International Journal of Advanced Technology in Engineering and Science
Vol. No. 11, Issue No. 05, May 2023
www.ijates.com
ijates
ISSN 2348 - 7550

CHAKRASANDHA: A Simplified Way of Living for Confined

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Abstract

Many people are suffering of temporary or permanent disabilities due to illnesses or accidents. For cases of difficult or impossible walking, the use of a wheelchair is becoming essential. Manual or electrical wheelchairs are satisfying for most of the low and medium level disability case where patients can use the wheelchair independently. However, in severe cases, it is difficult or impossible to use wheelchairs independently. In such cases wheelchair users often lack independent mobility and rely on somebody else handle the wheelchair. In this paper we are reviewing our idea of developing a prototype of a wheelchair which can be used by the disabled persons and it can make them use in an easy way.

"CHAKRASANDHA" will be a prototype of a wheelchair which will be controlled by tongue movement and a portable controller which can be placed on either side of arm rest on the wheelchair according to the condition of the patient. Features like moisture sensor, temperature sensor, voice kit for conveying message by the patient will be added to this prototype. A screen will be used to display the temperature of the patient and other parameters which should be monitored.

Introduction

Several studies have shown that both children and adults benefit substantially from access to a means of independent mobility, including power wheelchairs, manual wheelchairs, scooters, and walkers. Independent mobility increases vocational and educational opportunities, reduces dependence on caregivers and family members, and promotes feelings of self-reliance. For young children, independent mobility serves as the foundation for much early learning. Non ambulatory children lack access to the wealth of stimuli afforded self-ambulating children. This lack of exploration and control often produces a cycle of deprivation and reduced motivation that leads to learned helplessness. For adults, independent mobility is an important aspect of self-esteem and plays a pivotal role in "aging in place". While the needs of many individuals with disabilities can be satisfied with traditional manual or powered wheelchairs, a segment of the disabled community finds it difficult or impossible to use wheelchairs independently.

The main interest of our project is that it will be controlled by tongue movement. There will be many other features added to the project which will be according to other medical conditions of patients. Monitoring features with

various sensors which can examine the time-to-time health condition and voice kits will be added which will make it user friendly product.

Literature Survey

[1] "Advances in smart wheelchair technology", Sumit Desai, S. S. Mantha, V. M. Phalle (27-28 January 2017), IEEE

A smart wheelchair normally consists of a standard powered wheelchair base, a computer and sensors. The Smart wheelchair minimizes the physical and cognitive load required in steering it. Smart Wheelchair is controlled by a computer and a set of sensors. It based on techniques derived from mobile robotics research. A computer processes the sensor information and it generates the motor commands in an automatic way or with a shared control. The control module of smart wheelchair may consist of a standard wheelchair joystick, speech-based control, facial expressions or even gaze control, etc.

[2] "Gesture-based Smart Wheelchair for Assisting Physically Challenged People", Sarnali Basak (March 2019), IEEE

The system was successfully implemented on a prototype. In there instead of a wheelchair the prototype was a small car. The prototype could move forward, backward, right and left. On the other hand, the prototype could communicate with a mobile phone successfully with the help of the GSM module. They have used a USB cable to supply the power for the raspberry pi. The skywriter HAT sensor is attached right on to the raspberry pi. As it senses the gesture performed above the surface of the sensor, the python code inside the Raspberry pi becomes active to execute the specific operation predefined for that gesture. There is a GSM module connected to the raspberry pi via some jumper wires. There is also a SIM card inside the slot of the GSM module. Which makes the call or send messages to a phone in any location. GSM module needs to have a power supply of up to 2 amp at a time to execute an operation. But the Raspberry pi cannot supply the continuous power via the Vcc of Raspberry pi. So, they need to have a 2 Amp. power supply immediately to the GSM module when we input a gesture to make a call or sending a message. To solve this problem, they used a capacitor to attach the GSM module to the Raspberry Pi. So that the capacitor can store the current for the immediate supply to the GSM module. When the device gets an input gesture to execute the operation via GSM module, the capacitor is the one who makes the on-demand supply of the power to execute the command.

[3] "DEVELOPMENT OF SMART WHEELCHAIR", Suraj Kumar Vishwakarma (June 2017)

They have used a software that controls the overall functioning of the system. The stored program in a microcontroller all the basic functionalities of the function and the operation of the devices used in the system. The inputs are taken from sensors and output of the program decides action to be taken by the system.

[4] "Inductive tongue control of powered wheelchairs", Morten Enemark Lund Henrik Vie Christiensen, Héctor A. Caltenco Eugen Romulus Lontis, Bo Bentsen, Lotte N. S. Andreasen Struijk (August 31 - September 4, 2010)

The first tests of driving a powered wheelchair using the ITCS showed good and direct control of the wheelchair with multiple directional control and variable speed control. The chosen radio configuration occasionally showed a tendency to lose connection, bringing the wheelchair to a stop. The timer was paused accordingly and started again when the radio link was re-established. The ITCS control of the powered wheelchair enabled the subject to

complete the navigation track with an average of 0.265 m/s (15.9 m/min) with low speed (0.47m/s) of the wheelchair and an average of 0.33m/s (20 m/min) with the high speed (1.1 m/s).

Methodology

A. Block Diagram of Proposed System

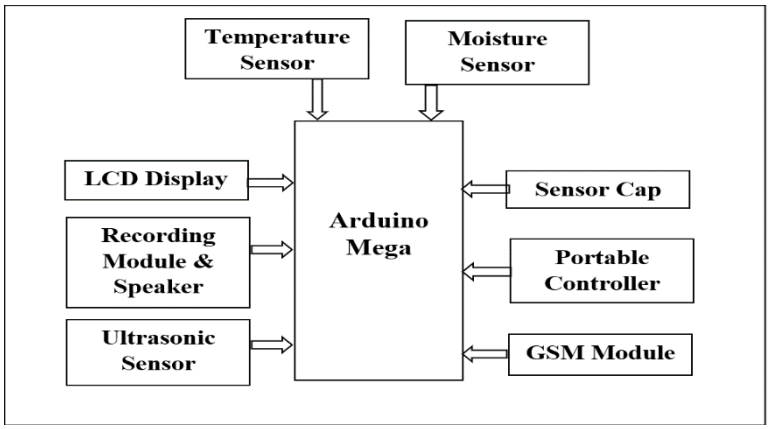

Fig 1: Block Diagram of proposed system

The project objective has been fulfilled by building a prototype of "CHAKRASANDHA" a smart wheelchair with two modes of controller: first, by tongue movement and the second way of controlling is through portable controller. This protype consist of health monitoring system which helps to keep a constant observation of the patient health. Voice module with various message stored on it will be useful for patient to convey message to caretaker.

- CHAKRASANDHA consist of Arduino Mega with various sensors added to it.
- There will be a sensor cap which will be consisting of sensors that will reach to cheek as our wheelchair will be tongue controlled.
- Portable controller in which four touch sensors is used for movement and other touch sensors are used as message conveyer.
- The length of will be 12' inch height will be 24' inch and breadth will be 10' inch.
- A display screen with various monitoring data displayed on it. The device will be charged with 12V/2A which will be a rechargeable lithium-ion battery.
- B. System Components
- Arduino Mega

Arduino Mega 2560 is an open-source development board based on Atmega2560 AVR microcontroller. This microcontroller is an 8- bit Microcontroller. It uses ATmega16U2 Microchip Technology. This board can be programmed using programmed using wiring/ processing language.

- LCD Display
- The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc.

These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

- Recording Module & Speaker

Voice Record Module is based on ISD1820, which a multiple-message record/playback device. It can offer true single-chip voice recording, no-volatile storage, and playback capability for 8 to 20 seconds. The sample is 3.2k and the total 20s for the Recorder. This module use is very easy which you could direct control by push button on board or by Microcontroller such as Arduino, STM32, Chip Kit etc. Frome these, you can easy control record, playback and repeat and so on.

- Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

- Temperature Sensor

The DS18B20 is a 1-wire programmable Temperature sensor from maxim integrated. It is widely used to measure temperature in hard environments like in chemical solutions, mines or soil etc. The constriction of the sensor is rugged and also can be purchased with a waterproof option making the mounting process easy. It can measure a wide range of temperature from -55°C to +125° with a decent accuracy of ±5°C. Each sensor has a unique address and requires only one pin of the MCU to transfer data so it a very good choice for measuring temperature at multiple points without compromising much of your digital pins on the microcontroller.

- Moisture Sensor

This module is used to sense moisture under the seat of the wheelchair. The module will detect the moisture or water droplets and voice module will be active and it will give convey message to caretaker and a message through SMS will be sent to the caretaker.

- Portable Controller

The TTP226 is a touch pad detector IC which offers 8 touch key. The touching detection IC is designed for replacing traditional direct button key with diverse pad size. Capacitive touch allows electronics to sense when your finger is within a few millimetres of a surface to simulate a button "press" just like how the pushbutton works. Capacitive sensing may be used in any place where low to no force human touch sensing is desirable .

- GSM Module

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computers. A GSM modem can be a dedicated modem device with a serial, USB, or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a

class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network.

CONCLUSION

The proposed system is a prototype of CHAKRASANDHA which can be built as a product and used by patients or people those who are in confined state. The prototype consists of various health monitoring system and multiway controller for the wheelchair. The system consists of two different ways of controller; the first one is through the tongue movement and the other way of controlling is the wheelchair is through the portable controller. Various sensors are used to monitor the user's condition. Temperature sensor can sense the temperature and if the temperature exceeds the normal body temperature it displays on the LCD screen and a SMS is sent to the caretaker phone; similarly, is the moisture sensor detects moisture it will give an alert message through the voice kit and SMS will be sent. Smart wheelchairs can be used indoors or outdoors, providing constant support for people who need them throughout the day.

REFERENCES

[1]. An IEEE paper on "Design and Development of a Smart Wheelchair for the Disabled People" by Foez Ahmed, Robi Paul, Md. Mufassal Ahmad, Arif Ahammad, Showmik Singha. 12 April 2021.

[2]. "An Independent Tongue-Operated Assistive System for both Access and Mobility" IEEE by Md Nazmus Sahadat, 2021.

[3]. Sensor Activation for Wheelchair Driving in Confined Spaces with a Tongue Controlled Oral Interface, by Eugen R Lontis 2020.

[4]. https://www.researchgate.net/publication/305699756_A_Study_on_Smart_Wheelchair_System

[5]. Gupta, T. Ghosh, P. Kumar, S. Shruthi and P. Bhawna, "Development of Android Based Powered Intelligent Wheelchair for Quadriplegic Persons", IOP Conference Series: Materials Science and Engineering 225, 2017.

[6]. K. Kalaiyarasu, G. Leelavathi, M. Suganya, S. Vignesh, N. Santhosh, ''Design and Implementation of Smart Roulettle using Gesture Control IJSART – Volume 2 Issue 3 –march 2016.

[7]. Ajit A. Mohekar, Savita V. Kendre, Tanmay N. Shah, Prof. P. D. Sonawane, Prof. Dr. S. T. Chavan design of an innovative retrofitted tricycle for a desirable person "International journal of advance research in science and engineering'' volume no.4, issue 07, July 2015.

[8]. Rashid Ahmed K., Safar Abdul Razack, Shamil Salam, Vishnu Prasad K.V., Vishnu C. R. "Design and Fabrication of Pneumatically Powered Wheel Chair-Stretcher Device'' International journal of innovation research in science, engineering and technology, vol.4, issue 10, October 2015.

[9]. Vivek Kaundal, Rajesh Singh, Anant Wadhwa Shashank Mishra, Aadhar Rastogi, "Low-Cost Robotic Wheel Chair for Disabled People in Developing Countries'' Conference on Advances in Communication and Control Systems 2013 (CAC2S 2013).

[10]. G Azam and M T Islam, "Design and Fabrication of a Voice Controlled Wheelchair for Physically Disabled People''.