Analysis study on flexibility of Robotic gripper finger

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Abstract: A flexible gripper for the robotic end effector conquered to handle different types of objects. The research is going on to develop the flexible gripper finger. This flexible gripper finger will worked well when defeat the all drawbacks like material selection, design and geometrical selection. This paper aims to help to beaten the material selection based analysis on flexibility of different finger materials which used in conventional flexible grippers.

***Keywords* - gripper, flexible, material.**

I. INTRODUCTION

Today, in manufacturing applications, general purpose grippers are part-specific and could only be used on tasks with limited versatility. Versatility based on the industrial application is usually obtained by the replacement of gripper used in the robotic arm appropriately. However, such replacement of grippers is expensive and involves time-consuming set-up activities, which affects working cycle-time. So, there is a need for the development of universal gripper. Technology has been helpful in revealing biomimetic designs to overcome the drawbacks of conventional grippers. One such design is a flexible gripper in which deflection takes place in the direction opposite to the direction of force applied. This paper aims to analysis the flexibility on different flexible gripper materials. The flexibility of the material is an imperative one in the flexible finger gripper.

II. LITERATURE STUDY

PFAFF, et.al. : This paper centers the theme FinRay Effect ® use in Practice. There are numerous gadgets utilizing FinRay Effect ®, yet this paper is constrained to manipulators and grippers. These manipulators will presumably not be supplanted in all applications where they utilized manipulators with a sequential or parallel kinematics. This gripper has Very low weight of moving parts which prompts a decrease in inertial powers. What's more, it is basic development and customizable structure. The manipulator comes back to the first position without perpetual distortion. Area of the manipulator end point is affected by the heaviness of the exchanged subject in light of the finger material which is Fiber. This material is more flexible contrasted with others.

Kuat, et.al. : This paper exhibits the starter chip away at model structure and examination of a three-finger under activated robotic end effector with a breakaway grasp system reasonable for research in robot control of items for mechanical and benefit applications. An epic utilization of a breakaway grip instrument utilizing helical riggings is introduced. This instrument gives autonomous development of the fingers activated by a solitary actuator. The end effector configuration model and its trial model are presented and talked about in detail. Acrylonitrile Butadiene Styrene (ABS) is utilized in this paper which isn't flexible..

Hao Zhang, et.al: They depicts pick-and-place framework in detail while featuring our structure standards for the stockroom settings, including the discernment strategy that use learning about its workspace, three grippers intended to deal with a substantial wide range of articles fit as a fiddle, weight and material, and handle arranging in jumbled situations. They additionally present broad investigations to assess the execution of our picking framework and show that the robot is capable to achieve different assignments in distribution center settings, for example, picking an objective thing from a tight space, getting a handle on various items from the rack, and performing pick-and-place undertakings on the table. For the errand of grabbing general items with an extensive assortment fit as a fiddle, material, and weight, the creators planned and manufactured three distinctive grippers, including a vacuum gripper, the Yale Openhand M2 gripper and the delicate gripper.

Whitney Crooks, et.al: The Tufts Passive Gripper was roused by the inactive grasp of the Manduca sexta and the straightforwardness of the Fin Ray® Effect. The gripper can be three-dimensional printed as one section on a multi material three-dimensional printer and just requires four extra strides to introduce the motor/tendon activation instrument. The Tufts Passive Gripper was enlivened by the latent grasp of the Manduca sexta and the straightforwardness of the Fin Ray® Effect. The gripper can be three-dimensional printed as one section on a multimaterial three-dimensional printer and just requires four extra strides to introduce the engine/ligament incitation component. The delicate parts of the gripper were imprinted in Tango Plus, an elastomer, and the hard segments were imprinted in Vero Clear, an unbending material.

Paul Glick, et.al: This work researches the mix of fluidic elastomer actuators and gecko-propelled cements to both improve existing delicate gripper properties and produce new capacities. On rough or messy surfaces where attachment is constrained, the gripper holds the usefulness of a pneumatically impelled elastomer gripper with no deliberate misfortune in execution. Plan systems for utilizing the one of a kind properties of the gecko-roused glues are displayed. By displaying fluidic elastomer actuators as a progression of joints with related joint torques, they structured an actuator that exploits the one of a kind properties of the gecko-enlivened glue. This work fills in as a guide for making gecko elastomer actuators and exhibits their relevance to high-stack applications. At the point when the cements don't add to grasp quality, the execution of non-gecko actuators is recuperated. Lessening vitality input and expanding hold quality will help broaden the utilization of delicate robotics into mechanical mechanization and different applications.

III. MATERIAL PROPERTIES

TABLE 3.1: ABS PHYSICAL PROPERTIES

Physical Properties	Acrylonitrile butadiene styrene (ABS)	Unit
Tensile Strength	55-60	MPa
Elongation at break	25-40	%
Modulus of elasticity	2600-3000	MPa
Flexural Strength	65-75	MPa
Flexural Modulus	1700-2200	MPa

TABLE 3.1: FLEXIBLE MATERIALS PHYSICAL PROPERTIES

Physical Properties	Tango Plus	Poly-jet photopolymer/Tango Black	Unit
Tensile Strength	N/A	1.8-2.4	MPa
Elongation at break	218	45-55	%
Compressive set	4.4	0.5-1.5	%
Shore hardness	27 Scale D	60-62	Scale A
Tensile tear Resistance	3.47	3-5	Kg/cm

IV. FLEXIBILITY ANALYSIS

With Tango rubber-like materials, we can simulate rubber with different levels of hardness, elongation and tear resistance. Available in several opaque and translucent colors, this material enables you to simulate a very wide variety of finished products, from handles to footwear. Tango material is useful for many applications including exhibition and communication models, rubber surrounds and over-molding, soft-touch coatings and no nslip surfaces, knobs, grips, pulls, handles, gaskets, seals, hoses and footwear.

Figure: 4.1: Tango Black Flexible Finger

Typical uses for Tango Black would be for over molding, Seals, Soft handle grips, Inlays, soft touch surfaces, Stoppers, Overlays, Plungers, Gaskets and ‘O’ rings, Any feature of a Prototype model that requires soft touch and flexibility,

V. CONCLUSIONS

In this paper, we observed a soft flexible robotic finger inspired by the fish fin and intended for use as part of Robotic gripper. This gripper fingers to create a preferred bending direction, producing a better and stronger grip on an object. The gripper is adaptable for different types of objects. This tango black finger is flexible, good visual qualities, and good mechanical wear properties.

VI. REFERENCES

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