

Bio Medical AID: Smart Wheel Chair for Especially-Abled and Elderly People

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Abstract— Approximately one billion people in the world are differently abled out of which nearly one fifth are in India alone. Especially abled people may include the deaf, dumb or physically handicapped people who faces a hard difficulty to run their daily life. The main objective of the research paper is to fulfil the unsaid needs of the differently abled and elderly people. A special chair having full backup with solar cells is designed to help the differently abled people which incorporates various sensors (example IR sensor, Magnetic sensor, proximity sensor, accelerometer etc.), latest microcontroller and supporting devices. Main objective of the work is to make a wheel chair which will run for them, guide them, understand them and execute the instructions given by them. Another main objective of the project is to track differently abled or elderly people for any health related emergency issue (like Blood pressure high/low and pulse rate high/low). It will provide a message at concerned number feeded in programming in case of any emergency to the especially able person. This all tried to invent at low cost so that the needy can bear the expenditure.

Keywords— Arduino board; Liquid Crystal Display (LCD); 3-axis accelerometer; Pulse rate sensor; Temperature sensor.

I. INTRODUCTION

The challenging problem faced by the paralyzed people is their independent mobility. The recognized gestures may be used to generate motion control commands to the controller so that the wheel chair movement can be controlled. The head movement is the gesture which can be performed by the quadriplegic patients whose body parts below the neck is paralyzed. So the head movement is possible for the patients. Quadriplegics are persons who are not able to use any of the extremities.

The aim of the project is to produce the upgraded technology related system which can help the elderly or especially abled people regarding fulfilling their daily needs and also inform to the concerned in case of any medical help requirement. The system also supposed to have various buttons to generate feed messages automatically which can cut down the complexity of circuit. The existing systems regarding this objective are not fulfilling all the requirements and are too complex which is very hard to understand and execute. Keeping in mind, one system which can be easily executable and with maximum facilities will be designed.

II. MATERIALS AND METHODS

Gesture recognition implies a method by that knowledge is collected from parts of the physical body (usually the hand) and then processed. The output can be executed on display, motor, GPS or GSM module. The circuit will be designed and

checked for error free output with the help of circuit designing software's (such as CAD, PSPICE etc.), then after program will execute to achieve desired objective. The wheelchair includes an accelerometer sensor which detects the movement of head and the controller will process the signal. It will transmit to the wheel chair for its navigation. A simple prototype by taking some of those gesture and convert it into visual form so that these can be understand by everyone. For that we need microcontroller board (Arduino in this case) to interface all of the sensors and actuators. In this system we have used an open source microcontroller board which is called arduino, which acts as the brain of this project. In this project, there are two sections; first is the transmitter part and other is the receiver part. The transmitter part consists of an arduino board, LCD display, 3-axis accelerometer, pulse rate sensor, temperature sensor and a switch. The arduino of transmitter part takes all the analog values from the different sensors and takes decisions according to the program and give signals to the L298 motor driver shield which drives the motors according to the instructions.

The 3-axis accelerometer is a sensor which has three outputs for all the three axes viz., x-axis, y-axis, z-axis. This sensor gives analog value from 0 to 1023 for all the three axis independently. Here we use only two outputs. We use x-axis value for the left and right motion and y-axis value for the forward and backward motion.

The Pulse rate sensor is used to count the heartbeat of the human which is sit on the chair. The output of this sensor is in the form of digital pulses. Normally the heartbeat of a healthy person is 72bpm. So with some tolerance, it can be considering as threshold level and if the heart rate of the person is above or below the threshold level and then a SMS is sent to a predefined number.

The temperature sensor (RTD) is used to measure the temperature of the person body. The output resistance of the RTD is decreases when there is an increase in the temperature. The temp of the body of a healthy person is 37°C, so this temp with some tolerance is considering as the threshold level, if there is any change in the temperature of the body of person then a message is sent to the predefined number.

The GSM module is used to send the message to a predefined number. Here we use SIM800L module for this purpose. Whenever the person presses the SOS switch, then an alert SMS is sent to a predefined number with the help of this module.

The Ultrasonic sensor is used to avoid any collision between the wheel chair and the obstacle. It measures the distance

between the wheel chair and the obstacle, if the distance is less than 10cm then the arduino doesn't send any enable signal for the forward, left and right movement. It only sends enable signal for the backward motion, and if the distance is greater than the 10cm then all movements are enable.

The LCD display is used to display the current status of the commands which are processed and also it is used for displaying the pulse rate and the temperature of the person.

The L298 motor driver shield is used for the motor control. The L298 has 6 pins out of which two are enable pins for the motor control pins. The other four pins are for the motor controls.

The motors are used for the movements of the wheel chair, with the help of these two motors, the wheel chair can move forward, backward, right and left.

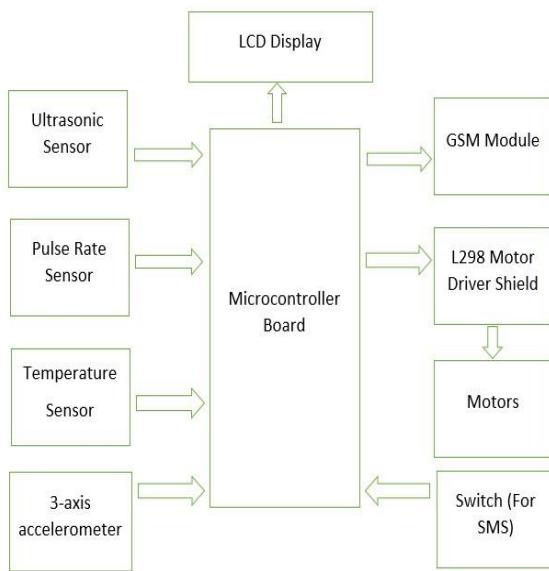


Fig 1. Block diagram of smart wheel chair

III. RESULTS AND DISCUSSIONS

Some prime features of the research are mentioned as follows-

- The robotic wheelchair motion is supported through the movements of head/hand motion.
- Head movements control is particularly useful for severely-handicapped people who have spinal cord injury or quadriplegia which, the recognized gestures are used to generate motion control commands to the controller so that the wheel chair movement can be controlled.
- The head movement is the gesture which can be performed by the quadriplegic patients whose body parts below the neck is paralyzed. So the head movement is possible for the patients.
- This system will prove as a system which is able to bridge the communication gap between especially disabled people and normal people.

This chair consists several advantages over normal chair:

- Timely information to concerned peoples.
- Easy to operate.

- Cost effective.
- Equipped with latest sensors and microcontrollers.
- Collision avoidance mechanism.
- Emergency alert.
- Basic medical facility.

IV. CONCLUSIONS

The Smart Wheelchair has the ability to uncover learning potential and facilitate the recognition of abilities in people previously excluded from access to independent mobility. Given the significant limitation that restrictions in mobility pose to participation for children with physical disabilities, therapists must begin to understand the effectiveness of interventions such as the Smart Wheelchair.

Due to the additional sensor like ultrasonic sensor, which protects the wheel chair from colliding, the user can operate the wheel chair confidently without any fear of collision. Also, the sensors like pulse rate sensor and temperature sensor continuously monitors the health of the user which helps to save user life in medical emergency conditions.

In summary, it can be concluded that Smart Wheel Chair has a wide range of application and scope in following areas:

- **Physically Challenged People**

Physically Disabled People can use it as per their purposes. People who are able to use their hand can use Joystick; People suffering from certain paralysis can use either voice or head movement as per requirement.

- **Patients in the Hospitals**

People suffering from certain paralysis can use either voice or head movement as per requirement.

- **Old Age Homes People**

At old age homes can use this chair as per their requirement.

As the elderly persons or differently abled persons faces a high order of difficulties in their daily routine work therefore this project will lead some novel findings to keep their daily needs work easier and by this way to provide them a better platform to live their life happily. As well as to minimize the requirement of dependency on other.

ACKNOWLEDGMENT

The author great fully acknowledge the suggestions and comments of the learned reviewers which finally help to improve the content of the manuscript.

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