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Development of Technology Assistance for Old Age People and Patients with Cerebral Palsy

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Abstract: An electro mechanical robot is designed to assist elderly people and patients having cerebral palsy. Cerebral Palsy is defined as "a group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain." The robot recognizes and provide water and food to the patient and also guides the patient to walk in a predetermined path in and around the house, provides multimedia support to train, entertain and pacify the person and recognizes the facial expressions to understand nature's call and lead the patient to rest rooms. The mechanical system is controlled by an Android based smart phone which manipulates all the information to take decisions.

Key words: Voice Recognition · Gesture Recognition · GPS · Alarm · Walking Robot · USB Serial Port

INTRODUCION

A robot [1] likes an electro-mechanical system to assist elderly people and patients having cerebral palsy. Cerebral Palsy is defined as "a group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain." The designed system will have android based mobile / tablet as the master controller and a microcontroller as a secondary controller to arbitrate the movements. The android based mobile / tablet will have audio recognition, face recognition to understand the sound and gestures of the patients and will act accordingly (provide water or food). It can also play some videos and songs which will pacify the patients in case they behave aggressively. It can also lead them to walking on a predefined path with the help of GPS data available within the mobile phone. The system can make emergency alarms, with user defined triggers / events.

Importance to Develop the Project: In total population have 1% of the people with mental retardation. The problem is continuously monitoring the patient because they will react differently if they are ignored for a while or not properly engaged. It is more than a humanity to engage them and also to ensure their safety. Project targets will and assist them in their day to day life. As the days progress, human life has become more and more mechanical and people don't have time to take care of elderly people or people with mental retardation. Hence, this project will help those people who are in need of assistance at all time. We are trying to design [2, 3] a system to take care of such people, ensuring their comfort and safety.

Solution to Develop the Project:A mobile / tablet with external speakers will be fitted on to the system, a camera and microphone detect any abnormal behavior of the patient and to generate warning alarms, a GPS system which can move the system in predetermined path, a small water storage that can supply water, and a small container to store snacks or food which can be served at the patient's discretion when some button is pressed. The button should have an image that depicts the availability of water and food. Motorized wheels and batteries will be fitted with the system to move in and around the house. The system is controlled by an embedded [4] device.

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Methodology: In this project we exploit the features available in an Android mobile to develop a patient monitoring system [5]. The features used are: GPS (for guiding the patient in walking), Microphone (to grasp the different types of sound made by the patient), Camera (to monitor the facial expressions), display (to play multimedia content to pacify the patient) and speaker (to play songs or to pronounce preloaded commands to the patient). We planned to design an electro-mechanical system that should have decent weight and broad wheels for maximum stability. The mobile can move around horizontally as well as vertically to capture the patients face. A face recognition algorithm will be inbuilt to do so. A battery and a charging unit will also be kept in the system, so that it will increase the weight of the total system and thus increases the stability. The system will also have containers for food and water, which will be brought out based on the inputs from the patient. The system will have a rubber hand, which can hold the patient and lead them for walking on a predefined path with the help of GPS in and around the house. The system will recognize the facial expression to understand nature's call and lead the patient to rest room.

Implementation Modules of the project:

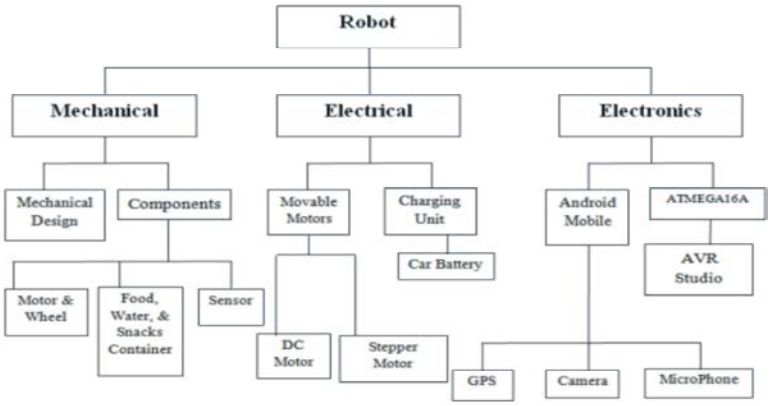

Fig. 1: Implementation Modules

Circuit Design of the Project: Android Mobile features (Camera and Microphone receive the input from the patients and GPS receives input from the Satellite or other Networks like Wi-Fi) receive inputs and send output to the RS-232 Serial Communication Port via the USB Serial Port. RS-232 communicates the received signal to the ATMEGA16A Micro Controller. The Micro Controller controls the motor device drivers ULN2003A and H-Bridge. ULN2003A drives Stepper motor and DC motor. DC motors are connected with H-Bridge to drive in bi-direction (left or right).

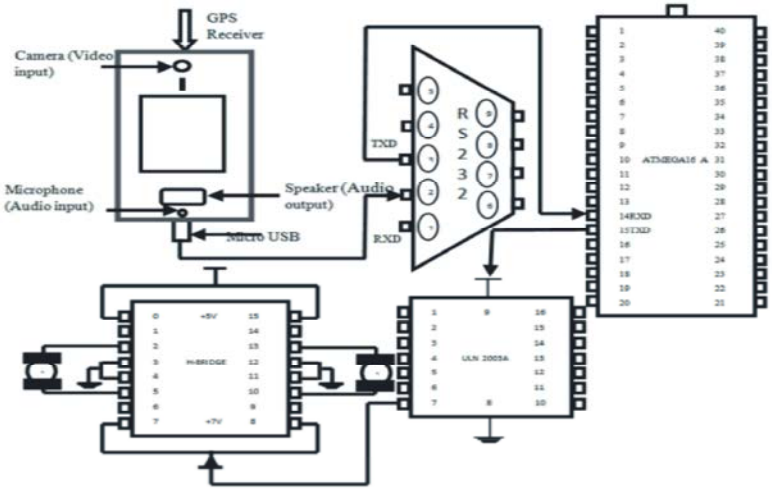

Fig. 2: Circuit Design

RESULTS AND DISCUSSION

GPS receives latitude and longitude values from location providers (GPS receiver or Networks (Wi-Fi, Zigbee) and indicates the path direction to the robot. when the robot reaches the turning point GPS indicates the turning points. The Microphone receives the sounds from the patient and recognizing the voice and then produces the result to the robot to take action.

GPS indicates robot reaches the end point.

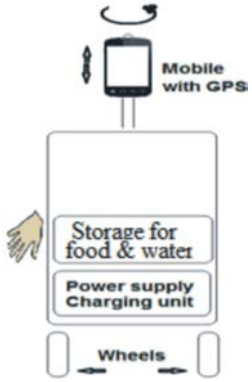

Fig. 3: Schematic Diagram

- Simulation results of the GPS.

GPS indicates robot reaches the end point

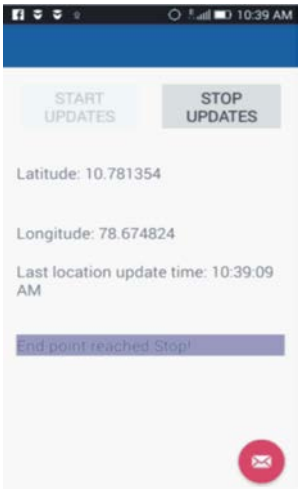

Fig. 1: Indicates End Point

Simulation Results of Voice Recognition: Voice Recognition is preparing the recognizer and then comparing the sound with the recorded sound. If the result is matched recognizer sends the signal to the robot to open the food container.

GPS indicates robot reaches the left turning point.

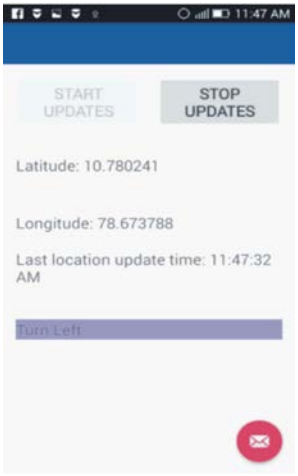

Fig. 2: Indicates Left Turn

GPS indicates that the robot reaches the right side of the turning point.

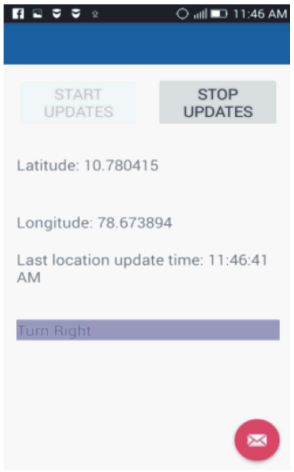

Fig. 3: Indicates Right Turn

Fig. 7: Recognition Result

CONCLUSION AND FUTURE WORK

In this paper, we have presented a robot to assist the elderly people and mental retardation patients. The robot ensures the safety of the patient by providing all time monitoring, guide them to walk on a predefined path in and around the house, provides food and water to the persons and it acts as a remote patient monitoring system. It can provide the tailor made entertainment for the elderly and mental retardation people. The robot is designed to capable of providing the services and assistance to the patients with cerebral palsy. An additional functionality of the developed system can act as a home security guard.

Future Work: Android Facial Recognition and mechanical design implementation are in processing and then w e will integrate the hardware with the software.

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