



NASA-JSC Technology Opportunity

MSC-21941 Control System for Prosthetic Devices

The invention is a myoelectric prosthesis control system for below-the-elbow amputees. Although many prosthetic devices have been developed, including computer controlled "bionic" or hydraulically actuated devices, these devices do not provide user feedback. Additionally, below-the-elbow amputees favor some derivation of the traditional hook-and-cable harness system developed in the last century because of the low cost, ease of repair, reliability and simple hook prehension (derived from the shoulder and back muscles through a harness and cable assembly). The Myoelectric Prosthesis Control System employs the favored harness and shoulder "shrug" control, but also includes a circuit for the dexterous control of an electromechanical prosthetic hand. The device can scale shoulder physical movement so persons of varying sizes and physical abilities can use it. In addition to providing user feedback, the system can provide wrist rotation and control of each finger digit. With no shrug, the prosthetic thumb and all of the prosthetic fingers are extended. As the shrug increases, the thumb and fingers move sequentially to the closed position. Although designed for use with a harness system, the device may be adapted to other types of prosthetic devices.

Potential Commercial Uses

Remote Handling of Hazardous Materials

The device can be used for remote handling of hazardous materials such as explosives and AIDS-infected blood.

Prosthetic Devices for Below-the-Elbow Amputees

Other Types of Prosthetic Devices

Benefits

User Feedback, Finger Control and Wrist Rotation

The system facilitates sequential or specific control of each finger digit, and provides wrist rotation and feedback to the user.

Employment of Hook-and-Cable Harness

The device employs the traditional hook-and-cable harness shoulder "shrug" control system developed in the last century. Simple prehension of the hook is derived from the shoulder and back muscles through a harness and cable assembly.

Low Cost

This device is simple and more economical to produce than other control systems.

Adaptability

Although designed for use with a harness system, the device can be adapted to other types of prosthetic devices.

Does Not Require New Technologies

The electronic elements are placed inside a harness already provided.

Accommodates Various Users

The technology can accommodate users of differing sizes and physical abilities.

Compact Design

The electronic control package in this system is quite small and can be easily mounted in the body of a prosthetic device.

Conformal Printed Circuit-Type Conductors

Conformal printed circuit-type conductors can be employed.

Hardware Programmable

The device can use frictional forces for actuation.

Improved Maintenance

This control system allows for easier cleaning of prosthetic devices and maintenance than do "hook and cable" systems.

Development Status

A working prototype was built but no longer exists.

Options for Commercialization

This technology opportunity is a part of the NASA Technology Transfer Program, the goal of which is to stimulate development of commercial applications of NASA developed technology. NASA is seeking industrial partners to continue the testing effort and license the technology for commercialization.

The invention is protected under the following U. S. patents: number 5376128 issued on December 27, 1994, number 5458655 issued on October 17, 1995, and number 5480454 issued on January 2, 1996. The patents are owned by the United States of America and were developed by the National Aeronautics and Space Administration.

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