Autonomous Control for Robotic Cutting on dVRK

Goal

Develop and evaluate an autonomous robotic cutting system on dVRK platform

What Students Will Do

- Create marker-based method for encoding position and rotation of an electrocautery tool tip
- Develop approach that utilizes the dVRK scope to track the planar motion of the tool tip
- Develop approach that utilizes a dual NIR and structured light RGB-D camera to track 3D motion of tool tip
- Utilize an image-based visual servoing approach to track, plan, and control robot actions
- Implement system on dVRK utilizing ROS and Open Robot Control Software (OROCOS)
- Evaluate planar approach in circle cutting task from FLS
- Evaluate 3D approach on phantom tumor resection task

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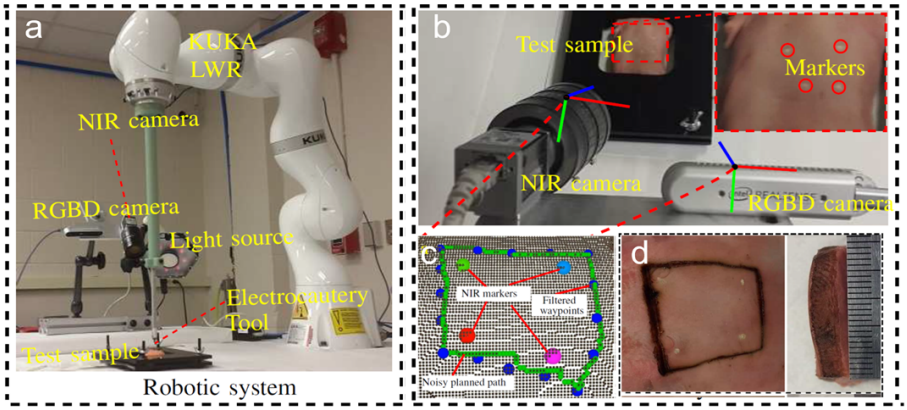

H. Saeidi, J. D. Opfermann, M. Kam, S. Raghunathan, S. Leonard, and A. Krieger, "A Confidence-Based Shared Control Strategy for the Smart Tissue Autonomous Robot (STAR)," in IEEE International Conference on Intelligent Robots and Systems, 2018, pp. 1268–1275.

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J. Ge, H. Saeidi, J. D. Opfermann, A. S. Joshi, and A. Krieger, "Landmark-guided deformable image registration for supervised autonomous robotic tumor resection," in Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 2019, vol. 11764 LNCS, pp. 320–328.

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Deliverables

- **Minimum:** demonstration of the planar visual servoing system on the dVRK
- **Expected:** demonstration of the planar and 3D visual servoing system on the dVRK
- **Maximum:** Evaluation and comparison of both approaches on circle cutting and tissue resection tasks

Group Size: 2-3

Skills: Programming skills such as C++ and ROS, knowledge of robotics, mechatronics skills, familiarity with the dVRK is a plus

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