

Development of anthropomorphic robotic hand driven by Pneumatic Artificial Muscles for robotic applications

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ABSTRACT

This paper presents the design and fabrication of a three-fingered anthropomorphic robotic hand. The fingers are driven by tendons and actuated by human muscle-like actuators known as Pneumatic Artificial Muscle (PAM). The proposed design allows the actuators to be mounted outside the hand where each finger can be driven by one PAM actuator and six indirectly interlinked tendons. With this design, the three-fingered hand has a compact size and a lightweight with a mass of 150.25 grams imitating the human being hand in terms of size and weight. The hand also successfully grasped objects with different shapes and weights up to 500 g. Even though the number of PAM actuators equals the number of Degrees of Freedom (DOF), the design guarantees driving of three joints by only one actuator reducing the number of required actuators from 3 to 1. Therefore, this hand is suitable for researches of robotic applications in terms of design, cost and ability to be equipped with several types of sensors.

KEYWORDS:

Degrees of freedom (mechanics); Muscle; Pneumatic drives; Pneumatics; Robotic arms; Robotics