

## **Development of Low Cost Upper Extremities Rehabilitation System with Interactive Feedback for Children with Movement Disorders**

### **Abstract**

Movement disorder (MD) is a type of disease where individual's motions move involuntary. These motions can be happened in any part of the body including hand, leg, face, neck, and limbs. There are several main types of MD such as Tridive Dyskinesia, Tremors, Myoclonus, Tics, and Athetosis. The main cause of MD is damage of nerves or areas of the brain, which affects movement coordination. However, children MD can be caused by either hypoxia, kernicterus, or cerebral palsy. In Malaysia, there are significant peoples is affected by MD around like 440,000 kids are registered in 2012. There are number of rehabilitation centers operated by non-governmental organization (NGO) and hospital to serve their needs. However, most of the equipment in these rehabilitation centers are focused on adult rehabilitation system such as ergometer. Besides that, child rehabilitation system is not affordable to own by rehabilitation center. In this project, we would like to propose "Development of Low Cost Upper and Lower Extremities Rehabilitation System with Interactive Feedback for Children with Movement Disorders."

The first objective of this project is to produce affordable rehabilitation system for children. By making the affordable system, each rehabilitation center is capable of buying the system with a lower cost. The second objective of this project is to improved quality of life for parents, child and rehabilitation center. Each child only requires using the system 10 minutes once a week. By installing the system in each rehabilitation center, this will eventually reduce workload of rehabilitation center to MD child in Malaysia. With increasing system installed in each rehabilitation center, parent does not require to travel far from their home just to visit rehabilitation center located at city center due to lack of child rehabilitation system. Thus, parents now have alternative choice to visit nearer rehabilitation center in order to use the system, which saves a lot of travelling time. By increasing the chance of child rehabilitation, chances that child recovering from MD such as grab something in the future is increased. Once the child is recovered from MD, parents will no longer required to visit rehabilitation center frequently. Besides that, the child can become a self-reliance person by working part-time or full-time job.

The overall system will have two sub-systems: mechanical system and electronic system. For mechanical system, a structure will be built to mount motor and child seat. The child seat will be fully covered by cushion to prevent uncomfortable and as a safety purpose while the motor will be round edge instead of sharp edge and covered by synthetic leather and thin layer of sponge. Then, a unique track will be built and mounted on the floor, which provides the structure to run on the same place, ultrasound sensor will be placed around the track to prevent interruption towards the system (it will cut off the power supply once object detected and the system will decelerate slowly) and live cam will equipped to monitor the child who is using this system. For electronic system, a microcontroller board will be used to

communicate with motor and tablet. The tablet will display graphical user interface (GUI) animation to attract child's attention. The animation will move at a speed directly proportional to the speed of motor. Once the system is built, the system will undergo several tests before child can use the system.

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