



Development of Dynamic Arm Support for Children with Duchenne Muscular Dystrophy

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Introduction

Children with Duchenne muscular dystrophy disease lose their mobility and need different types of orthoses highly over time. The Project is inspired by improving the quality of life of these children .It aims to develop an arm orthosis to help arm movements and provide physical therapy remotely for the needs of these children.

Specifications and Design Requirements

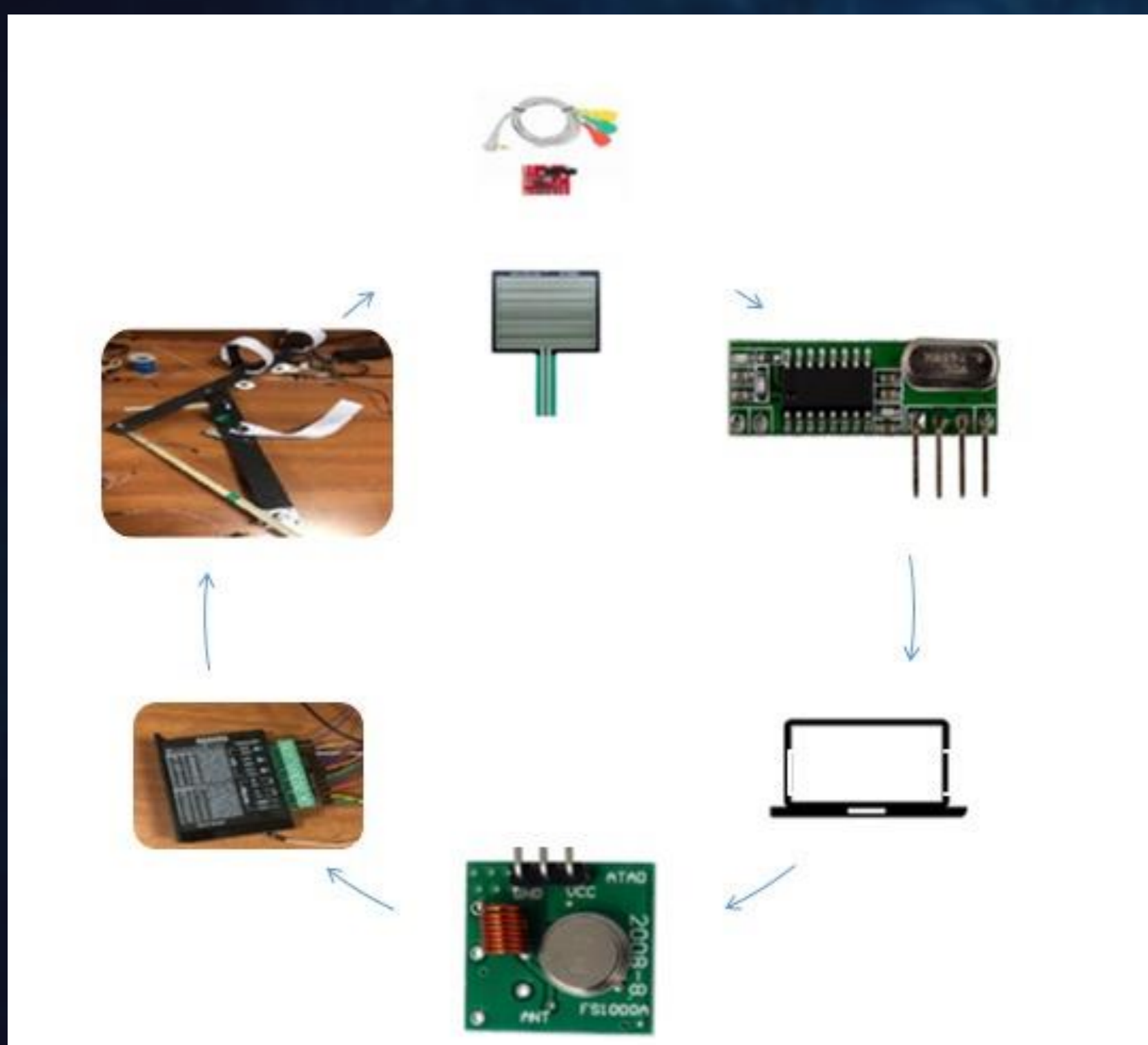
In this project, the existing mechanical design was develop and turned into a suitable orthosis for the arm. Along with the relevance of the design, muscle signals in the arm were obtained through the EMG and FSR sensor. The obtained signals were transferred between the two devices wirelessly by using RF modules together with Arduino UNO development board.

In order for the arm orthosis design to move linearly, step motor and microstep driver were used in the design. In order for the stepper motor to work, a control algorithm was created by classifying the data received.

Solution Methodology

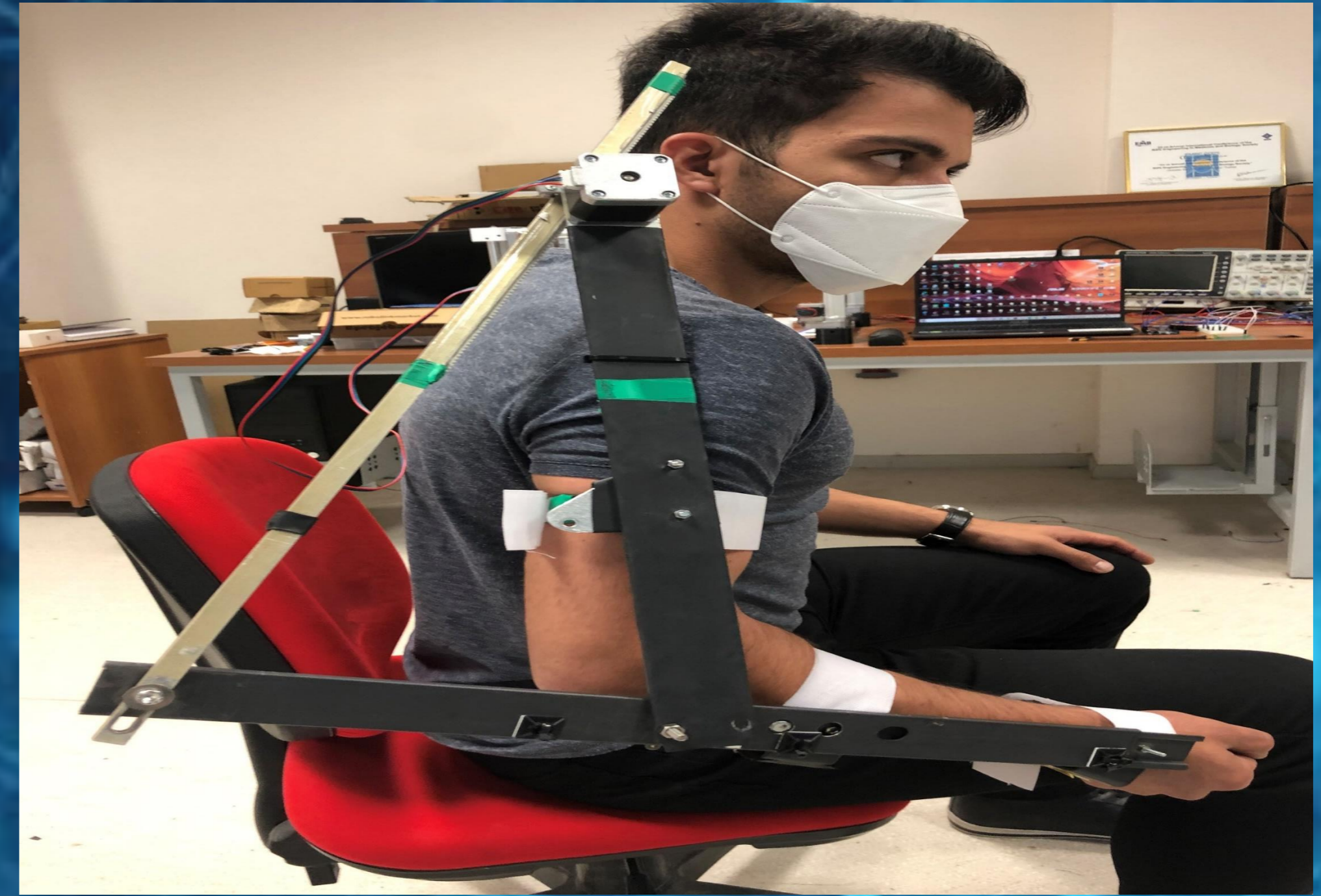
Control and movement part of the design, Arduino UNO, micro stepper driver, FSR sensor, EMG sensor and step motor were used for movement part of the project. In the control algorithm, it was defined that the user can make hundred movements. The data received from the sensors were classified as weak, medium and strong. As a result, three different movements were defined. The person using the orthosis will be able to make small, medium and large movement according to the pressure applied to FSR sensor and the signals received from the EMG.

Wireless communication of the design, In order to obtain data transfer wirelessly separate RC switches are used for transmission and reception. In addition to that those RC switches can be controlled via a library that could be imported to arduino. Finally continuous data transmission is obtained with an acceptable time delay.



Application Areas

The arm orthosis in this project is designed to facilitate the daily life of DMD patients, as well as to easily perform physical therapy practices at home..



Results and Discussion

At the end of we provided in the project a dynamic arm support that can sense three different intention and provide movement of the orthosis.

If EMG signals collected from biceps muscle exceed predefined thresholds depending on the strength of the signal, the signal is classified among three movements end step motor at the shoulder provide movement. In addition to that by using EMG and FSR together if the user can perform the movement by himself ,this design allow him do his/her movement with little friction..

Acknowledgements

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