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SMART ELECTRIC WHEEL CHAIR FOR HOME APPLIANCES CONTROL

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Abstract : The concept of the project is to design and implementation of a smart, motorized wheelchair using an Arduino controller, aimed at enhancing autonomy for individuals with mobility impairments. The system integrates a conventional electric wheelchair with bluetooth technology, allowing users to command self-mobility and control various home appliances such as lights and televisions through a user-friendly interface. The wheelchair supports both manual and automated operation, providing a significant improvement in independence and effortlessness for the user.Utilizing Internet of Things (IoT) technology, the wheelchair is equipped with Wi-Fi and Bluetooth connectivity, facilitating seamless interaction with smart home devices. Safety features include collision avoidance sensors, which help prevent accidents by stopping the wheelchair when obstacles are detected. Additionally, the energy efficiency of the wheelchair is optimized through an advanced battery management system. Preliminary testing with users who have different mobility impairments indicates that the smart wheelchair significantly enhances their ability to perform daily activities and interact with their environment independently. Future enhancements will focus on expanding device compatibility and improving the wheelchair's learning algorithms to better adapt to user behavior patterns and preferences.

Index Terms - Internet Of Thing(IOT) , Wireless Fidelity (Wi-Fi)

INTRODUCTION

Smart Wheel Chair is mechanically controlled devices designed to have self-mobility with the help of the user command. This reduces the user human effort and force to drive the wheels for wheelchair. Furthermore, it also provides an opportunity for visually or physically impaired persons to move from one place to another. The wheelchair is also provided with obstacle detection system which reduces the chance of collision while on thejourney. Smart wheelchair has gained a lot of interests in the recent times. These devices are useful especially in transportation from one place to another. The machines can also be used in old age homes where the old age persons have difficulty in their movements. The devices serve as a boon forthose who have lost their mobility. Different types of smart wheelchair have been developed in the past butthe new generations of wheelchairs are being developed and used which features the use of artificial intelligence and hence leaves a little to tinker about to the user who uses the wheel chair. The project also aims to build a similar wheel chair which would have a sort of intelligence and hence helpsthe user on his/her movement. The wheelchair is the most ubiquitous equipment used by people with lower limb disability. Most of the wheelchairs available in the market are manual in nature with some available with motorized option. Anything beyond that is custom made which is costly and not within the reach of most people. People with severe lower and upper disabilities have to resort to costly electronic controlled wheelchairs. People with severe lower and upper disabilities have to resort to costly electronic controlled wheelchairs or be totally dependent on another person to move them around in their manual wheelchairs. Motorized wheelchairs controlled through joystick, softball, finger, tablet, chin and head are readily available at a high cost but most of them do not cater for those with upper limb disability.People with severe lower and upper disabilities have to resort to costly electronic controlled wheelchairs or be totally dependent on another person to move them around in their manual wheel. It enables them some degree of freedom in mobility and independence as opposed to those with both upper and lower limb disabilities. The devices serve as a boon for those who have lost their mobility.

OBJECTIVES

It deals with the Existing System of the Smart Wheelchair. It deals with the Proposed System of the Smart Wheelchair.This explains the detail of Hardware Description and explains the detail of Software Requirements with presents the Result and Discussions.

RESEARCH METHODOLOGY

[1] Jinhui Fan., et.al [2011] The increase in the number of senior citizens and Disabled persons, there is a growing demand for human-friendly Wheelchairs as mobility aids.Wheelchair is often controlled by Hands via joysticks, so it is inconvenient and difficult for Persons in wheelchairs to play sports. To solve this problem,this presents a method of motion control based on sitting Postures, includingdirection and speed hand-free control. The High-speed analog data acquisition system provides enough Information according to the sitting postures of the wheelchair Users, where four force sensors are installed under the seat. The Intelligent wheelchair control system will calculate gravity Centre of human body and decide to move in which direction and provide proper speed to control the motors. At the same Time, it shows the dynamic moving directions and creates a real Time path map ofthe intelligent wheelchair to guide the users. This control mode will give the disabled or the wheelchair Athletes more opportunities not only for sports, but also for some other everyday work. The results of experiments and Simulations indicate that this intelligent wheelchair control System effectively provides mobility and autonomy to the target Population.

[2] Qiang Zeng, et.al [2016] This describes a novel robotic wheelchair, and reports experiments toevaluate its efficiency and understand how human operators use it. The conceptat the heart of the collaborative wheelchair assistant (CWA) is to relyon the user's motion planning skills while assisting the maneuvering with flexible path guidance. The user decides where to go and controls the speed (including start and stop), while the system guides the wheelchair along software-defined guide paths. An intuitive path editor allows the user to avoid dangers or obstacles online and to modify the guide paths at will. By using the human sensory and planning systems, no complex sensor processing or artificial decision system is needed, making the system safe, simple, and low-cost. We investigated the performance of the CWA on its interaction with able-bodied subjects and motion efficiency. The results show that path guidance drastically simplifies the control. Using the CWA, the wheelchair user needslittle effort from the first trial, while moving efficiently with a conventionalwheelchair requires adaptation.

[3] Diaz, V. S, et.al [2015] An electric wheelchair guidance system intended for people with heavy motion impairments (such as persons with tetraplegia), It is especiallyuseful when impairments also affect to wheelchair steering as it is able to automatically guide wheelchairs between diligent points in a known environment (a hospital, a school, etc.), conditioned with track marks paintedon the floor.Italso provides a semiautomatic navigation mode, where control is shared between user and navigation system. It is intended for learning wheelchair manipulation of some electric wheelchair users have strongmotion impairments restricting the needed movements for driving a wheelchair. Problems may arise driving along prolong. They can get tired asforce, accuracy and movement control needed to use the steering device musthe maintained for a long time. Several automatic control systems have been developed to free users from continuously attend wheelchair movement. Some of them have led to very interesting solutions based on autonomous motion wheelchairs, but withserious drawbacks when porting from research prototypes to commercial wheelchairs a low cost, fully open end as an aid in places where navigation is difficult or dangerous (i.e., for crossing narrow corridors). Some electricwheelchair users have strong motion impairments restricting the needed movements for drivinga wheelchair.

[4] Al-Haddad A. A., et.al [2012] In the present study, we put forward a new approach together with theclassic method, to direct the powered wheelchair by means of eye movements. At the same time as the wheelchair automatically travels towards the location of the desired destination, the user is granted to look around without restraints. Only Electro Oclo Graphy (EOG) signals are used to guidethe wheelchair eye gazes and blinks. Switching between guiding methods; typical manual method and developed automatic method, can be done any time by the user. In the proposed guiding approach; by scheming the gaze angle of the wheelchair user, the control unit is able to obtain the desired point location; distance and direction. Bug algorithms are employed to guide the wheelchair in the automatic guiding approach. Two different Bug algorithms are utilized to navigate the wheelchair in the auto controlling method. A comparison is discussed between Bug and Tangent-Bug, algorithms.

Experimental testsshow slightlydifferent resultsthan theory, because the bug algorithms cannot continuously update the robot's position data in experiments. Switching between guiding methods; typical manual method and developed automatic method, can be done any time by the user. A comparison is discussed between Bug and Tangent-Bug, algorithms.Experimental tests show slightly different results than theory, because the bug algorithms cannot continuously update the robot's position data inexperiments. Switching between guiding methods; typical manual method and developed automatic method, can be done any time by the user.

PROBLEM DEFINITION

The advances in speech recognition technology have made it possible to control any electronics-based device using voice command. This technology is capitalized for voice-controlled wheelchair to assist those withboth upper and lower limb disabilities. A variety of voice-controlled wheelchairs have also been developed by other researchers. This research is based on Voice-controlledWheelchair design based on mobile platforms, bymeans of Bluetooth technology, design and implementation of wireless remote-control solutions. In this work, Smart Wheelchair control using Arduino Uno microcontroller and Bluetooth Module via android application is presented. This control mode will give the disabled or the wheelchair athletes more opportunities not only for sports, but also for some other work.The results of experiments and simulations indicate that this intelligent wheelchair control system effectively provides mobility and autonomy to thetarget population. This research isbased on Voice-controlled Wheelchair design based on mobile platforms, bymeans of Bluetooth technology.

OVERVIEW OF THE PROJECT

The wheelchair is the most ubiquitous equipment used by people withlower limb disability. This enables them some degree of freedomin mobility and independence as opposed to those with both upper and lowerlimb disabilities. Most of the wheelchairs available in the market are manualin nature with some available with motorized option. Anything beyond thatis custom made which is costly and not within the reach of most people. People with severe lower and upper disabilities have to resort to costly electronic controlled wheelchairs or be totally dependent on another person to move them around in their manual wheelchairs. Motorized wheelchairs controlled through joystick, softball, finger, tablet, chin and head are readily available at a high cost but most of them do not cater for those with upper limb disability.

ARDUINO MICROCONTROLLER(HARDWARE)

The Arduino is an open-source electronics platform based on easy-to- use hardware and software used to build electronics projects. All Arduino boards have one thing in common which is a microcontroller. A microcontroller is basically a really small computer. With the Arduino, you can design and build devices that can interact with your surroundings. The Arduino boards are basically a tool for controlling electronics. They are ableto read inputs with their onboard microcontroller and turn it into an output.

Broad Types

Various kinds of Arduino boards are available depending on differentmicrocontrollers used. However, all Arduino boards have one thing in common: they are programed through the Arduino IDE. The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons you can use on a single board), speed,operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which you would need to buy separately. Some can run directly from a 3.7V battery, others need at least 5V.

Arduino Uno Microcontroller

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or batteryto get started.

The UNO differs from all preceding boards in that it does not use theFTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. The figure 5.1 contains UNO means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version1.0 will be the reference versions of Arduino, model for the Arduino platform. moving forward. The Uno is the latest in a series of USB Arduino boards ,and the reference Pin Configuration.
pins are explained below.
Vin: This is the input voltage pin of the Arduino board used to provide inputsupply from an external power source.
5V: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard components.
3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board
GND: This pin of the board is used to ground the Arduino board.
Reset: This pin of the board is used to reset the microcontroller. It is used to Resets the microcontroller.
Analog Pins: The pins A0 to A5 are used as an analog input and it is in therange of 0-5V.
Digital Pins: The pins 0 to 13 are used as a digital input or output for the Arduino board.
Serial Pins: These pins are also known as a UART pin. It is used for communication between the Arduino board and a computer or other devices. The transmitter pin number 1 and receiver pin number 0 are used to transmitand receive the data resp.
External Interrupt Pins: This pin of the Arduino board is used to producethe External interrupt and it is done by pin numbers 2 and 3.
PWM Pins: This pin of the board is used to convert the digital signal into an analog by varying the width of the Pulse. The pin numbers 3,5,6,9,10 and11 are used as a PWM pin.
SPI Pins: This is the Serial Peripheral Interface pin; it is used to maintain SPI communication with the help of the SPI library. SPI pins include:
SS: Pin number 10 is used as a Slave Select
MOSI: Pin number 11 is used as a Master Out Slave InMISO: Pin number 12 is used as a Master in Slave OutSCK: Pin number 13 is used as a Serial Clock

CONCLUSION

This project elaborates the design and construction of smart electric wheelchair with the help of bluetooth module. The circuit works properly to move as the command given by the user. After designing the circuit that enables physically disabled to control their wheel using an android application in their smartphones and it has also been tested and validated. The detection of any obstacle is successfully controlled by the microcontroller. This proposed system contributes to the self-dependency of differently abled and older people. The main aim of this project implementation is to help all the people who are dependent on wheelchair for; mobility. Wheelchair is simple to operate and does not need any external help. Proposed system of mobile operated wheel chair control using bluetooth connection very useful and efficiently.

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