Gesture Controls for Raven Robot

Group 7

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Overview

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Raven Robot

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- Open-Source System
- Closer Tools
- Applications/Innovations
  - Heart Surgery
  - 3D US
  - Field Teleoperation

image courtesy of popular mechanics

3Gear System

- 2 Kinects
- Tracks hands, fingers
- Modifies for closer applications

Image courtesy of 3Gear

CISST/ROS Libraries

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- CISST
  - open source software for computer assisted intervention systems
  - calibrate systems and track sensors

- ROS
  - open source software for controlling robots

Goals

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Minimum: saw Wrapper for 3Gear,cisstToRos in whatever shape, simple frames moving in Gazebo

Expected: Integrate 3Gear, CISST, ROS libraries. Control a Raven Simulator using gesture controls.

Maximum: **Control the Raven robot using gesture controls**

Significance

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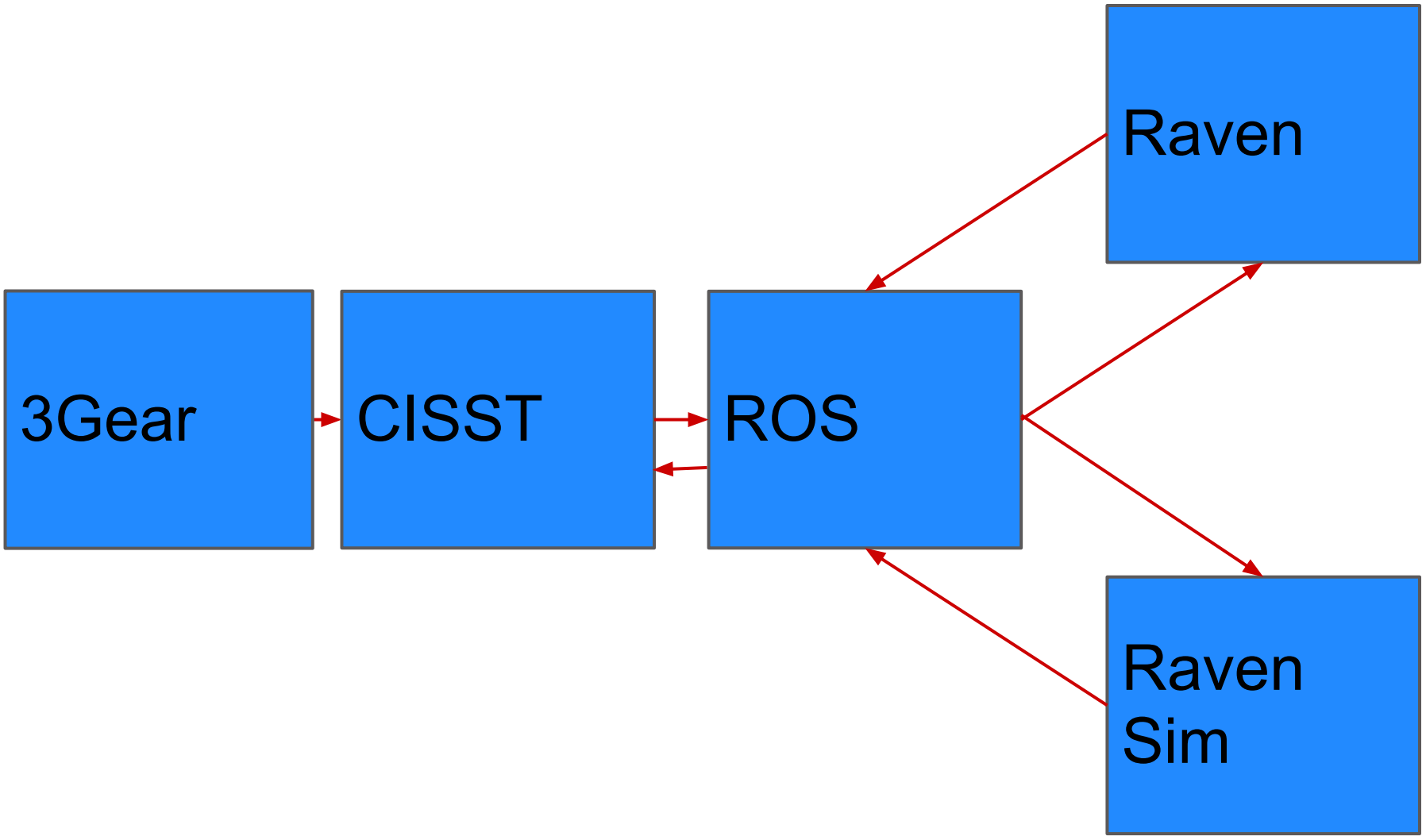
- Gesture controls integrated with CISST libraries (possibilities!)
- CISST/ROS integration (more possibilities!)
- Oh yeah, and a ROBOT.

Technical Approach



Milestones

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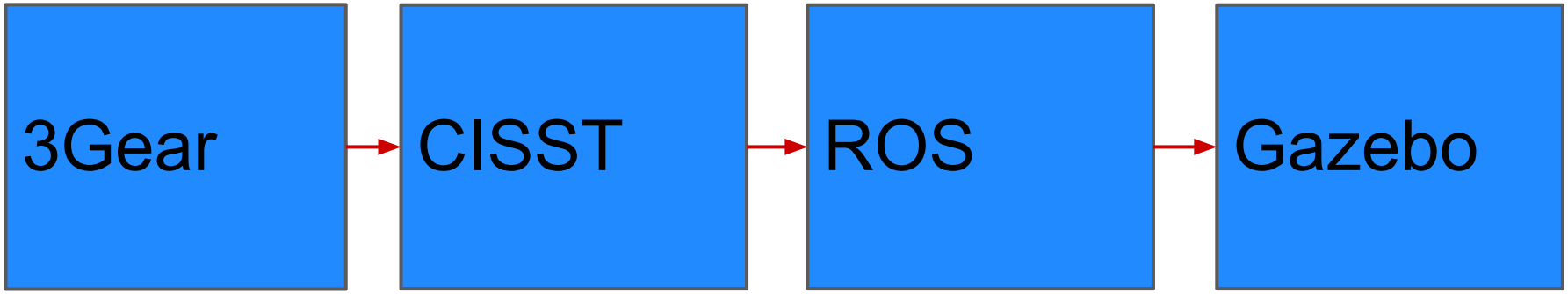
April 1 - 3Gear talks to CISST - Kristine
April 1 - CISST talks to ROS - Alan
April 19 - ROS talks to Simulator - Both
April 26 - 3Gear to Simulator - Both
April 29 - ROS talks to Raven - Both
May 3 - 3Gear to Raven - Both

Deliverables - Min

- SAW wrapper for 3Gear

- cisstToRos interface

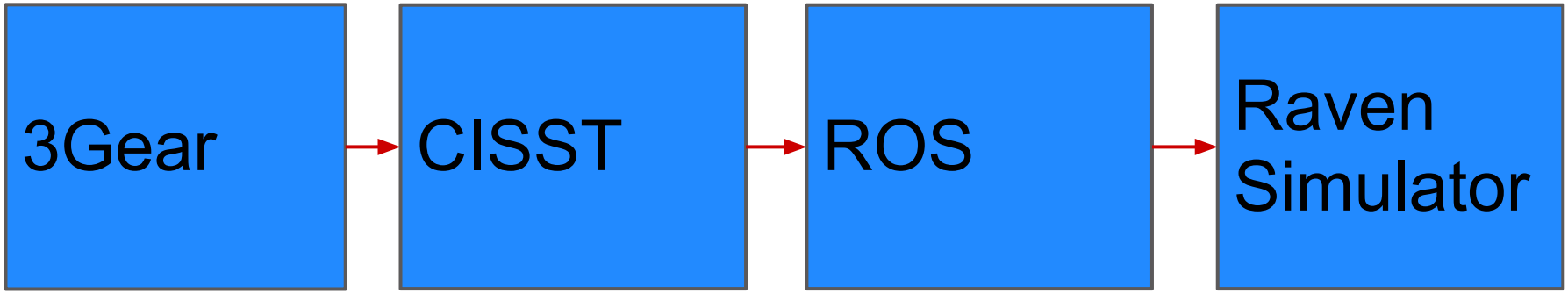
- Simple frames moving in Gazebo



Deliverables - Expected

- Integrate all stages (3Gear to CISST to ROS to simulator)

- 3Gear moves Raven Simulator



Deliverables - Max

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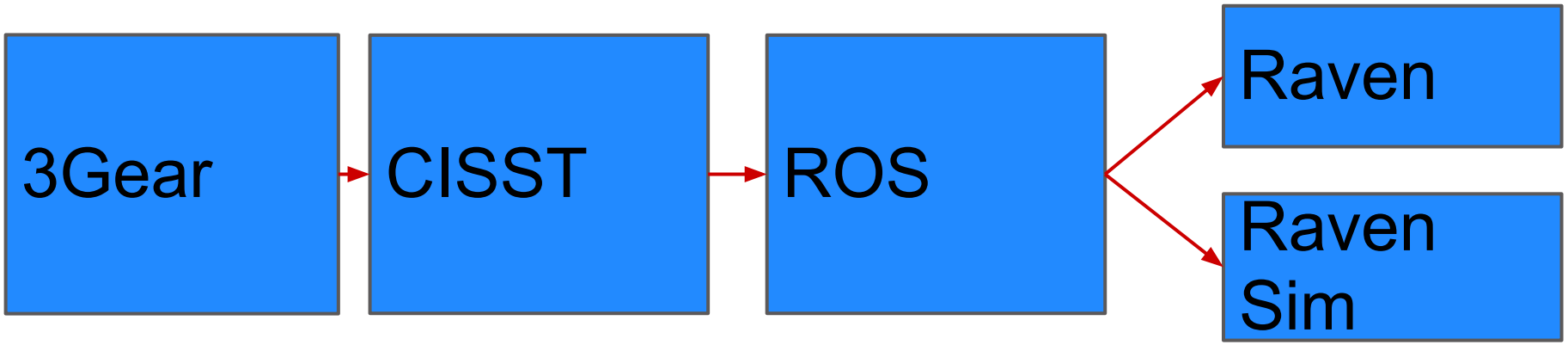
- Integrate 3Gear, CISST, ROS, Raven Simulator, and Raven Robot

- Move the Raven Robot using gesture controls!



Timeline

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		February			March				April				May	
		Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15
	Deliverable													
3Gear to CISST	Install 3Gear (Kristine)													
	Install CISST (Both)													
	Code! (Kristine)													
	Milestone Validation (Both)													
CISST to ROS	Access Linux Machine (Alan)													
	Install CISST on Machine (Both)													
	Install ROS (Both)													
	Code! (Alan)													
	Milestone Validation (Both)													
ROS to Raven Simulator	Acquire/Install Raven Simulator (Both)													
	Code! (Both)													
	Milestone Validation (Both)													
ROS to Raven Robot	Access to Raven Robot + Controlling Computer													
(Maximum Deliverable)	Code? L2Robot?													
	Milestone Validation													
System Integration	3Gear to ROS - Networking/Setup													
	3Gear to ROS - Validation/Debugging													
	3Gear to Raven Simulator - Validation/Debugging													
	3Gear to Raven Robot - Validation/Debugging													

Dependencies

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Access to 3Gear Computer

- **Resolution Plan:** Get J-Card access, ask Kell for access
- **Resolve by:** February 15
- **Resolved:** No
- **Fallback plan:** N/A

Learn to build CISST

- **Resolution Plan:** Meet with Anton to help us
- **Resolve by:** February 22
- **Resolved:** No
- **Fallback plan:** Find another helpful person to teach us CMake (or learn it through documentation)

Access to Linux Machine for ROS and Raven Simulator

- **Resolution Plan:** Kell finds us a Linux machine to work with
- **Resolve by:** February 22
- **Resolved:** No
- **Fallback plan:** Work on a virtual machine or on our laptops

Dependencies

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Networking between 3Gear (Windows) machine and ROS/Raven (Linux) Machine

- **Resolution Plan:** Ask mentors for help
- **Resolve by:** March 25
- **Resolved:** No
- **Fallback plan:** Learn to network computers?

CAD models and/or actual Raven Simulator

- **Resolution Plan:** These should be available through the Raven community
- **Resolve by:** March 15
- **Resolved:** No
- **Fallback plan:** Contact other research groups/universities for access to their Raven Simulator, or use the Gazebo simulator

Access to Raven Robot + Control Computer

- **Resolution Plan:** Ask Kell for access
- **Resolve by:** April 15
- **Resolved:** No
- **Fallback plan:** Maximum Deliverable is not achieved.

Management Plan

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- Weekly meetings with Kell and Anton (Wednesdays 1pm)
- Weekly meetings without mentors also on Wednesdays
- Update the project webpage every Wednesday
- We will each work approximately 6-10 hours per on the project.

Readings

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- **M.J.H. Lum, J. Rosen, T.S. Lendvay, M.N. Sinanan, B. Hannaford, 'Effect of Time Delay on TeleSurgical Performance,' IEEE International Conference on Robotics and Automation (ICRA), 2009.**

- M.J.H Lum, J. Rosen, H. King, D.C.W. Friedman, G. Donlin, G. Sankaranarayanan, B. Harnett, L. Huffnam, C. Doarn, T. Broderick, B. Hannaford,'Telesurgery Via Unmanned Aerial Vehicle (UAV) with a Field Deployable Surgical Robot,' Proceedings, Medicine Meets Virtual Reality (MMVR), Long Beach, CA, 2007.

- https://trac.lcsr.jhu.edu/cisst - description and documentation of CISST code

- Quigley, Morgan, et al. "ROS: an open-source Robot Operating System." ICRA workshop on open source software. Vol. 3. No. 3.2. 2009.

- http://www.threegear.com/technology.html

- http://www.ros.org/wiki/