Software Framework for Research in Semi-Autonomous Teleoperation

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https://collaborative-robotics.github.io/

Johns Hopkins University / Laboratory for Computational Sensing + Robotics

da Vinci Research Kit (dVRK), installed at 35 sites worldwide

https://github.com/jhu-dvrk/sawIntuitiveResearchKit/wiki

Setup Joint Controller (WPI + JHU)

dVRK-S: da Vinci S/Si PSM

Software Enhancements:
- Teleoperation of ECM
- Support for setup joints
- Support for head sensor and camera control
- Support for different tool types using CRTK format
- MTM gravity compensation (contributed by CUHK)
- ECM gravity compensation
- Encoder velocity and acceleration on FPGA
- Multiple teleop components per MTM or PSM
- Improved efficiency of ROS interfaces

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AiM — Automation and Interventional Medicine Laboratory / WPI

dVRK MTM, Geomagic Touch, Novint Falcon, Razer Hydra, Spacenav Mouse

The Asynchronous Multi-Body Framework (AMBF) allows the simulation of complex closed loop robots as well as general purpose robots. The simulation can be interfaced with a variety of inputs including both haptic and non-haptic devices (shown at the top right). The lower set of sub-figures show examples of simulated environments for interactive training and learning. All the simulated objects (bodies, joints, lights, cameras, etc.) can be controlled through a complimentary Python client.

Open source AMBF software available at: https://github.com/WPI-AIM/ambf

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BioRobotics Lab / Electrical & Computer Engineering University of Washington

- **Community Growth and Custom Robots:** The first 3-arm RAVEN-II system in Brisbane, Queensland and the first RAVEN-II system with joint encoders at the University of Virginia.
- **CRTK Support and Test Script:** RAVEN-II software now supports many CRTK commands and queries. The crtk-cpp tests are developed and successfully tested on RAVEN-II for a variety of movement and state interfaces.

interface	RAVEN arm	Raven grasp
crtk_state, state commands	supported	supported
servo_jp, _jr, _jv	supported	supported
servo_jf	in progress	in progress
servo_cp, _cr, _cv	supported	undefined
servo_cf, setpoint_cf	undefined	undefined
measured_js, setpoint_js, _cp	supported	supported
measured_cp, _cv	supported	undefined
measured_cf, setpoint_cv	in progress	in progress

RAVEN software (CRTK compatible): https://github.com/uw-biorobotics/raven2/tree/crtk
Open Source CRTK-cpp test scripts available at: https://github.com/collaborative-robotics/crtk-cpp

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Community Events

(1) Raven/dVRK User Group Meeting: Sept 2017, University of British Columbia

(2) IROS Workshop 2017: Shared Platforms for Medical Robotics Research (photo of surgeon panel)

(3) ICRA Workshop 2018: Supervised Autonomy in Surgical Robotics

(4) IROS 2018 Tutorial on "Collaborative Robotics Toolkit (CRTK) and Open Platforms for Medical Robotics Research"

(5) ISMR Workshop 2019: Open Platforms for Medical Robotics Research

(6) ISMR Workshop 2020: Data-Driven Methods for Robotic Minimally-Invasive Surgery (April 22, 2020)

Project Overview

Common API: Collaborative Robotics Toolkit (CRTK)

2020 National Robotics Initiative (NRI) Principal Investigators' Meeting
FEBRUARY 27 - 28, 2020 | ARLINGTON, VIRGINIA