



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Vishnu Matta; Ayush Sheth	Project Number 38021
Project Title iTherapy 2.0: A Physical Therapy Humanoid Robotic Companion for Autistic and Cerebral Palsy Kids	
Abstract Objectives/Goals Physical therapy for cerebral palsy kids and social learning for Autistic kids is a challenge. It involves frequent doctor visits and hours of repetitive exercise at home. A primary issue with such treatment is the kids are easily distracted and do not follow the practices at home. With a family member affected by such condition, we decided to create an engaging, humanoid robot, which acts as a physical therapy companion and provides real-time feedback to the therapist through video recordings of the patient's progress. Thus reducing the need for frequent clinical visits. We built a raspberry pi based humanoid robot, that can be remotely programmed to perform tasks to guide the patient at home. We also developed a mobile app for the physical therapist to prescribe the necessary exercises, and monitor the progress of the patient. Methods/Materials The iTherapy system includes three components - A therapist mobile app, a humanoid robot and a video recording system to send patient videos to the therapist. We developed a native iOS app using Xcode for the therapist to assign exercises to the patient, and receive patient videos. Then, we built a Humanoid robot, using a Raspberry Pi 3, with ten servo motors. The body of the Robot was created using acrylic plastic. We built three robots for this project in 3 phases. Phase 1 - robot was created with off the shelf parts. Phase 2 - we built a robot ground up, with two motors, that could perform hand exercises. Phase 3 - we improved from the previous robot, where we added eight more servo motors, incorporated leg movements and robot interaction with the mobile app. For the video recording system, we used a USB web camera. Results Our third prototype has achieved the flexibility of movements to demonstrate full set of exercises, we set out to emulate, including voice based guidance. The therapist mobile app can successfully communicate with the robot. The therapist also gets an email notification when the patient completes a set of exercises. Conclusions/Discussion Researchers at Vanderbilt University and Georgia Tech found autistic kids and kids with cerebral palsy respond far more emphatically and enthusiastically, to humanoid robots than other systems. Hence, we believe iTherapy 2.0, when productized as a system, has the real potential of saving time and money. Most importantly, the system speeds up recovery for patients.	
Summary Statement We built a humanoid robotic companion for kids with cerebral palsy and autism, to help speed physical therapy and social learning skill training at home, assisted by a therapist mobile app for real time monitoring and feedback.	
Help Received Our families helped significantly in procuring all the materials needed to build the robots. Online resources enabled us to learn python programming and controlling servo motors via a Raspberry Pi. We also, interviewed a professional physical therapist to understand the process and get her feedback about	