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DESIGN AND OPTIMIZATION OF SOFT SILICONE PNEUMATIC ACTUATORS USING FINITE ELEMENT ANALYSIS

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ABSTRACT

The necessity of the soft gripper devices is increasing day-by-day in manyapplication especially when safe, gentle motions and soft touch are necessary. In this project, used to the selection of soft silicone pneumatic actuators using finite element analysis has been designed and fabricated to construct a soft gripper. The model of soft silicon pneumatic actuator is designed using solid works and its bending motion is simulated in ANSYS software for optimization and compared with experimental results. Actuator fabrication and experimental tests were presented, and agreements between the Finite Element simulations and test results were achieved. After finalizingthe Finite element simulations were performed to validate this concept and the designed structure. The actuator is fabricated usinginjection molding process that includes the molds. The gripper base was fabricated to have three configurations and three openings. That could be adapted to objects of different sizes and shapes. Experiments conducted show the bending motion characteristics of the actuator at different pressures. The actuator shows excellent bending performance and the eccentricity in its design supports increased bending motion up to a certain extent compared to normal Rubber without eccentricity. Its also measured the full-off force of gripping objects with different stiffness. The effects of profile shape on the actuator performance are analyzed and the results are presented. The possibilities of this gripper can be demonstrated on future industrial gripping. In this soft gripper that can be easily attached to existing robots.

KEYWORDS: *Silicone Rubber, Pneumatic Actuator, Soft Gripper, Soft Materials*