



**DESIGN AND DEVELOPMENT OF ROBOTIC FINGERS WITH HYBRID  
ACTUATION 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**

Recently, industrial robots have been improved remarkably and applied with wide range of task to assist human. Robotic hand gives lots of benefits to human daily life by acting as prosthetic hand and effective robot end-effectors. This project covers the development of four robotic fingers which are the index, middle, ring and pinky finger. This encompasses the design of mechanical structure and hybrid actuation system of the robotic fingers. The hybrid actuation system used by the robotic fingers is a combination of a miniature DC motor actuator with a Shape Memory Alloy (SMA) wire. The metacarpal phalange joint of the fingers uses a miniature DC motor based actuation system whereas the proximal inter phalange joint uses a SMA wire based actuation system and the distal inter phalange joint uses mechanical linkages based actuation system. Kinematic analysis was carried out on the robotic fingers in order to obtain the working envelope of the robotic fingers while the simulation and clash analysis were conducted by using CATIA. Then, Rapid Prototyping technique was applied to fabricate the four robotic fingers' model. This model would verify the simulation and clash analysis conducted on the robotic fingers design.

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