The Power of Twisted Strings: A Portable Elbow CPM Machine with Twisted String Actuator

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CPM actuators are used to assist the rehabilitation of patients who lost their athletic mobilities. These devices require structural stability and enough output force to assist the medication treatments. However, current CPM actuators are bulky and heavy, which disturbs the treatment. In this research, we tried to solve these problems, and designed circular actuator with twisted strings, so that it can reduce the volume and weight drastically. Since rehabilitation devices required high power and large spaces, we customized the pulley system for our model to enhance the range and power sufficiency. Furthermore, we predicted the movement of our actuator by setting up a theoretical model and established relationship between variables for our actuator. Also, we calculated the required input current of the motor to move the arm brace in constant speed throughout physical calculations. From the experiment based on theoretical model, it showed output force over 60N, so that we concluded that it is enough to move the arm of average adult man. Also, we found out that if the contraction rate of the string is less than 33%, our actuator followed the theoretical model. As the load on the actuator increased, the power of the device increased too, and this indicated that our device is suitable for rehabilitation. Our research is meaningful because we provided innovative form of power transmission and applied it for rehabilitation devices that can help countless people around the world. This actuator is expected to be effective than other rehabilitation machines, reducing volume and weight but providing high power sufficiency. We are looking forward for our ergonomic CPM device to help rehabilitation and give hope for patients all over the world.

Awards Won:
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