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Design of a Robotic Hand Using Flexure Joints

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Abstract

Background:

Robotic systems play an important in today's world, and designing the system using flexure can enhance the capability [1, 2]. As the world has evolved with technology and so is the robotic field. Automation and robotics have been used in almost everywhere and can be made more economic and robust by incorporation design modification [3].

Objectives: This paper discusses the design, and construction of a robotic hand using flexures member. Flexures are very simple and elegant method to build the system and are majorly used for space robotic system. The system has less joint element like bearing, screws, and rivets. It has gaining popularity due to ease in manufacturing using advance manufacturing technique, without compromising on the efficiency of the system.

Methodology: Flexures can be defined as beams that allows motion by bending load elements. It restricts the motion of the system into one direction hence providing constraint as defined by the user. The movement of the fingers will be controlled by a tendon wire that will be pulled by a DC motor. The flexure joint will provide strength to the joint and will also act as restoring member to bring back the system to initial configuration when no external force is acted. Finite element simulation is conducted for the designed flexure in-order to know the efficacy of the joint and deployment to the robotic hand.

Result and Discussion: The design presented in this paper is based on straight flexure. The FE simulation results shows that the model has flexibility about the axis of motion and provide stability to the joints. Based on simulation results the model was fabricated and the experimental setup is developed to conduct the experiments.

Conclusions and future work: The proposed design can be further enhanced by incorporating different flexure types such as changing the I shaped flexure into C shaped or any other combination. The design can provide a huge change in the industry of prosthetic arm because of its ease of manufacturing and economic. Furthermore, it can be used for space explorations and robotic surgeries.

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