

Development of a Multi-DOF High Torque Joints Light Weight Robot Hand

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This research aims to the development of an externally powered myoelectric (EMG) controlled robot hand fit for daily life activities. The myoelectric upper limb prosthesis is a function recovery device for the hand, which functions goes from simple gripping tasks to more complex activities. Moreover, the prosthetic hand must be light weight as well as water proof. The hand uses the interference drive mechanism for a torque adaptive joint at the fingers, which allows us to provide a high grip power with a light structure. The wrist joint uses the parallel wire type interference for a 3DOF joint with high torque.

1. Interference drive type adaptive joint method

Fig. 1 shows the interference drive type adaptive joint. When the wire guide is close to the joint (a), it works as a passive joint transmitting no power. Because the wire route is close to the joint, the moment arm is small allowing for low torque & high speed movements (b). But when the wire guide parts from the joint the momentum arm increases, turning the joint into a high torque & low speed configuration(c).

2. Parallel wire type interference drive joint method

We developed a parallel mechanism that works by making two or more actuators cooperate together transmitting the power with two or more wires to control the object, allowing for high torque equal to the sum of actuators. As a result, we achieve an actuation with 3DOFs with high power transmission in any configuration. The main objective is to design a mechanism with lossless bearing power transmission. Fig. 2 shows the mechanism developed in our laboratory with oil less bearing for the rotating axis forming a guide for the actuators wires, resulting in a 3 DOFs high torque joint. Fig. 3 shows the application in our prosthetic hand.

Keywords: Multi-D.O.F. Prosthetic Hand, Adaptive Joint for Interference-driven Mechanism, Interference Driven Link based on Parallel-Wire Mechanism

References

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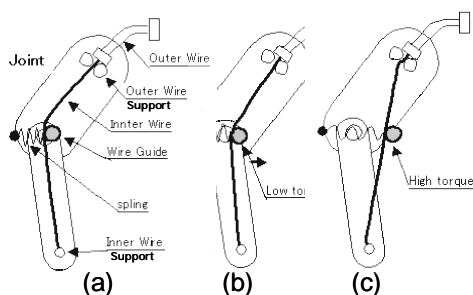


Fig. 1 Adaptive Joint Mechanism.

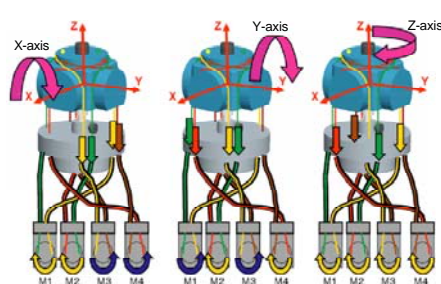


Fig. 2 3 DOF Joint System.



Fig.3 Multi-D.O.F. EMG prosthetic hand