

Telesurgery and Telestration for Microsurgery

*Computer Integrated Surgery II
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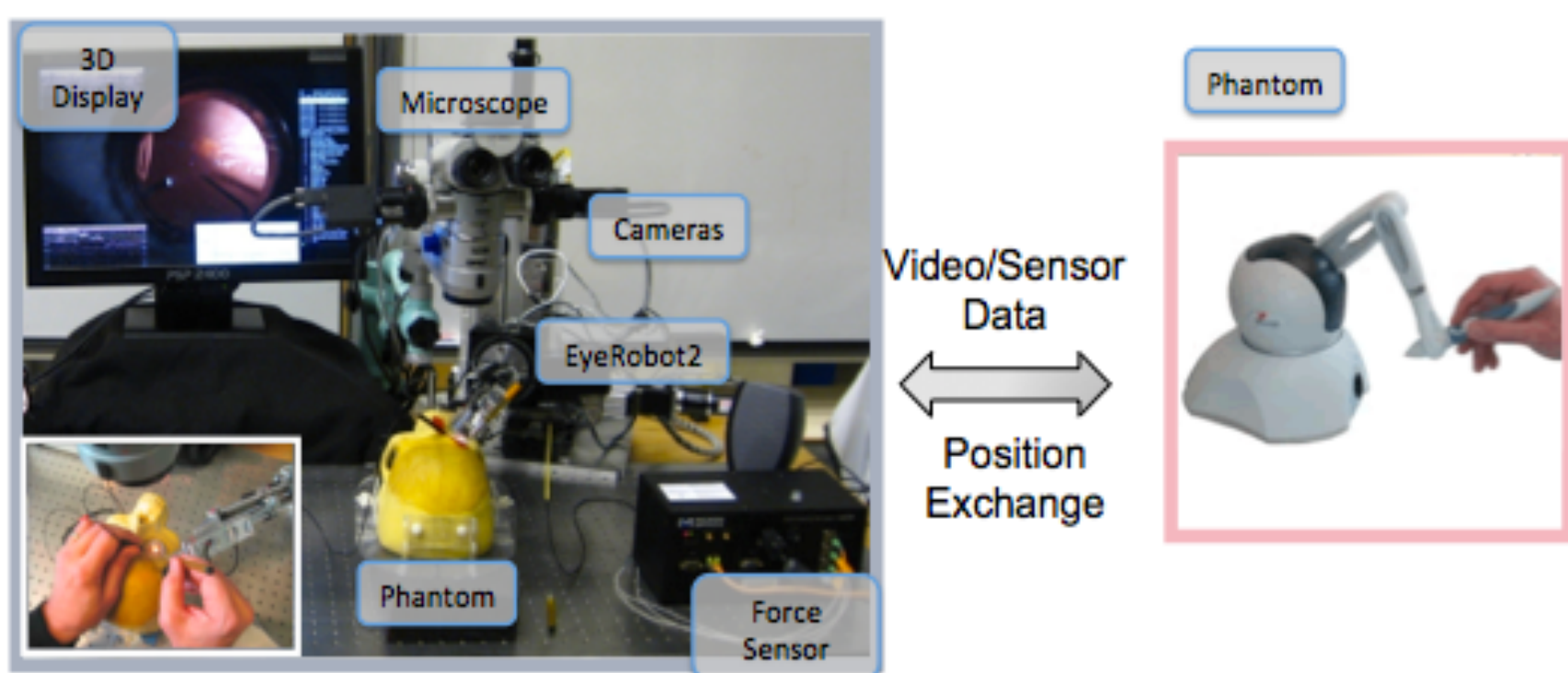
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Introduction

- Retinal surgery and other microsurgeries requires fine control and great concentration.
- Surgeons become exhausted and are often working close to the limits of human dexterity.
- Cooperative control systems effectively aid in these problems (i.e. hand tremor reduction via the Steady Hand Eye Robot).
- A telesurgery system has implications for cooperative surgery, education, and communication.

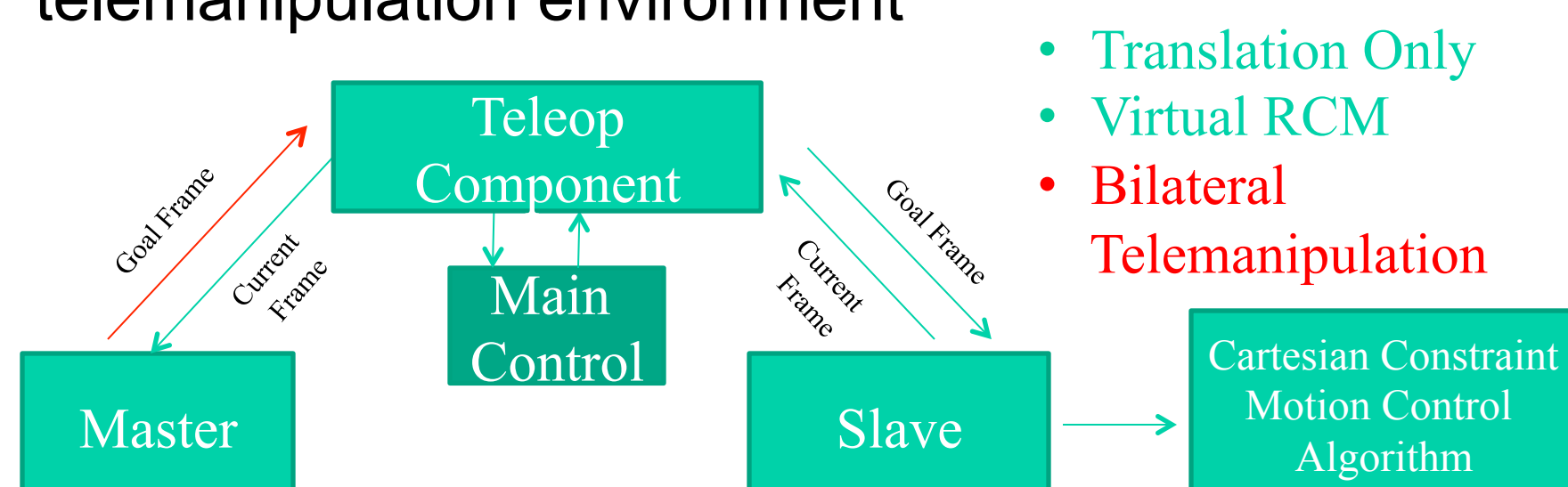
Telesurgery

- Master/slave system for controlling the Steady Hand Eye Robot by using the Phantom Omni Haptic Device
- The Omni has many advantages (haptic feedback, 3D control, cheap, etc.)



Technical Approach

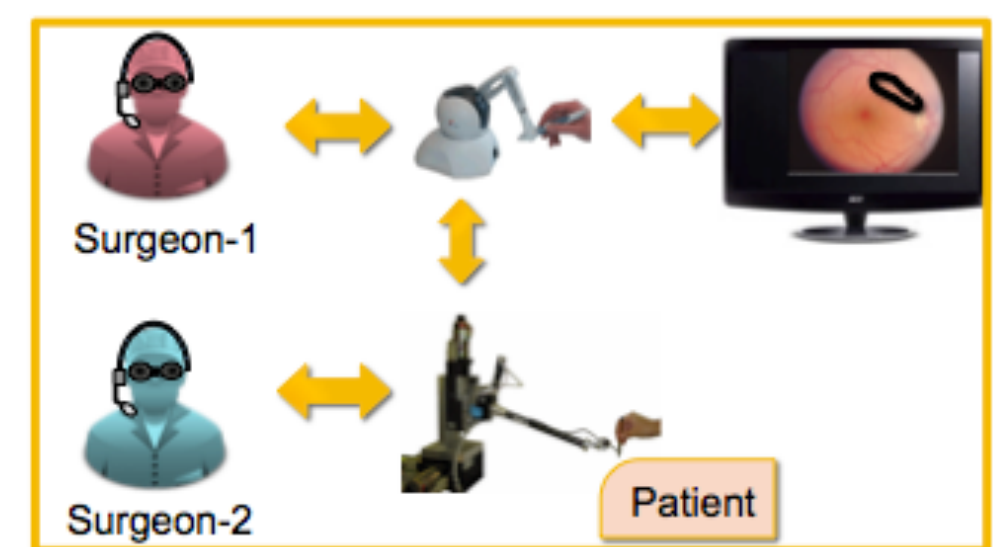
- 1) Identify error in the already-existing framework
- 2) Fix the error (via Cartesian Motion Control)
- 3) Extend the telesurgery platform with bilateral cooperation
- 4) Set up workstation to simulate real telesurgery environment



Telestration

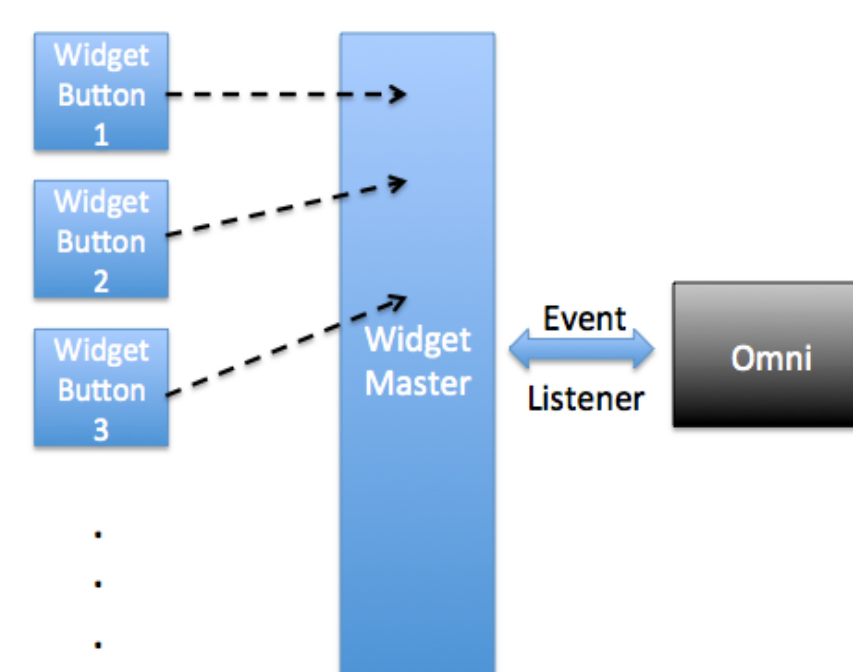
- Use the Omni to graphically annotate the 3D display during surgery
- Inspired by sport telestrators
- Useful for communication and educating surgeon trainees and eventually...defining virtual fixtures.

- The primary surgeon may continue with the surgery as the secondary surgeon uses the Omni for telestration



Technical Approach

- Simple scaling algorithm and graphics software
- Widget-based sidebar approach



- Highly modular
- Each widget is responsible for a single graphics object
 - Straight line
 - Free hand drawing
 - Square
 - Circle
 - Eraser

Networking and System Setup

- Individual components connected to a Global Component Manager
- The Teleopcomponent Application mediates actions related to telesurgery and telestration



Future Work

- Integrate tool tracker with particle filtering to then have the capability of drawing virtual fixtures via telestration
- Additional telestration widgets
- Bimanual telesurgery

Lessons Learned

- Familiarity with Constrained Optimization Algorithm
- Familiarity with CISST development framework

Acknowledgements

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