DE-4205 (DE) MANUS
Modular Anthropomorphous User-adaptable Hand Prosthesis with Enhanced Mobility and Force Feedback

SHORT DESCRIPTION AND GRAPHIC/PICTURE

The figure shows the skeleton of the first MANUS project’s prototype and the electronic unit containing all the system control electronica. It is a multifunctional device with three active fingers and wrist pronation & supination. In addition the system supports force biofeedback in order to integrate the user in the control loop. The electronic box contain a microcontroller structure able of EMG calibration and processing, comand generation and overall prosthesis control.

Setting the Scene

Myoelectrical prosthesis appeared as an interesting alternative to mechanical prosthesis. However, only 10% of the upper limb amputees choose to wear this kind of prosthesis. The lack of multifunctionality and high costs are some of the reasons. The MANUS project’ aim is providing a modular multifunctional hand/wrist prosthesis in order to overcome the problems of current commercial devices. In order to due so a interdisciplinary team was set up. It comprises medicals firms, research centres and universities and rehabilitation centres.

Approach

A new concept is proposed within the MANUS project. Our goal is providing an advanced hand prosthesis and a training system to be used prior to prosthesis fitting. Being aware of the importance of user’s opinion we started by identifying users needs and setting on these basis the prosthesis technical specification. All possible design alternatives were taken into account in a conceptual design stage, and the one that best fitted the specification was developed and manufactured. Eventually, clinical trials have been conducted on the training platform and the hand prosthesis.

Results and Achievements

As a result of the above
The described approach two concrete prototypes were manufactured and tested, a hand/wrist prosthesis and the corresponding VR training platform. The training platform is a PC-based device that allows carrying out prefitting prosthesis training. It simulates the prosthesis functionality and allows EMG command language calibration and learning. The training platform has conducted intensive validation and clinical trials, that show good user friendliness and acceptance. It is currently being subjected to patent application.

The second prototype is a multifunctional hand prosthesis. It has been designed to obtain a modular device that can be adapted to every user’s requirements. The EMG command language is common to the TP one and allows up to 18 different control word out of just one single EMG signal.

Three motors are used to power the prototype, allowing thumb flexion and opposition as well as index-medium flexion. In addition, wrist pronosupination is supported. The system includes also force biofeedback so that the user is involved in the control process. After systems integration, a validation process is planned to take place during the last months of the project.

Different world-wide firms in the market of upper limb prosthetics were also contacted for possible cooperation agreements towards system marketing and commercialisation.

**Conclusions and Plans for the Future**

The MANUS project has shown a new concept of upper limb prosthetics. Currently, functional prototypes of both TP and prosthesis are available and have been subjected to clinical trials.

The aim of the MANUS consortium is identifying an external partner for system exploitation. This should be approached in a global world-wide basis.

The industrial partners involved in MANUS are willing to co-operate in the exploitation by manufacturing the system components under their respective business areas. The whole consortium supports any kind of exploitation agreement that might be set up with an appropriate external partner.

**Contact Details**

**Project Name:**
MANUS – Modular Anthropomorphic User-adaptable Hand Prosthesis with Enhanced Mobility and Force Feedback

**Research Area:**
Technical aids for upper limb physical impairment and amputation

**Timescale:**
01.06.96 - 31.05.01

**Budget:**
Overall cost: 1,158,535 ECU
European Commission contribution: 620,000 ECU

**Keywords:**
Prosthetics, Upper limb amputation

**Key Project Participants:**
IAI, CSIC (ES)
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