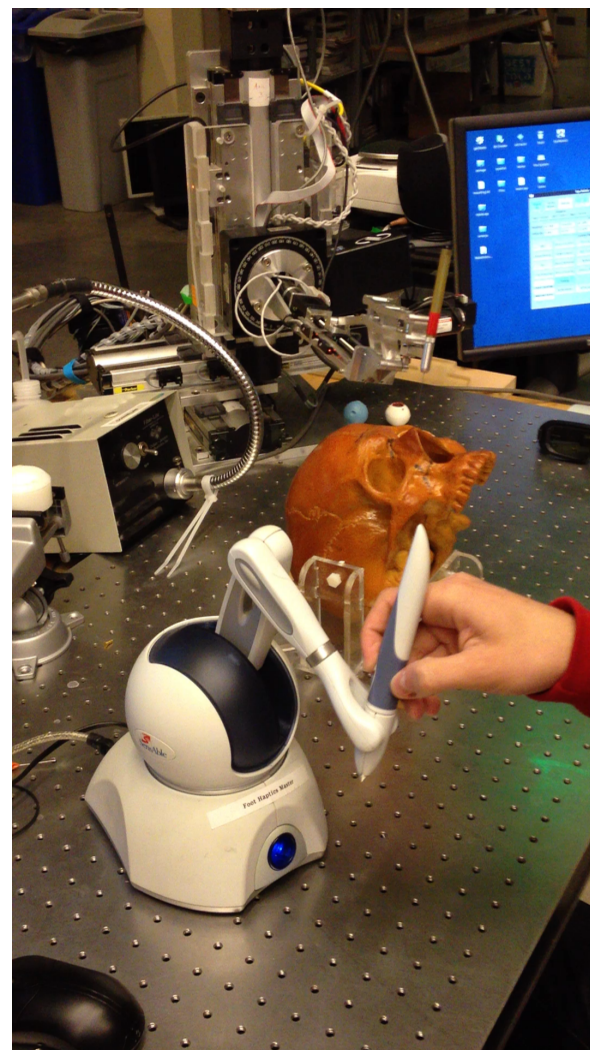
Milestone 1 – Identify Telemanipulation Error

- Description of the problem
 - Unexpected rotation in the Robot due to the optimization algorithm
 - Different Robot joints have different “costs” of movement
 - The robot moves optimally however the Omni may not.



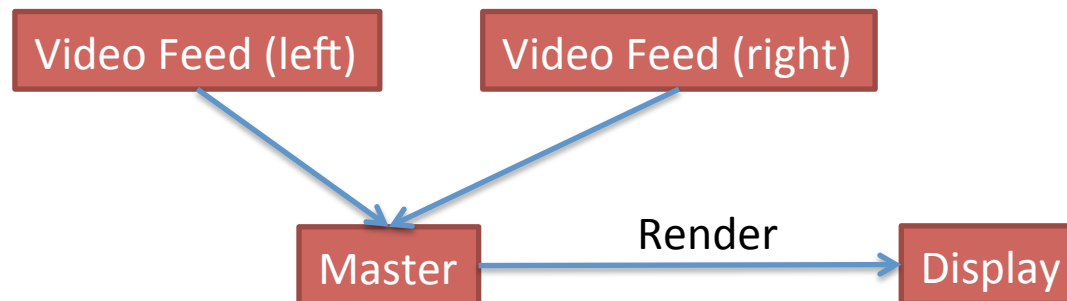
Milestone 1 – Repair Telemanipulation Error

- The Robot has velocity limits for each Joint
- Created a new condition
 - When using Telemanipulation, set velocity limits to 0 for rotation
 - This disallows the rotation component



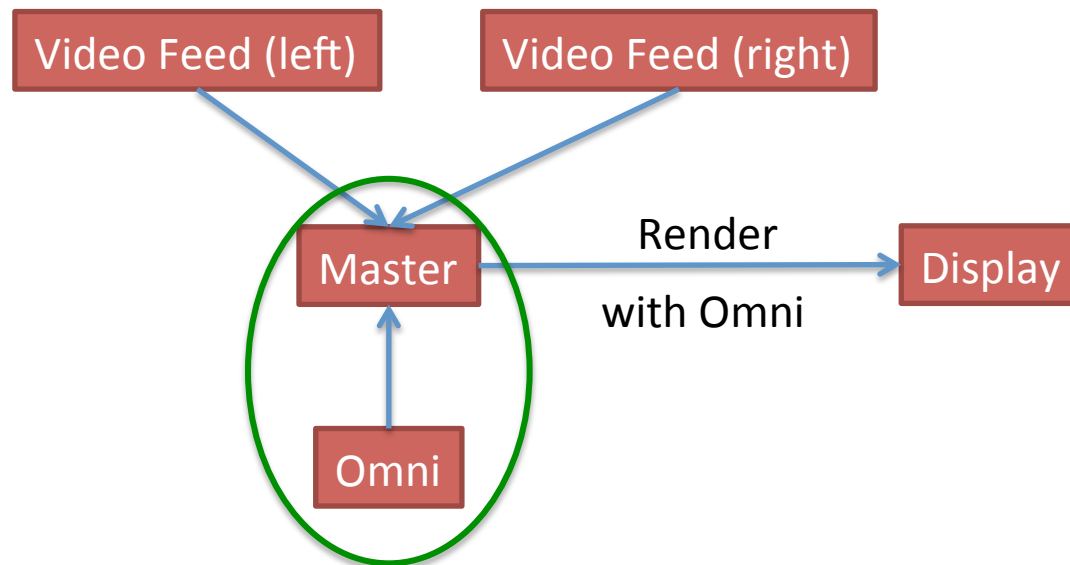
Milestone 2 – Telestration

- Learn EyeSAW and develop Telestration framework

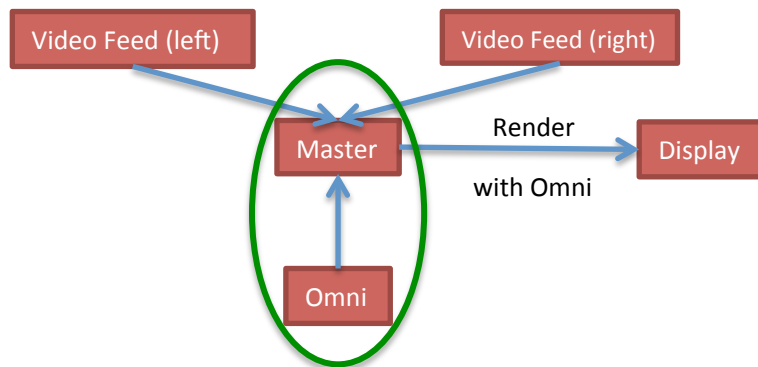


Milestone 2 – Telestration

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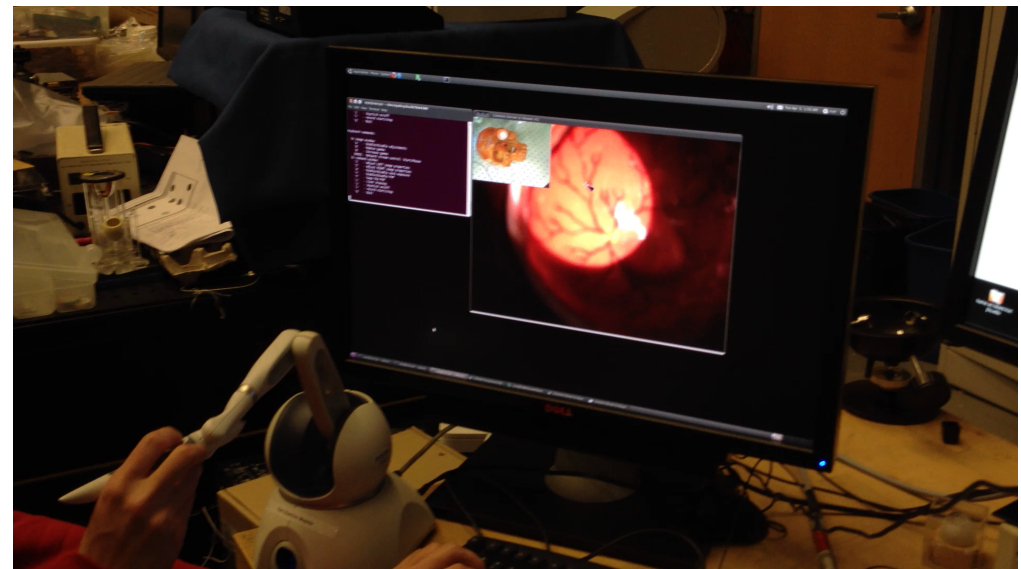


Milestone 2 – Telestration

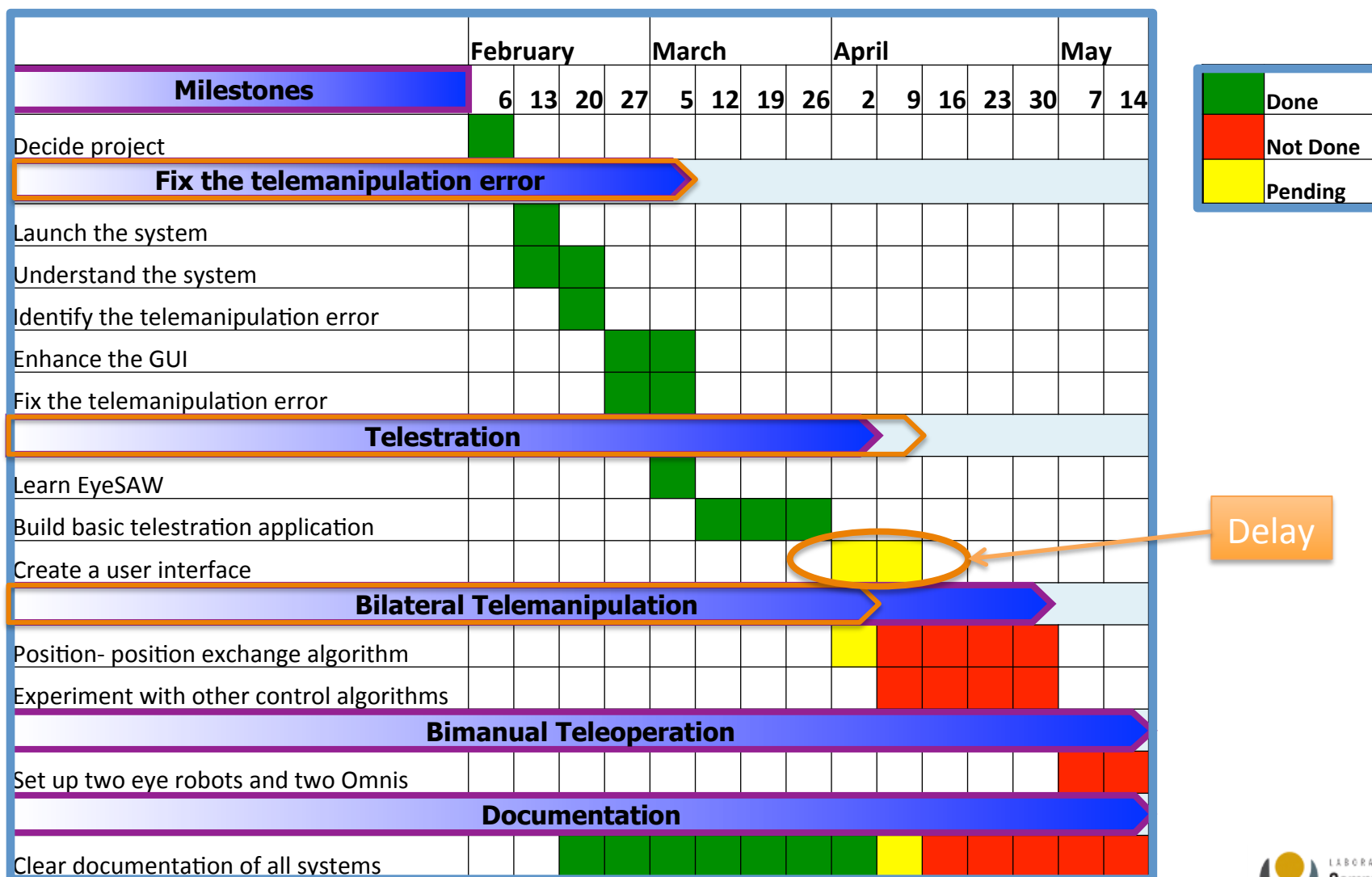


Tasks

- Develop connection with Omni to the Master
- Scaling of Omni position
- Virtual wall with Omni to create drawing board



Updated Project Timeline



Dependencies

Dependency	Plan of Action	Status
Eye Robot 2	<ul style="list-style-type: none"> • Almost always available at nights/on weekends. • Med campus Eye Robot • Can always use Eye Robot 1 	Resolved
Omni	<ul style="list-style-type: none"> • Safe to assume at least one is always available 	Resolved
3D Video Display	<ul style="list-style-type: none"> • Older technology is available all the time • Can use 2D display for debugging 	Resolved
Marcin	<ul style="list-style-type: none"> • In the lab 7 days a week 	Resolved
Access to the Lab	<ul style="list-style-type: none"> • Resolved (have access) 	Resolved
Access to Med Campus Lab	<ul style="list-style-type: none"> • Pending 	Not needed
CISST SVN	<ul style="list-style-type: none"> • Resolved (have access) 	Resolved
da Vinci Master Console	<ul style="list-style-type: none"> • Will resolve as needed 	Resolved
NEW Eye Robot 2 for Bimanual	<ul style="list-style-type: none"> • Wait 	Pending

Updated Deliverables

- Minimum
 - Improve telemanipulation
 - Telestration using Omni
 - Develop a friendly/ergonomic user interface (pedal/mode changing)
 - Documentation
- Expected
 - Bilateral teleoperation
 - Bimanual teleoperation with two Robots (possibly Eye Robot 1) and two Omnis
- Maximum
 - Virtual fixture definition via telestration
 - Telemanipulation and telestration via da Vinci Master Console
 - Design validation experiment

References

- Uneri et. al., “New Steady-Hand Eye Robot with Micro-Force Sensing for Vitreoretinal Surgery,” *IEEE RAS & EMBS*, 2010.
- Balicki et. al., “Prototyping a Hybrid Cooperative and Telerobotic Surgical System for Retinal Microsurgery,” 2011.
- Ammi et. al., “Robotic Assisted Micromanipulation System using Virtual Fixtures and Metaphors,” *IEEE Int. Conference*, 2007.
- Kazanzides et., al., “Component-based software for dynamic configuration and control of computer assisted intervention systems,” 2011.
- Bohn et. al., “User interface integration and remote control for modular surgical assist systems,” 2010.
- Rajesh Kumar et. al., “Performance of Robotic Augmentation in Microsurgery – Scale Motions,” Proceedings of the 2nd International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), 1999.

Questions?

- THANK YOU FOR LISTENING!