

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF HYBRID ACTUATION
MECHANISM FOR PROSTHETIC FINGER**

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have complied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

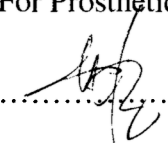
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ABSTRACT

A compact and lightweight biomimetic robotic finger with two degrees of freedom which functions closely to a biological finger has been developed. The focus is the mechatronic design of a new hybrid mechanism for the actuation of the finger joints. The hybrid mechanism consists of a DC Micromotor and a Shape Memory Alloy (SMA) actuator. By using a DC Micromotor, a high response rate as well as comparable torque and speed can be achieved at the (Metacarpophalangeal) MCP joint. By using SMA to actuate the (Proximal Interphalangeal) PIP joint, the finger configuration has been miniaturized to anthropomorphically accurate size. A customized test jig has been developed for the calibration of SMA wires. A heat sink was integrated to the rig for the purpose of cooling of SMA wires. Furthermore, a Graphical User Interface (GUI) was developed using Visual Basic.NET to control the fingers in three basic modes of operation, i.e. open posture (0°), grasp posture (45°) and closed posture (90°). A functional prototype has been built to test the hybrid actuation mechanism and the outcomes have been satisfactory.

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