

Project Statement
The E-Grip

Team 5

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Statement of Need

With the prevalence of strokes and their associated debilitations, such as limited mobility in certain limbs, there is a growing need for devices that can facilitate movement. This is the case with our client, who has lost fine motor control within his left hand and wrist. The client suffered a mild stroke to the right hemisphere of his brain, resulting in debilitation of his left hand. This has caused limited strength and mobility in his hand, especially in his grip, making everyday tasks difficult. The client still wishes to be able to perform simplistic acts such as swinging a golf club and sweeping a floor.

Basic Preliminary Requirements

To be able to accomplish the desired objectives of the client, we must develop a device which is lightweight, user friendly, non-cumbersome, and enables the client to grip and release with a minimal amount of strength. Prior attempts have utilized devices such as ace-bandages, splints, Velcro, tape, and prosthetics which have all proven to be unsuccessful. This device must be able to be implemented and controlled by one hand.

Basic Limitations

The largest limitation is that of the anatomical body and its abilities. Specific considerations need to be made in regards to client safety so as to not exceed physical boundaries. If an electrical approach is used, one must be aware of the risk involved with excessive voltage and current. Also, the environment in which the device is used must be taken into account, as excessive exposure to moisture is potentially damaging. In the case of a mechanical device, special attention must be paid to the forces exerted by the device. Excessive forces may exceed physical tolerance, causing pain, discomfort and even injury to the user. In terms of design implementation it must be ensured that all standards and regulations set forth by the U.S. Consumer Product Safety Commission (CPSC) are strictly upheld.

Other Data

Previous E-Grip device:

A woven glove that utilized both electrical and mechanical components attempted to facilitate a gripping motion. It implemented linear actuator motors with nylon strings to mimic the muscular motion of grasping. This device also contained a voice activated control system which allowed several degrees of grip strength. This approach proved to be unsuccessful due to its bulky nature, difficulty of use, and lack of performance.

Current Sources of Research

<http://news.bbc.co.uk/1/hi/health/4225896.stm>
<http://www.var.org/jour/98/35/4/doshi.pdf>

Questions

1. Are there any current products that can perform such tasks?
2. Are there different degrees of grasping that need to be met?
3. What dimensions must this conform to?
4. Is electrical stimulation of the hand in order to contract fingers feasible?
5. What materials have a reasonable cost to performance ratio?
6. Look into robotic arm mechanics.
7. Look into any disabilities acts and regulations for possible restrictions.

Technical Areas

- Control
- Computer Programming
- Instrumentation
- Analog Electronics