Multi-Fingered Robotic Hand for Prosthetic Application

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THE Robotic hands are essential components of any Robotic system as they are required to work as human hand. Robotic or artificial hands, those with four fingers and a thumb, have demanding responsibilities that will improve the efficiency and usefulness of the robot if they can establish a power grasp and precision grip. Nowadays it is more and more important for robots to serve and help people, especially the old and the disabled. There are about 1,000,000 people who had an amputation of a hand or a complete arm worldwide The main factors for a loss of upper or lower limbs are accidents followed by general diseases and injuries. For diseases and tumors, amputation is a way of stopping the spread of the disease to the rest of the body.

About 30 to 50% handicapped persons do not use their conventional prosthetic hands regularly since the hands are heavy in weight, low functionality and limited DOF's cause inability to adapt to the shape of an In order to serve them adequately, it is indispensable for the robots to have soft-moving hands. The various artificial hands that are available are essentially based on linkage - mechanisms or hydraulic and pneumatic elements such as wires, cables and chains, belts, artificial muscles etc The artificial hands presently in use are complicated in design and control structure and also costly to be implemented for robotic or prosthetic applications.

The need for an adaptable hand with flexibility, dexterousness and load carrying capacity analogous to the human hand seems to be the ideal one for robotic or prosthetic application. An extensive research in this area has lead to the design and development of such hands which are becoming more and more complicated in structure, components along with programmable control systems being developed. Several kinds of flexible pneumatic rubber actuators have been developed and reported with two or more internal chambers having symmetric cross section or attached to a joint to create bending motion.

The multi-fingered hands actuated by pneumatic artificial muscle are costly and difficult to miniaturize. The proposed actuator has a single internal chamber and is simple, compact and easy to manufacture. In this work, an asymmetric bellow

flexible pneumatic actuator (ABFPA) with single internal chamber has been manufactured using rubber and nickel materials for developing a novel underactuated hand. It is found that the robotic hand made of asymmetric nickel bellow is better than that of rubber bellow interms of load carrying capacity, durability and strength. By proper selection of materials and manufacturing of the ABFPA with reinforcement, a versatile dexterous hand can be fabricated which is suited for dynamic application. The present work has paved the way for extensive research on this innovative technique as it holds out the true potential for innumerable and very interesting application in various areas.