Collateral Control Systems for Surgical training

Update Presentation

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Updated Goals

Original Goals:

1. Implement dual console control in the AMBF simulator
2. Create new training puzzles of varying difficulties to test different skills and operations in AMBF simulator
3. Conduct user studies to evaluate the effectiveness of varying levels of shared control on

Due to COVID-19, conducting a user study is impossible hence we had to adjust our goals while still attempting to contribute the most functionality possible to the AMBF simulator.

Updated Deliverables

Original Deliverables:

Minimum	Implementation of a dual console/shared control with dVRK system and AMBF simulator, 5-6 puzzles to be used in study, design user study and collect mock data.
Expected	Dual console/shared control, puzzles, **data acquisition script**, and conduct user study with actual subjects.
Maximum	All of the above along with writing a paper on results of user study.

Again, due to COVID-19, achieving our expected deliverables won't be possible. However, in order to contribute the most possible in this project we intend to complete our minimum deliverables along with the blue, bolded component in our expected deliverable.

Updated Dependencies

Item	Description	Importance (out of 5)	Needed By	Status	Alternatives	Contact
Homewood IRB approval	Approval to conduct user study	4	N/A	Not Possible	Use mock data to prove concept	Dr. Russ Taylor, Dr. Adnan Munawar
J-Card Access to JHU Robotarium	For access to dVRK consoles	4	N/A	Not Possible	Use different controls to test puzzles and estimate configurations for different possible control schemes	Dr. Adnan Munawar
Subjects for user study	Consenting surgeons and/or trainees to participate in study	3	N/A	Not Possible	Generate mock user data for proof of concept	Dr .Peter Kazanzides

Updated Timeline

Task	Revised Start Date	Expected Finish Date	Status
Familiarization with AMBF simulator and dVRK environment	2/12	2/28	Complete
Implementing dual-console control in AMBF simulator	2/28	3/27	Complete
Design puzzles for user study	4/1	4/15	Not Started
Testing dual-console collateral control with ~~dVRK~~ (completely in AMBF)	3/27	4/15	In Progress

Updated Timeline Cont.

Task	Revised Start Date	Expected Finish Date	Status
Write and test data acquisition script	4/6	4/13	Not started
Finalize procedure for user study	4/13	4/20	Not started
Generate mock data and potential forms of analysis	4/20	5/1	Not started
Write final report/paper/poster	5/1	5/5	Not started

Next Steps

1. Continue testing and configuring dual console implementation
2. Explore possible new control methods due to lack of dVRK access.
3. Design puzzles in Blender software and upload into AMBF simulator
4. Edit data acquisition script to gather more data points and increase robustness
5. Generate mock data and design user study

Reading List

Bric, Justin D, et al. "Current State of Virtual Reality Simulation in Robotic Surgery Training: a Review." *Surgical Endoscopy*, U.S. National Library of Medicine, June 2016, www.ncbi.nlm.nih.gov/pubmed/26304107.

Bric, Justin, et al. "Proficiency Training on a Virtual Reality Robotic Surgical Skills Curriculum." *Surgical Endoscopy*, U.S. National Library of Medicine, Dec. 2014, www.ncbi.nlm.nih.gov/pubmed/24946742.

Lerner, Michelle & Ayalew, Mikias & Peine, William & Sundaram, Chandru. (2010). Does Training on a Virtual Reality Robotic Simulator Improve Performance on the da Vinci (R) Surgical System?. Journal of endourology / Endourological Society. 24. 467-72. 10.1089/end.2009.0190.

Moit, Harley, et al. "A Standardized Robotic Training Curriculum in a General Surgery Program." *JSLS : Journal of the Society of Laparoendoscopic Surgeons*, Society of Laparoendoscopic Surgeons, 2019, www.ncbi.nlm.nih.gov/pmc/articles/PMC6924504/.

Sridhar, Ashwin N, et al. "Training in Robotic Surgery-an Overview." *Current Urology Reports*, Springer US, Aug. 2017, www.ncbi.nlm.nih.gov/pmc/articles/PMC5486586/.