

SYSC 4907 M7

Design and Development of a Tele-Guided Robotic Suturing System



Group size: 3-4 students.

Suitable for: Students with interest in mechatronics, robotics, Computer Systems, and Software Engineering students. A multidisciplinary team with students from different programs is preferred.

Desired background: Instrumentation, signal processing, machine learning, software engineering. A background in biomedical engineering is not required.

Supervisor: Prof. C. Rossa: carlosrossa@cunet.carleton.ca

Lab information: <https://www.biomechatronics.ca>

This project has already been assigned and is not available. Posted for administrative purposes only.

Project Description: Serious wounds sustained in isolated environments without on-site medical expertise or treatment options often result in rapidly deteriorating medical conditions. This is often experienced in injury-prone military environments where wounds must be addressed as soon as possible, and on-site medical personnel may not be readily available. This capstone project focuses on the design and development of a tele-guided semi-autonomous robotic device that performs a surgical stapling operation on wounds and gashes using guidance from a remote surgeon or other medical personnel. Such a system is primarily intended for use in military applications where gash injuries are common, and immediacy of wound mending is paramount. With the benefit of removing a medic from the physical dangers of the immediate environment, this system will send injury image data to a surgeon, who will inform the device of the locations to place surgical staples onto the wound. The system will transform the surgeon's inputs into corresponding actuator displacements to position the stapling mechanism in the correct location and orientation. This project will incorporate a chassis, a stapling mechanism, electrical components, control systems, and an interactive GUI for the remote surgeon. Moreover, this system may lay the technical foundations for a more suitable robotic mending procedure in the following years for use in more common environments. Future work may include adding a UV light wound-disinfecting sequence to dramatically reduce risk of infection.

Anticipated deliverables: A fully functional prototype including sensor design, signal processing unit, AI classification algorithm, user interface, and supporting documentation.