DEVELOPMENT OF A SHAPE MEMORY ALLOY ACTUATION SYSTEM FOR A LABORATORY FINGER PROSTHESIS

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ABSTRACT

A prosthetic finger is designed for the purpose to imitate the grasping capabilities of the human finger, where it will add obvious improvements in the quality of life of amputees. This study is done to utilize advanced actuators to design and develop innovative, lightweight, powerful, compact, and dexterous robotic technology, and is implemented in the mechatronic design of a biomimetic adult finger. The key to satisfying these objectives Is the use of advanced or smart materials, where in this case of study is a Shape Memory Alloy (SMA) to power the joints of the prosthetic finger. In this study, the Shape Memory Alloys (SMAs) actuator is placed in between the DIP Joint and the MCP Joint where it will control only the flexion-extension of the DIP and PIP Joint. In order to develop the Shape Memory Alloy (SMA) actuation system, laboratory tests are required where a Load Cell (0-1 ON) will be used to obtain the performance (load capability, displacement capability and current/ voltage requirements) of the Shape Memory Alloys and a test bed will be setup for the experiment. The Shape Memory Alloys of various length and diameters will be tested and the obtained results will be used to plot graphs and will be examined to determine which Shape Memory Alloy (SMA) actuation system is most suitable to suit the design of the biomimetic adult finger.

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