THE DEVELOPMENT OF A PROGRAMMABLE PROSTHETIC CONTROLLER

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The traditional two-muscle myoelectric control system is not appropriate for all amputees. Mechanical switches and Force Sensitive Resistors (FSRs) are easier for some amputees to control than myoelectric inputs. In some cases the amputee may be unable to contract antagonist muscle groups independently. To address these cases a variety of single-site control options, such as level-sensitive, rate-sensitive and involuntary closing systems are available. All of these options can be used with either a proportional or digital system. If the amputee requires control over a second degree of freedom, such as a powered elbow or wrist, several methods, such as additional switch inputs or cocontraction, can be used to switch between devices. Alternatively, simultaneous control can be effected using more complex control schemes that involve linear combinations of inputs.

Clearly, the number of possible control system permutations is large and constantly evolving. The objective of this project was to develop a microprocessor-based prosthetic controller that allows an amputee and prosthetist to configure a control system for an individual amputee in software. The amputee can use the system to try a number of schemes and select the control system of choice. Preconfigured control programs, including the most popular schemes that are commercially available in dedicated hardware can be selected from a menu. Alternatively, the prosthetist and amputee can use a graphical user interface to create new control schemes from a small set of control building blocks.

The digital controller is capable of calibrating itself automatically to the user's input signals and have the programmability to allow a broad range of control strategies. In addition to allowing amputees to try out a variety of options without the need for calibration, the autocalibrating controller will accommodate changes in the amputee's inputs over the short and long term.