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IoT Based Smart Reclining Wheel Chair

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Abstract

Individuals with disabilities are immobile; smart devices give them access to medical databases. One possible way to make improvements to your scenario would be to create a health-1 monitoring system for a patient. The current project's objective is to build a low-cost smart wheelchair that uses a microcontroller and to attach a health monitoring device to a standard wheelchair

1. INTRODUCTION

Paralysis or Tetraplegia is a kind of paralysis caused by serious injury or illness that can result in the partial or total loss of limbs and lower acme. Paraplegia is another variant of paralysis but it does not induce the arms which results in a loss in sensual activity and controlled movements. On the other hand, paralysis can weaken muscles affecting limbs and torso. Generally, paralysis begins in the brain or spinal cord or in both. The spinal cord sends signals to and from the brain and brain interprets these signals. An injury can restrict this transmission so that a signal doesn't process and interprets by brain. On other hand a brain injury can destroy the brain's ability to interpret signals. Paralysis is unpredictable diseases that can be affecting any age group people. Some factors can greatly affect outcomes after injury such as age, caring, first aid etc. Although some patients experience significant improvements but paralysis is incurable disease. This means no surgical procedure, drug can guarantee to proper functioning of movements. The strength of moving is a basic requirement in our lives, so this paper aims to provide aid to quadriplegic patients who are partially disabled. As indicated by the Population and Housing Census 2010 of the National Institute of Statistics and Geography (INEGI), in Mexico there are 5,739,270 individuals with some sort of inability. A patient who can't move their appendages either upper or lower part of the body but they can act with their eyes, hand and tongue so an approach is proposed in form of a smart wheelchair that can provide free movement to the patients and support to nearer ones using sensors and motors.

The first approach is based on voice recognition a smart wheelchair that uses a computer program to implement the system. The second approach utilizes framework embedded systems to perform the task. The second approach is better because of smaller size, minimal effort, and less power utilization. Domingo introduces different application scenarios using Internet of Things. On observing IoT architecture from a specialized perspective, we noticed that IoT consists of three layers perception, network and application layers. According to the some researchers, there are some challenges for disable people such as self-configuration, self-healing, self optimization etc.. introduces the patient head tilts around x, y and z axes to provide the motion of the wheelchair. To detect the head position respective to the sensor array infrared and ultrasonic sensors have been used. To find out the head orientation optical and camera sensors are used. introduce a wheelchair controller for Paralysis and paralysis amputee on the basis of their voice or head tilt controller.

Wheelchairs are essential mobility aids for individuals with disabilities or limited mobility. Traditional wheelchairs offer basic functionality for movement but may lack features for comfort and customization. The proposed reclining wheelchair system aims to address this limitation by introducing reclining functionality controlled via Arduino microcontrollers. Bluetooth-based text control further enhances usability by

allowing users to operate the wheelchair remotely using a smartphone or similar device.

2. Objectives

Improve the accessibility, dependability, and affordability of public and private transportation choices for people with disabilities. Eliminate obstacles to employment for people with disabilities, such as discrimination and a lack of accessible workplaces.

1. Connectivity and Control
2. Navigation Assistance
3. Reclining
4. Real-time Monitoring

METHODOLOGY

The complex issues that people with disabilities encounter emphasize the need for inclusive solutions in a variety of spheres of life, including digital technology and physical environments. Physical accessibility in buildings, public areas, and transit networks

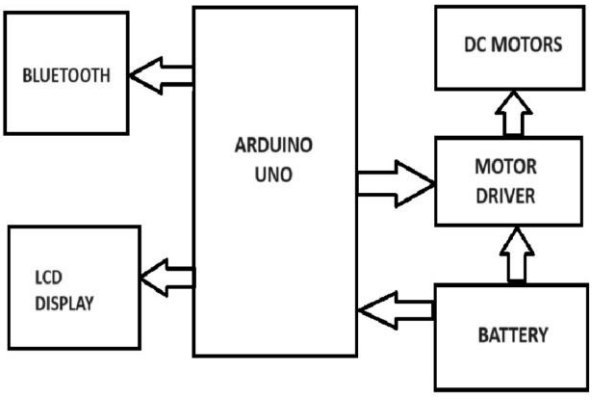

Fig-1: Block diagram

The user of a reclining wheelchair can lie at a specific angle while still sitting upright. For those who must use a wheelchair for extended periods of time and need to adjust their position to reduce sitting pressure, reclining wheelchairs are a good option. The wheelchair's motor can be used to control its motion. The L293N motor driver is used in conjunction with a microcontroller to regulate the motor speed. The motors are positioned in each of the chair's four corners. The user of a reclining wheelchair can lie at a specific angle while still sitting upright. In order to help the user extend their hips and lower back, the knees can also be elevated.

COMPONENTS

Arduino UNO

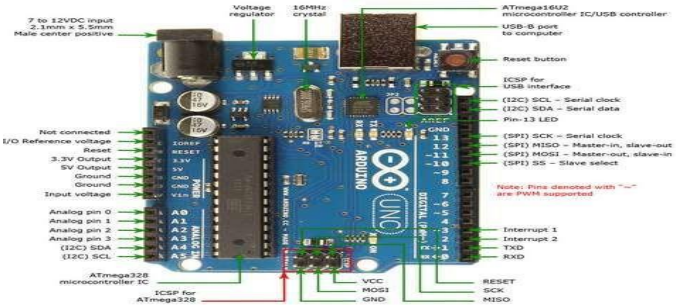

Fig-2: Arduino UNO

The Arduino Uno is a microcontroller that operates at 16 MHz and has 32 KB of flash memory, 2 KB of SRAM, and 1 KB of EEPROM. It has 14 digital input/output pins, 6 analogy input pins, and a reset button. The board can be powered via USB or an external power supply and has a voltage regulator for 7V to 12V. Arduino software (IDE) can be programmed using the board, which is part of the open-source Arduino project. Arduino's large and active community offers numerous libraries and resources for various sensors, actuators, and modules. The Arduino Uno is compatible with various expansion boards, such as shields, which can be stacked on top for additional functionality. If the patient presses a button within a prescribed time, the dosage is dispensed, and if not, the unit makes the receptacle inaccessible and contacts a list of caregivers.

Table -1: Specifications of Arduino UNO

Microcontroller	ATmega328P
Operating Voltage	5v
Input voltage	7-12v
Input voltage limit	6-20v
Digital I/O Pins	6
Analogue input Pins	6
DC current per I/O pins	20 mA
DC current for 3.3v Pin	50 mA
Flash Memory	Of which o.5KB is used
SRAM	2 KB
EEPROM	1KB
Clock Speed	16MHz
Length	68.6mm
Width	53.4nm
Weight	25g

L293D Motor Driver

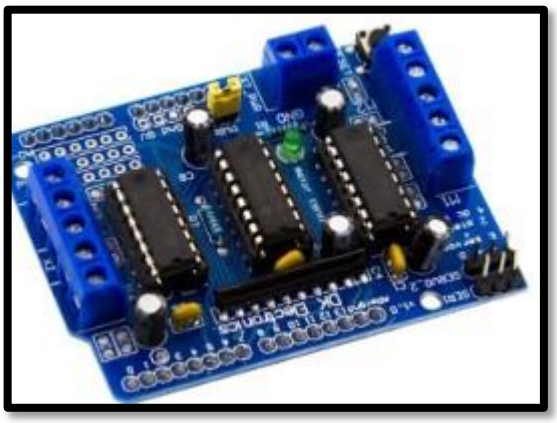

Fig-3: Motor Driver

An integrated circuit chip called a motor driver is used to regulate motors in autonomous robots. It serves as an interface between Arduino and motors; the L293 family of integrated circuits are the most often utilized ones. Two DC motors or one stepper motor may be independently controlled by the L293D thanks to its two H-bridge configurations.It is appropriate for a variety of digital control systems since it has built-in safety against voltage spikes and back EMF and is compatible with both TTL and CMOS logic levels

LCD DISPLAY

Fig -4: LCD Display

A 16*2 LCD demonstrates contains two lines likewise; there are 16 characters for each line.Each character is appeared by 5x7 pixel lattice.This LCD includes two registers, specifically, Order and Data. The charges select extras the charge bearings that are given to the LCD. A charge is a rule given to LCD to do a predefined errand like presenting it, clears its screen, sets the cursor position, controls show et cetera.The data enroll saves the data to be appeared on the LCD.

Table-2: Terminals connected

Terminal 1	GND
Terminal 2	+5V
Terminal 3	Mid terminal of potentiometer (for brightness control)
Terminal 4	Register Select (RS)
Terminal 5	Read/Write (RW)
Terminal 6	Enable (EN)
Terminal 7	DB0
Terminal 8	DB1
Terminal 9	DB2
Terminal 10	DB3
Terminal 11	DB4
Terminal 12	DB5
Terminal 13	DB6
Terminal 14	DB7
Terminal 15	+4.2-5V
Terminal 16	GND

3. CONCLUSIONS

The online version of the volume will be available in LNCS Online. Members of institutes subscribing to the Lecture Notes in Computer Science series have access to all the pdfs of all the online publications. Non-subscribers can only read as far as the

abstracts. If they try to go beyond this point, they are automatically asked, whether they would like to order the pdf, and are given instructions as to how to do so.

BLUETOOTH MODULE

Fig: 5 Bluetooth Module

The wireless module used in this project is Bluetooth HC-06 module. HC-06 is a Bluetooth serial module that is used to convert the serial port into Bluetooth. This Bluetooth module is using Serial Port Protocol (SPP). It has 2.4 GHz radio transceiver and baseband. This module also works low power operation, 1.8 to 3.6 V I/O. It also has a feature that it will auto-connect to the last device on power as default. HC-06 is used to connect with the Arduino Uno microcontroller. This allows the microcontroller board on the wheelchair to receive command signals wirelessly from the PC or smartphone. Figure 7 shows the HC-06 Bluetooth module.

Features

- Bluetooth protocol: Bluetooth Specification v2.0+EDR
- Frequency: 2.4GHz ISM band
- Modulation: GFSK (Gaussian Frequency Shift Keying)
- Emission power: ≤4dBm, Class 2
- Sensitivity: ≤-84dBm at 0.1% BER
- Speed: Asynchronous: 2.1Mbps (Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
- Security: Authentication and encryption
- Profiles: Bluetooth serial port
- Power supply: +3.3VDC 50mA
- Working temperature: -20 ~ +75Centigrade

30RPM DC Motor

Fig-6: 30RPM DC Motor

A geared motor is a motor that operates at a specific voltage range, typically 30 volts DC, to ensure proper performance and prevent damage. Geared motors are used in various applications, such as robotics, industrial automation, conveyor systems, and automotive. They provide higher torque while operating at a lower speed. To control the motor's speed and direction, additional circuitry may be needed, such as an H-bridge motor driver. To ensure proper performance, the power supply should be stable at 30V DC, as unstable or higher voltages can damage the motor or reduce its lifespan. The motor's datasheet should provide information on the current it draws at the specified voltage, including speed, torque, and efficiency. Physical dimensions and mounting options should also be considered to ensure the motor fits within the project's constraints.

BATTERY

Fig-7: Battery

Liquid crystals are the main component used in the operation of one type of flat panel display known as an LCD (Liquid Crystal Display). There are many consumer and business uses for LEDs because they are widely utilized in

computer monitors, instrument panels, televisions, cellphones, and other devices.

CONNECTING WIRES

Fig-8: Connecting Wires

A jump wire (also known as jumper, jumper wire, jumper cable, DuPont wire, or DuPont cable) is an electrical wire or group of them in a cable with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

FUTURE SCOPE

1. Enhanced Control Interface: Develop a dedicated mobile application or graphical user interface (GUI) for controlling the wheelchair's movement and reclining options. This would offer a more intuitive and user-friendly interface, incorporating features such as touch-based controls, customizable settings, and real-time feedback.

2. Sensor Integration: Integrate sensors such as proximity sensors or ultrasonic sensors to enable obstacle detection and collision avoidance capabilities. This would enhance the safety and autonomy of the wheelchair, allowing it to navigate through indoor and outdoor environments more effectively.

3. Automatic Reclining Profiles: Implement the ability to save and recall personalized reclining profiles based on user preferences. Users could define multiple reclining positions for different activities or comfort levels, enhancing the overall user experience and convenience.

4. Remote Monitoring and Assistance: Introduce remote monitoring and assistance features, allowing caregivers or healthcare professionals to monitor the wheelchair's status, location, and user activity remotely. This could facilitate proactive intervention in case of emergencies or technical issues.

5. Integration with Smart Home Systems: Explore integration with smart home systems and IoT platforms to enable seamless interaction with other connected devices and services. This could include voice-controlled operation, integration with home automation routines, and data sharing for health monitoring purposes.

6. Modular Design and Customization: Design the wheelchair with a modular architecture to facilitate easy customization and upgrades. This would allow users to adapt the wheelchair to their changing needs and preferences over time, while also promoting interoperability with third-party accessories and enhancements.

7. User Feedback and Iterative Improvement: Collect feedback from wheelchair users, caregivers, and healthcare professionals to identify areas for improvement and refinement. Continuously iterate on the design, functionality, and user experience to ensure that the wheelchair meets the evolving needs of its users effectively.

By exploring these avenues for future development, the reclining wheelchair using Arduino can evolve into a more advanced and adaptive mobility solution, empowering users with greater independence, comfort, and accessibility in their daily lives.

CONCLUSION

The development of a reclining wheelchair using Arduino, equipped with DC motors for head and leg reclining functionality, along with Bluetooth text-based controlling for movement and reclining options, represents a significant advancement in assistive technology for individuals with mobility impairments. By leveraging Arduino's versatility and Bluetooth communication capabilities, this project has successfully demonstrated the feasibility of creating a customizable and user-friendly solution for wheelchair users.

Through this project, we have achieved the integration of DC motors for reclining the wheelchair's head and leg sections, providing users with enhanced comfort and adaptability to different seating preferences. The utilization of Bluetooth communication enables users to control the wheelchair's movement and reclining options conveniently using text-based commands from a paired mobile device or computer.

REFERENCES

[1] Paralysis/Tetraplegia,Available:https://www.spinalcord.com/paralysis-tetraplegia [Accessed: 11/05//2018].

[2] Murai, Akira, et al. "Elevator available voice activated wheelchair." Robot and Human Interactive Communication, 2009. RO-MAN 2009. The 18th IEEE International Symposium on. IEEE, 2009.

[3] Lv, Xiaoling, Minglu Zhang, and Hui Li. "Robot control based on voice command." Automation and Logistics, 2008. ICAL 2008. IEEE International Conference on. IEEE, 2008.

[4] Ruzaij, Mohammed Faeik, et al. "Design and testing of low cost threemodes of operation voice controller for wheelchairs and rehabilitation robotics." Intelligent Signal Processing (WISP), 2015 IEEE 9th International Symposium on. IEEE, 2015.

[5] Ruzaij, Mohammed Faeik, and S. Poonguzhali. "Design and implementation of low cost intelligent wheelchair." Recent Trends In Information Technology (ICRTIT), 2012 International Conference on. IEEE, 2012.

[6] Ruzaij, Mohammed Faeik, et al. "Hybrid Voice Controller for Intelligent Wheelchair and Rehabilitation Robot Using Voice Recognition and Embedded Technologies." Journal of Advanced Computational Intelligence Vol 20.4 (2016).

[7] ITU NGN-GSI Rapporteur Group, Requirements for Support of USN Applications and Services in NGN Environment, Geneva, Switzerland: International Telecommunication Union (ITU), 2010.

[8] L. Atzori, A. Iera, and G. Morabito, “The internet of things: A survey,” Comput. Netw., vol. 54, no. 15, pp. 2787–2805, 2010.

[9] Mari Carmen Domingo “An overview of the Internet of Things for people with disabilities”, journal of Network and Computer Applications, 2012, pp. 584-596.

[10] Ruzaij, Mohammed Faeik, et al. "Design and implementation of lowcost intelligent wheelchair controller for paralysiss and paralysis patient." Applied Machine Intelligence and Informatics (SAMI), 2017 IEEE 15th International Symposium on. IEEE, 2017.

[11] Suryawanshi, S. D., J. S. Chitode, and S. S. Pethakar. "Voice operated intelligent wheelchair." International Journal of Advanced Research in Computer science and software engineering 3.5 (2013): 1.

[12] Atzori, Luigi, Antonio Iera, and Giacomo Morabito. "The internet of things: A survey." Computer networks 54.15 (2010): 2787-2805.

[13] Ruíz-Serrano, A., et al. "Development of a dual control system applied to a smart wheelchair, using magnetic and speech control." Procedia Technology 7 (2013): 158-165.

[14] Lu, Tao. "A motion control method of intelligent wheelchair based on hand gesture recognition." Industrial Electronics and Applications (ICIEA), 2013 8th IEEE Conference on. IEEE, 2013

[15] Rathore, Deepesh K., et al. "A novel multipurpose smart wheelchair." Electrical, Electronics and Computer Science (SCEECS), 2014 IEEE Students' Conference on. IEEE, 2014.

[16] Kondori, Farid Abedan, et al. "Head operated electric wheelchair." Image Analysis and Interpretation (SSIAI), 2014 IEEE Southwest Symposium on. IEEE, 2014.

[17] Ford, James M., and Saleem J. Sheredos. "Ultrasonic head controller for powered wheelchairs." Journal of Rehabilitation Research and Development 32.3 (1995): 280-284

[18] ESP8266 manual [Online] Available: https://www.espruino.com/ESP8266 [Accessed: 14 may 2018].

[19] L298 Dual-H-Bridge motor manual [Online] Available: http://www.instructables.com/id/Arduino-Modules-L298N-Dual-HBridge-Motor-Controll [Accessed: 15 may 2018].

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