EVALUATING AND TESTING THE MECHANICAL STRUCTURE OF A ROBOTIC FINGER SYSTEM

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"I declared that this thesis is the result of my own work except the ideas and summaries which is I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently in candidature of any degree."

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ABSTRACT

Rapid development of robot technology has led to the gradual review of the use of robots in human life. Studies conducted have led to the discovery of robotic hand to help disabled people. The existing robotic hands are varying from the point of design, mechanism, system and functionality. This project presents evaluating and testing the mechanical structure of a robotic finger system in order to determine the mechanical strength and durability of the structure and mechanism of the finger. Design of the robotic finger is being evaluated and analyzed. There are two different finger designs being studied in order to make comparison between these designs in terms of their strength and durability. A dynamic analysis method is conducted to verify theoretically the strength of the robotic finger. The testing on the finger structure is called as destructive test. Tests are carried out until the specimen fail, in order to verify the specimen's structural performance under different load. Three types of destructive tests are conducted on the robotic finger structure namely: flexural test of the robotic finger design by applying load on the specimen until it breaks and tensile test for the Distal Interphalangeal (DIP) and Proximal Interphalangeal (PIP) strength by pulling the two ends of the joints until broken. The third test is on Shape Memory Alloy (SMA) wire that is used in the actuation mechanism together with a miniature motor as a hybrid system. The SMA-wire is tested to obtain the result of its strength when two ends of the wire are pulled. The testing revealed several limitations and verified the robotic finger's capabilities. Results obtained from the testing are used to further design optimization of the robotic finger.

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