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Sensory Feedback in Prosthetic Arms

The sense of touch in our body is something that many of us take for granted. It is after all hard to imagine how we would move and utilize our arms and legs without any sensory feedback. For amputees who need to use hand prosthetics, it is however very clear how they could improve their quality of life if they could “feel” with their hands once again. An artificial sense of touch could be realized by creating a mechano-tactile feedback system: a system which would work by sending physical force feedback to the user. This is something was created in this project, and would work by providing a specified amount of force using servo motors, based upon user input.

Is there an obstacle to create the above? Yes and no. The solution to the above

A practical use-case for the above, is to mount the servo motors on a residual limb on the prosthetic arm user, for example this could be the upper arm. After touching objects with this device, the user would feel mechanical pressure on their upper arm from the motors.

Mechano-tactile feedback using servomotors

For the feedback system in this project two different types of sensors where used. The SingleTact capacitive force sensor as well as a FSR sensor (Interlink 402) were used. Both sensors where used separately and a test bench was used to compare the measurement results from both types. The servo motor used was a PQ23 Auctonix Linear Actuator, which work differently from the typical motor: it detracts and extends an arm into a specified position.

The measurements where done as follows: the user would input specified force into a graphical user interface created for this project. The motor would then push towards the target plate (a material built to emulate the human upper arm), until the specified

So how where the results? From the main findings it can be concluded that both sensors provide similar performance in terms of accuracy, and can with some further tweaking be used as part of a sensory feedback system. It also showed that the use of proportional control can be used to reduce error. The overall performance of the system cannot be satisfactory for a final product, some possible solutions for further improvement are discussed in the report.