Development of a Teleoperation Robot

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Thousands of humans have lost their lives while trying to protect others in settings such as nuclear waste disposal, biohazard control, and natural disaster reconnaissance. The purpose of this engineering project was to design a wireless teleoperation robot that would act as a second-body avatar for a user and protect it from harm while continuing accuracy. The robot was developed to copy the arm, hand, and head movements of the user by means of 2 potentiometers, 2 accelerometers, and 8 flex sensors arrayed across a suit on the user. XBee and Arduino computer protocols were used to analyze and transmit data . An analysis of the precision of the data was then used to redesign the suit, robot, and code to improve their accuracy. To increase immersion, a visual system which allowed the user to see what the robot saw, as well as a haptic system which translated touches on the robot to direct sensory stimulation on the user with solenoids and servos were developed. The haptic feedback was evaluated by how accurately it matched the force exerted by the robot, given by the difference in the force applied versus felt. It was also tested by how precisely the robot could autonomously interact with an object with or without haptics enabled. Data showed that servos could incrementally demonstrate haptic force and more accurately control objects, whereas solenoids provided a constant force without similar accuracy. The system prioritized cost efficiency to make immediate realistic impacts upon society.

Awards Won:

Third Award of $1,000