

Motor Rehabilitation of Children with Cerebral Palsy using Virtual Intelligence

Introduction

Virtual rehabilitation is a virtual reality-based rehabilitation process for enhancement to conventional therapy for Cerebral Palsy (CP) patients. The virtual rehabilitation system is being developed for the patients who are suffering from physical (motor) disability. The rehabilitation system includes therapy exercises for standing balance, sitting balance, range of motion, and strengthening exercises for upper limb (hand) function. The system integrates inexpensive devices like Balance Board, camera, IMU, and gesture sensor for gross and fine motor rehabilitation of CP kids.

Specifications

Hardware:

- Gesture recognition sensor: Kinect, Leap
- Motion recognition sensor: IMU
- Balance measurement: Balance Board
- Computer
- Communication: Bluetooth
- Non-immersive Display
- LED TV
- Headgear

Software:

- Platform:
- LabVIEW: 2d exergames
- Unity 3d exergames
- Patient information and trials records

Benefits

- ✓ Virtual reality studies are promising for clinical use in paediatric rehabilitation, especially in CP.
- ✓ Integration of assessment scales in to the VR based rehabilitation system
- ✓ Mapping of difference components of rehabilitation with exergames
- ✓ Targeted and quantified rehabilitation
- ✓ Adaptations of local requirements

Applications

For use in Advance Paediatrics and Physical Medicine and Rehabilitation department of hospitals.

Status

- ✓ Virtual reality-based system for rehabilitation of motor disability in children with cerebral palsy
- ✓ Implementation and limited clinical trials of the developed system for rehabilitation of motor disability in children with cerebral palsy at PGIMER Chandigarh (project partner)

Mapping of therapy modules with BOT-2 scale

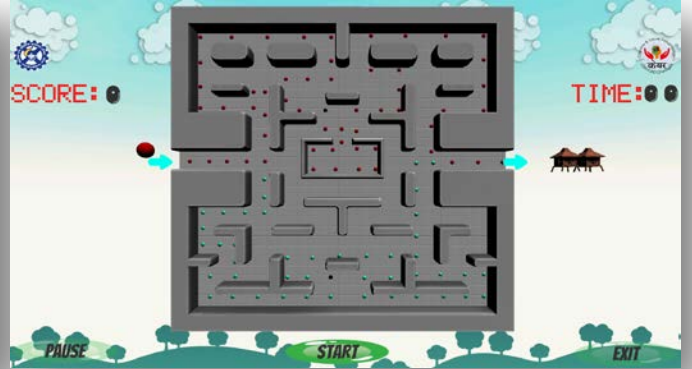
S.no.	Therapy Modules	BOT-2 Modules	Sensor Modules
1.	Fun and Fight	Strength and Coordination	Leap Sensor
2.	Collision of Balls	Bilateral Hand Coordination	Leap Sensor
3.	Virtual Peg Board	Manual Dexterity	Leap Sensor
4.	Break the Bricks	Upper Limb Coordination	VEERA Sensor
5.	Kill the Monsters	Upper Limb Coordination	VEERA Sensor
6.	Maze	Fine Motor Precision	Touch or Airbar
7.	Magic Way	Fine Motor Integration	Touch or Airbar
8.	Fruit Splash	Upper Limb Coordination	VEERA Sensor
9.	Erase and Reveal	Visual Object Identification	VEERA Sensor
10.	Collecting Crystals	Upper Limb Coordination	VEERA Sensor

Therapy modules

- ✓ Modules developed in Unity platform, supports easy integration and adaption to different patient needs



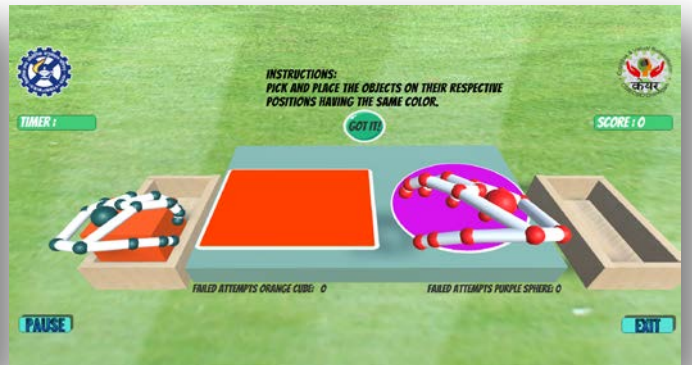
Fine Motor Integration



Fine Motor Precision



Upper Limb Strength



Upper Limb coordination



Upper Limb Strength



Balance and Agitation