ERC | CISST

Project Checkpoint Presentation
(April 23rd 2013)

Interfacing APL Snake End Effector to LARS

Group 3 Piyush Routray & Ashish Kumar

Outline

- Project Summary
- Background and Significance
- Original Project Plan
- In Progress
- Project Plan Timeline
- Reading List

Statement of Our Project

The main and static aim of our project is to interface the APL Snake end effector to the LARS and achieve end-point control.

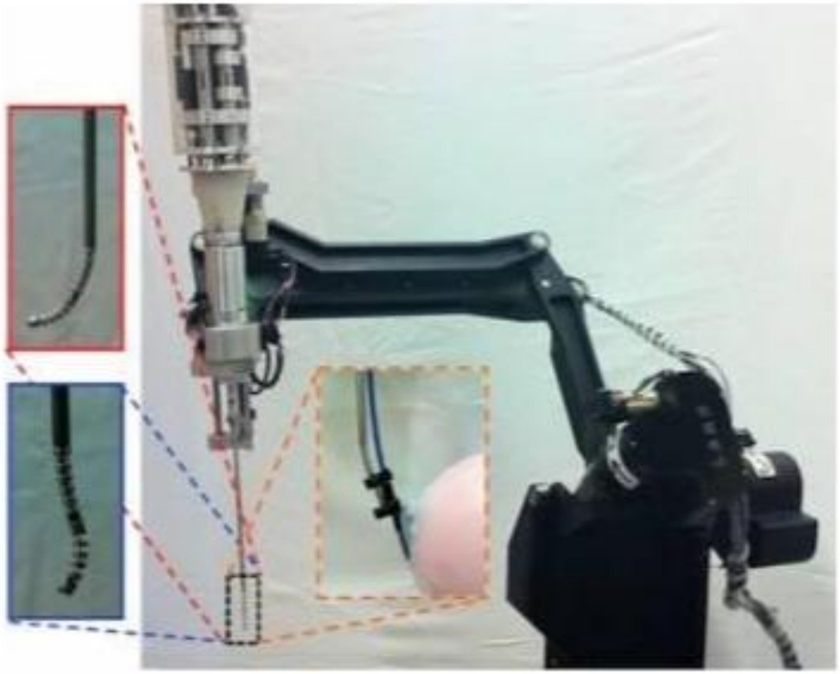


Image from: Tutkun Şen: *Elastography with LARSnake Robot*

Background & Significance

Image courtesy: Tutkun Sen

- The APL Snake was initially developed with an intention of use in hip osteolysis removal surgery.
- Various potential applications have been thought of since development, such as use in heart surgeries etc.
- Constantly being upgraded to be a self sustained surgical tool.
- Intuitive control interface for the manipulator, has since, been designed and integrated with the snake using PHANTOM® Premium haptic controller.
- LARS is an ideal system to aid autonomous operation of the APL Snake due to its mobility, dexterity, and versatility of use with various end-effectors.

ERC | CISST

APL The Johns Hopkins University APPLIED PHYSICS LABORATORY

Laboratory for Computational Sensing + Robotics

Original Plan: Project Stages

Minimum:

Fix the LARS——————————————————→(Mar 15th)

End-point control—————————————————→(Apr 29th)

Expected:

3D Registration and alignment with insertion axis– →(May 6th)

(previously April 22nd)

Maximum:

Configure the Snake in any desirable alignment—- →(*)

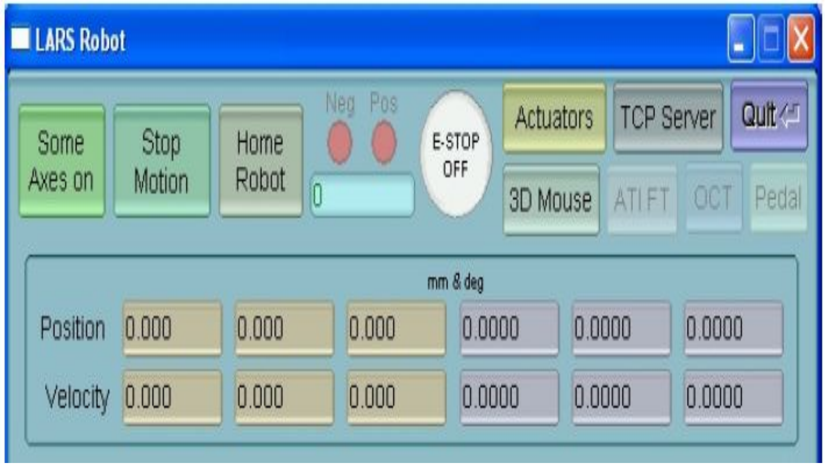
Demonstration of the same on cadaver—————— → (*)

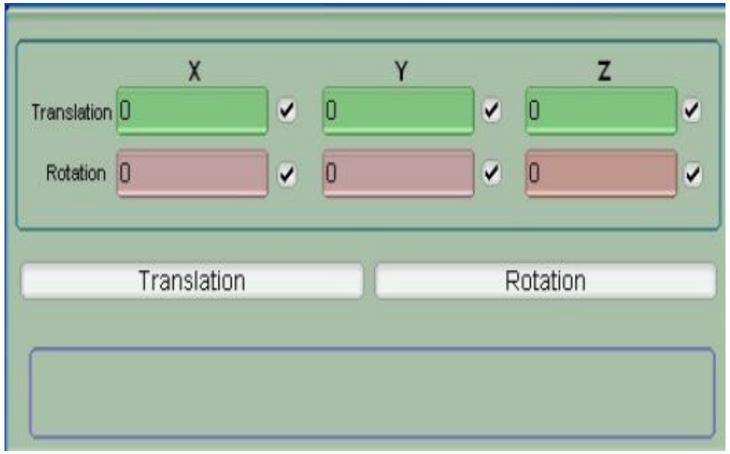
*after the end of EN.600.446 timeline Prof. Armand expects us to demonstrate application on a cadaver and record video of the same.

In –Progress

Interface Development.

The interface to control the LARS and Snake using FLTK is being designed:

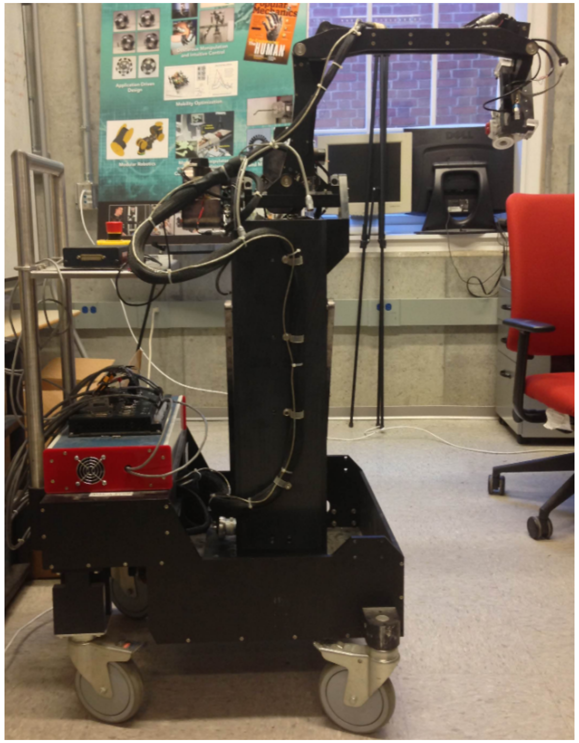


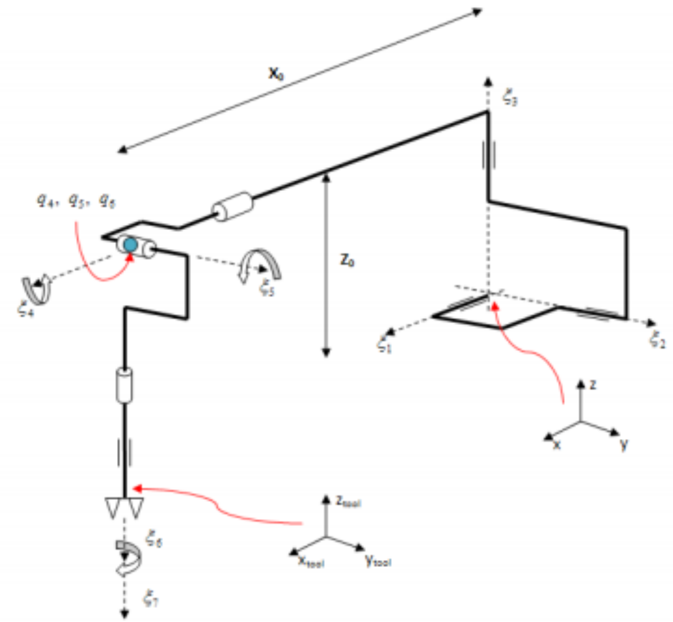


Images from report of Seth Billings and Ehsan Basafa

In –Progress

Inverse Kinematics

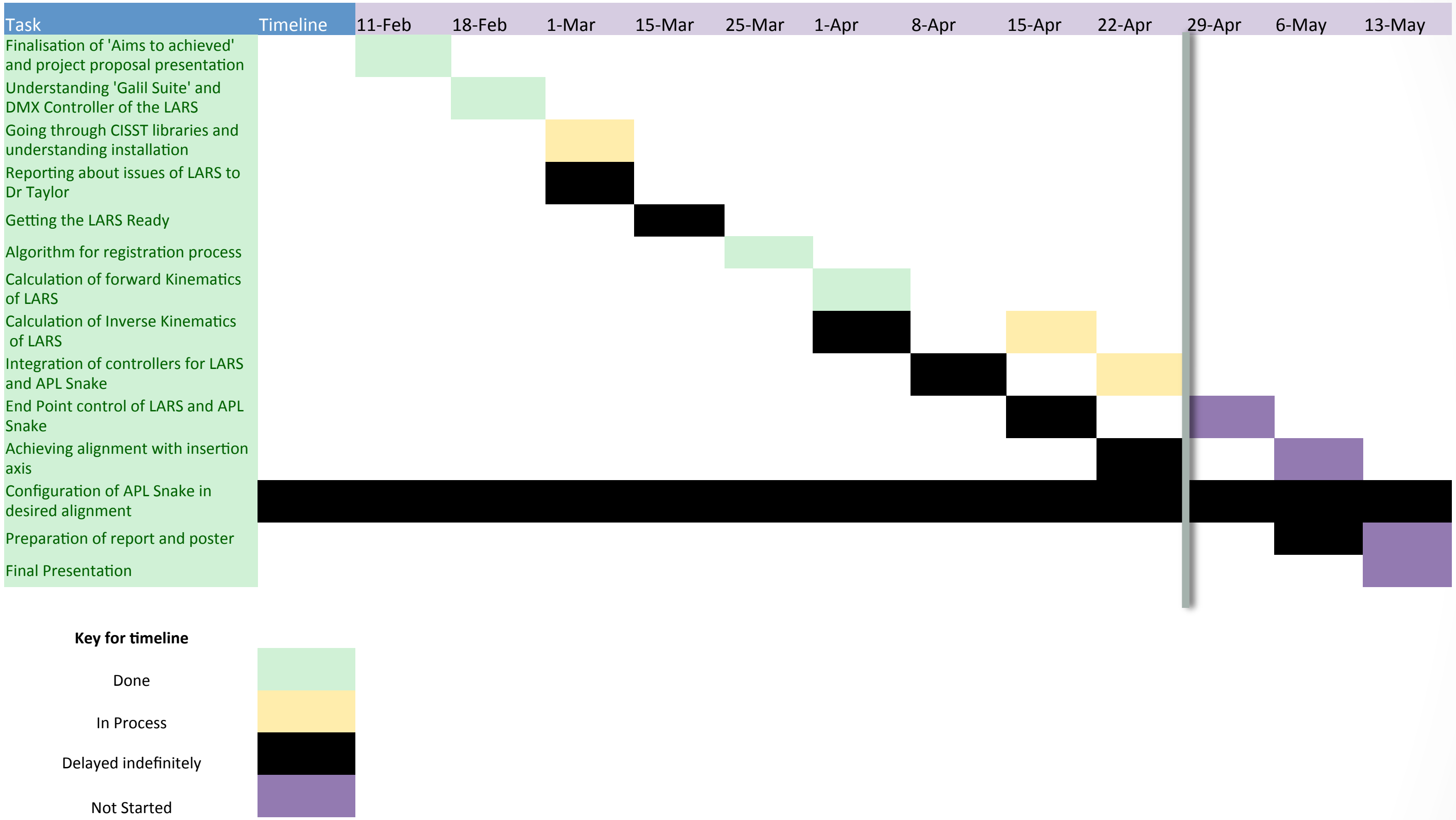




Forward Kinematics Image from Seth Billings and Ehsan Basafa

ERC | CISST

Project Plan Timeline



Project Summary | Original Project Plan | Major Change | In-Progress | **Project Plan Timeline** | Dependencies | Reading List

Reading List

[1] M. D. M. Kutzer, S. M. Segreti, C. Y. Brown, R. H. Taylor, S. C. Mears, and M. Armand, "Design of a new cable-driven manipulator with a large open lumen: Preliminary applications in the minimally invasive removal of osteolysis," in Robotics and Automation, 2011. ICRA 2011. Proceedings of the 2011 IEEE International Conference on, 2011.

[2] J. Funda, R. Taylor, B. Eldridge, S. Gomory, and K. Gruben, "Constrained Cartesian motion control for tele-operated surgical robots," IEEE Transactions on Robotics and Automation, vol. 12, pp. 453-466, 1996.

[3] Galil Motion Control, Inc. DCM-40×0 User Manual, Rev. 1.0c. Dec, 2008. www.galilmc.com

[4] Galil Motion Control, Inc. DCM-40×0 Command Reference, Rev. 1.0d. Dec, 2008. www.galilmc.com

[5] G. Hamlin and A. Sanderson, A Novel Concentric Multilink Spherical Joint with Parallel Robotics Applications. IEEE, pp. 1267-1272. 1994.

[6] A. Kapoor, M. Li, and R. Taylor, Constrained Control for Surgical Assistant Robots. IEEE Int'l Conf. on Robotics and Automation. pp. 231-236. May 2006.

[7] A. Kapoor. Motion Constrained Control of Robots for Dexterous Surgical Tasks. Johns Hopkins University Ph.D. Thesis. Sept, 2007.

[8] P. Marayong, et. al. Spatial Motion Constraints: Theory and Demonstrations for Robot Guidance Using Virtual Fixtures. IEEE Int'l Conf. on Robotics & Automation. pp. 1954-1959. Sept. 14-19, 2003.

[9] R. Taylor, et. al. A Telerobotic Assistant for Laparoscopic Surgery. IEEE Engineering in Medicine and Biology. pp. 279-288. May/June 1995

QUESTIONS?

THANK YOU!