

EV CONTROLLER DEVICE FOR PHYSICALLY CHALLENGED PERSON

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Abstract - "Safety Rules are best tools", as the quote says that the safety is a basic need of every human, it plays a major role in the automotive field. 1214 road crashes occur every day in India causing death, in this 50% causes due to rash drives. The ideology is to control the speed of the motor vehicles based on the speed limits given by government. The speed governor is completely based on the speed limit in city, taking curve and highways. It gives the complete status of the vehicles after met with accident to the police and ambulance services with the correct GPS locations. Any obstacles or speed breakers is been detected in the road and intimated the drive within 200 meters so that the driver could slow down the car, else the in build auto braking system activates and the vehicle is slowed down. The device is specially designed to operate using voice commands which help physically disabled persons to operate the vehicles. It also integrated with switches which act as an interrupt to on and off the vehicles.

Key Words: Physically Challenged E-Vehicle, GSM, GPS, Voice commands, Android Application.

1. INTRODUCTION

This project was developed in a way that the robot is controlled by voice commands. An android application with a microcontroller is used for required tasks. The connection between the android app and the vehicle is facilitated with Bluetooth technology. The robot is controlled by buttons on the application or by spoken commands of the user. The movement of the robot is facilitated by the two dc servo motors connected with microcontroller at the receiver side. The command from the application is converted in to digital signals by the Bluetooth RF transmitter for an appropriate range (about 100 meters) to the robot. At the receiver end the data gets decoded by the receiver and is fed to the microcontroller which drives the DC motors for the necessary work. The aim of Voice Controlled Robotic Vehicle is to perform the required task by listening to the commands of the user. A prior

preparatory session is needed for the smooth operation the robot by the user. For the same a code is used for giving instruction to the controller.

Our aim is to make a robot vehicle which can be controlled by the voice command of a person. Normally these types of systems are called as Speech Controlled Automation System (SCAS)[14]. Our design is a prototype of the above mentioned system. The idea is to create a sort of robot which going to be driven by voice commands. The robot is remotely controlled by a mobile phone; there are many articles that show the communication between a robot and smart phone. Smart phone is a very good interface for remotely automating the robot. It contains many features that can be helpful. In this design, an android application with a micro controller is used for the required task. The connection between the application and the robot is facilitate with Bluetooth technology. The commands issued will be relayed over through the channel and will be received by the module. The objective of voice controlled robotic vehicle (VCRV)[13] is to listen and act on the commands of the user. Here the system requires accent training, post which the device will start understanding the commands issued; and the commands have been added by codes.

The main motive to build a VCRV is to analyze the human voice and act according to the programmed commands. The most basic commands are backward, forward, right, left and also stop the robot. The vehicle is to be controlled wirelessly with the use of android smartphone; our intention is to make a robotic vehicle with use of advanced smartphone technology in a very simple and economic way. In current scenario vehicles are manually controlled and all are done by the person who is driving the vehicle. Every action like start and stop, applying brake, gear transmission, acceleration

requires human effort. But nowadays new technologies have been developed that can be integrated with the conventional vehicles to new vehicle form. In the technology era, the space between the physical and the digital world is brought closer by the introduction of gesture concept. For all dangerous tasks, we prefer technology rather than people. Even though these robots are being controlled manually in the early stages, these can now be controlled via voice and gestures. This technology of gesture and voice recognition can be defined by the interaction between the computer and the body language of human beings. This constructs the communication link between technology and mankind[17]. The target of this work is to upgrade the complete security to the robot and to simplify the controlling mechanism. The voice directions are handled, utilizing an advanced mobile phone. The individual human right hand robot is created on a smaller scale controller based stage and can know about its present area. The viability of the voice control conveyed over a separation is estimated through numerous examinations. Execution assessment is completed with consequences of the underlying investigations. The developments to be forecasted are possibly referring to the applications in ventures, medical clinics and how, including the environmental laboratories. Providing human labor is the biggest problem all over the world. With the help of this device, they can move in a wheelchair on their own by just giving voice commands through Bluetooth. If any obstacle is detected while moving it informs the user and stops. It also detects if any fire and smoke occur due to emergency, detects and informs the prescribed number to get the required help. A prototype is developed by incorporating all the features in a single module.

II. LITERATURE REVIEW

S.A. Daud (et al), [2013] describes the use of multiple Infrared sensors to reconstruct a shape by detecting any changes in sensor displacement when there is an obstacle placed in front of the sensor. Meanwhile, the distance between IR sensors and the obstacle was set at 5 cm to minimize the noise contributed by the reflection of the sensor during data collection. A stepper motor[15] was used in the experimental design

to control the movement of an obstacle which rotates at 3600 for one complete cycle. Additionally, Arduino Software was used as a micro controller to control the switching mode of the sensor and CoolTerm Software was used to store the sensor output data in the text file format. For analysis, Matlab Software has been used to plot the graph of sensor value against the collected data. IR sensors are capable in measuring data up to 0.05 cm of resolution in displacement. Experimental results showed that by using IR sensors[18], it is possible to reconstruct a shape via plotting the graph for cylinder, hemisphere and ellipse shape obstacles. Vocal-fold paralysis patients treated with stem-cellgrafting

Jun-ichiro Furukawa (et al),[2012] proposes a human movement model both for myoelectric assistive robot control and biosignal-sensorfailure detection. We particularly consider an application to upper extremity exoskeleton robot control. When using electromyography (EMG)-based assistive robot control, EMG electrodes can be easily disconnected or detached from skin surfaces because the human body is always in contact with the robot. If multiple electrodes are used to estimate multiple joint movements, the probability of sensor electrode misplacement increases due to human error. To cope with the aforementioned issues, we propose a novel human movement estimation model that takes anomalies into account as uncertain observations. We estimated human joint torques by automatically modulating the contribution of each sensor channel for the movement estimation based on anomaly scores that were computed according to synergistic muscular coordination. We compared our proposed method with conventional approaches during drinking-movement estimation with five healthy subjects in the three aforementioned anomaly situations and showed the effectiveness of our proposed method. We applied it to a four-DOF upper limb assistive exoskeleton robot and showed proper control in sensor failure situations.

Talluri, (et al),[2019] Nearness of specialist is basic for legitimate patient consideration. In any case, they can't be available on every single spot to give drug or treatment. So remote observing of a patient is the correct arrangement. This framework is utilized to

screen physical parameter like heart beat and send the deliberate information straightforwardly to a specialist through Web application. This System comprises of an IR base heart beat sensor, Arduino Uno. This estimates heart beat from a baby to senior individual. The minimal effort of the gadget will give fitting command post successful checking framework." Heart Rate observing framework utilizing Heart rate Sensor and Arduino". With the advancement of innovation, in this venture we can detect body temperature and pulse carefully utilizing Arduino. Arduino is utilized on the grounds that it can detect the earth by getting contribution from assortment of sensors and can influence its surroundings by controlling lights, engines, and different actuators. The microcontroller on the board is modified utilizing C". LM35 is utilized for the sense body temperature Body temperature is a fundamental parameter for checking and diagnosing human wellbeing. Heart beat sensor was utilized for detecting pulse. This gadget will enable one to quantify their mean blood vessel weight (MAP) in around one moment and the precise body temperature will be shown on the Android. The framework can be utilized to gauge physiological parameters, for example, Heart rate, Pulse rate.

Kjartan Halvorsen (et al), [2016] as discussed in a calibration method for a triaxial accelerometer using a triaxial gyroscope is presented. The method uses a sensor fusion approach, combining the information from the accelerometers and gyroscopes to find an optimal calibration using Maximum likelihood. The method has been tested by using real sensors in smart-phones to perform orientation estimation and verified through Monte Carlo simulations. In both cases, the method is shown to provide a proper calibration, reducing the effect of sensor errors and improving orientation estimates.

Antoine Ferreira (et al), [2012] as discussed Research activities on nanorobotics comprise an emerging interdisciplinary technology area raising new scientific challenges and promising revolutionary advancement in applications such as medicine, biology and industrial manufacturing. Nanorobots could be defined as intelligent systems with overall dimensions at or below the micrometer range that are made of

assemblies of nanoscale components while exploiting the physics at such a scale, or as larger platforms capable of robotic operations at the nanoscale. The development of nanorobots presents difficult design, fabrication and control challenges, as such devices will operate in microenvironments whose physical properties differ from those encountered by conventional parts. Furthermore, nanorobotics is a field that calls for collaborative efforts between physicists, chemists, biologists, computer scientists, engineers and other specialists to work towards this common objective.

Farrell Farahbod (et al), [2019] The x-axis of Time Domain Charts can now display elapsed time. Timestamps are recorded. Exported CSV files contain the UNIX timestamp for each sample. CSV files can be imported (replayed.) New and existing charts are configured with a non-modal side panel instead of a pop-up window. Layout files and CSV files can be imported via drag-n-drop. Charts can be maximized (full-screened.) The Time Domain Chart now renders properly even when the sample number is very large. Samples are automatically swapped to disk if there's not enough space in RAM. Binary mode supports uint8 values. Binary mode supports bitfields (for showing boolean and enum values.) Various small bug fixes. See the git commit log for more details.

III. EXISTING SYSTEM

There are various types of modified vehicles which are commercially used by the handicapped people in their day to day life. Let us see an overview of those vehicle as follows.

The manually operated tri-wheeled vehicles are the most commonly used disabled vehicles by the handicapped people. It is generally operated by the use of pedal and chain drive system linked to the sprocket of wheel rims. The wheels are fixed as rigidly by the use of clamps, couplings and linked with the help of frames. The entire design of the tri-cycle will be compact and in simple mode of construction. It provides the easy way to have good maintenance in conditions. The cost of the construction and development will be less when compared to that of other vehicles. The photographic image [16] of existing manually operated tri-wheeled vehicle.

IV. PROPOSED SYSTEM

Voice activation speaker recognition to regulate the Bioloid GP automaton by MFCC and DTW strategies is enforced well in automaton robots. The first step in the speech recognition process is feature extraction. In this paper, Mel Frequency Cepstrum Coefficient (MFCC) on the characteristic extraction process and Dynamic Time Warping (DTW) used have a feature matching technique. It is to develop a robotic vehicle using Arduino and to controls the vehicle with the help of voice based information. The whole mechanism of the project is based upon the device namely Arduino. The feature of “hand gesture” helps it to move wirelessly depending upon the Radio Frequency, which is placed upon the hand of the user. The voice command was given to the Android smartphone that converts speech to text and it communicates with the control unit through Bluetooth. When voice command reaches the control unit the robot should look for the object using a camera attached to it. The robot will rotate 360degree by taking a snap at each interval of time and the snap is analyzed. If the object is detected by the robot then it will calculate the distance between the object and robot . The four-wheeled voice assistant robot that is controlled by an android mobile phone is developed in this paper. The Voice Commands given by the user through the android mobile phone is transferred to the robot by Bluetooth network.

V. REQUIREMENTS

Arduino Mega

Arduino is open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It’s intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone, or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP)[19]. Arduino received an Honory Mention in the Digital Communities section of the 2006

Ars Electronica Prix. The Arduino Nano can be powered via the mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source.

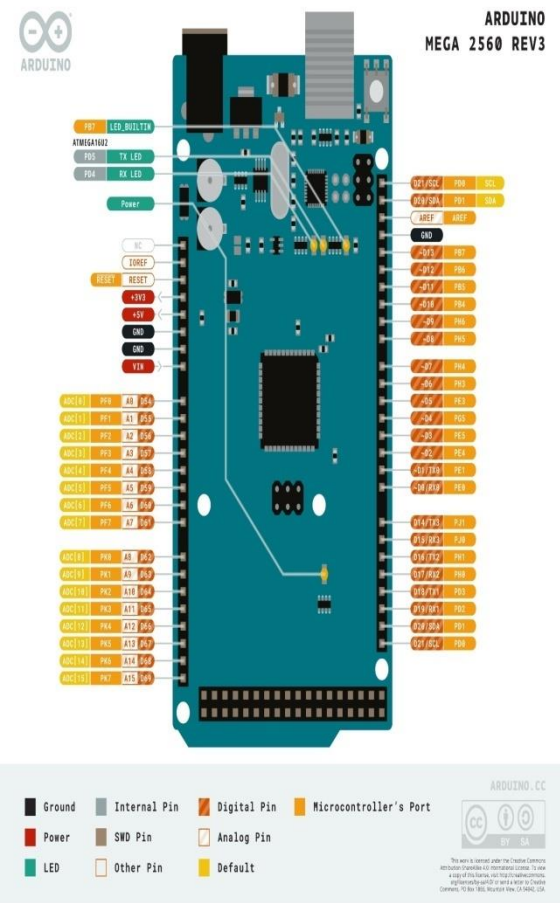


Figure 1: Arduino Mega

PIN DESCRIPTION

Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is a smallest, complete, and breadboard friendly. It has everything that Diecimila/Duemilanove has (electrically) with more analog input pins and onboard +5V AREF jumper. Physically, it is missing power jack. The Nano is automatically sense and switch to the higher potential source of power, there is no need for the power select jumper. Nano’s got the breadboard-ability of the Boarduino and the Mini+USB with smaller footprint than either, so users have more breadboard space. It’s got a pin layout that works well with the Mini or the Basic Stamp (TX, RX, ATN, GND on one top, power and

ground on the other)[20]. This new version 3.0 comes with ATMEGA328 which offer more programming and data memory space. It is two layers. That make it easier to hack and more affordable.

Bluetooth Module

HC05 module is a simple Bluetooth module is a simple Bluetooth serial port protocol module designed for wireless serial connection setup. It has a footprint as small as 12.7mm X 27mm. It will simplify the overall design cycle.

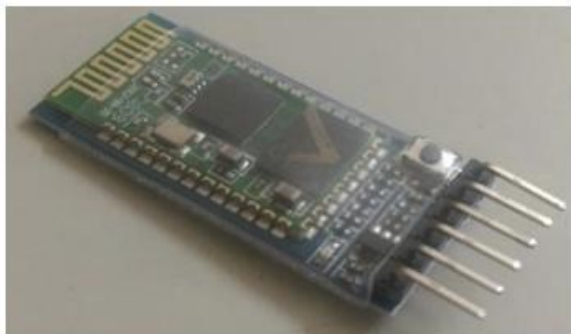


Figure 2: Bluetooth

GPS

The Global Positioning System (GPS)[22], originally Navistar GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Air Force.



Figure 3: GPS

It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. GPS provides critical positioning capabilities to military, civil, and

commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver. The GPS project was launched by the U.S. Department of Defense in 1973 for use by the United States military and became fully operational in 1995. It was allowed for civilian use in the 1980s. Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS and implement the next generation of GPS Block IIIA satellites and Next Generation Operational Control System (OCX)[27]. Announcements from Vice President Al Gore and the White House in 1998 initiated these changes. In 2000, the U.S. Congress authorized the modernization effort, GPS III. During the 1990s, GPS quality was degraded by the United States government in a program called "Selective Availability"; this was discontinued in May 2000 by a law signed by President Bill Clinton. The GPS system is provided by the United States government, which can selectively deny access to the system, as happened to the Indian military in 1999 during the Kargil War, or degrade the service at any time. As a result, several countries have developed or are in the process of setting up other global or regional satellite navigation systems. The Russian Global Navigation Satellite System (GLONASS)[23] was developed contemporaneously with GPS, but suffered from incomplete coverage of the globe until the mid-2000s.[8] GLONASS can be added to GPS devices, making more satellites available and enabling positions to be fixed more quickly and accurately, to within two meters (6.6 ft).[9] China's BeiDou Navigation Satellite System is due to achieve global reach in 2020. There are also the European Union Galileo positioning system, and India's NAVIC. Japan's Quasi-Zenith Satellite System (QZSS) is a GPS satellite-based augmentation system to enhance GPS's accuracy.

GSM

The communication with this module is done through UART or RS232 Interface. The data is sent to the module or received from the module though UART interface. The module is typically connected to +4.0V standard power supply. It can work on +4.5V regulated

power and any higher voltage may damage the module. And the power source should be able to deliver a peak current of 2A. The UART interface is established as shown in figure. All you need to do is connect RXD of module to TXD of Arduino and TXD is connected to RXD of ARDUINO. The ground of controller and module must be connected for voltage reference. Here AUDIO IN is connected to MIC and AUDIO OUT is connected to a speaker or headset. And at last we need to connect a working GSM SIM card to the module. On powering the module the NETLIGHT LED will blink periodically to state successful connection. After all connections are done, we need to write a program for the microcontroller to exchange data with module. Since data exchange sequence between controller and module is really complex we will use libraries prewritten for the module. You can download libraries for controller or module through their websites. Using these libraries makes the communication easy. All you need to do is download these libraries and call them in programs. Once the header file is included, you can use simple



Figure 4:GSM

commands in the program to tell the controller to send or receive data. The controller sends the data to the module through UART [21] Interface based on protocol setup in libraries. The module sends this data to another GSM user using cellular network.

Gyro Sensor

A micro electro mechanical system, popularly known as MEMS, is the technology of very small electromechanical and mechanical devices. Advance in MEMS technology has helped us to develop versatile products. Many of the mechanical devices such as Accelerometer, Gyroscope, etc... can now be used with consumer electronics. This was possible with MEMS technology. These sensors are packaged similarly to another IC's. Accelerometers and Gyroscopes complement each other so, they are usually used together. An accelerometer measures the linear acceleration or directional movement of an object, whereas Gyroscope Sensor measures the angular velocity or tilt or lateral orientation of the object. Gyroscope sensors for multiple axes are also available. Gyroscope sensors are also called as Angular Rate Sensor or Angular Velocity Sensors. These sensors are installed in the applications where the orientation of the object is difficult to sense by humans. Measured in degrees per second, angular velocity is the change in the rotational angle of the object per unit of time.



Figure 5: Gyro Sensor

Depending on the direction there are three types of angular rate measurements. Yaw- the horizontal rotation on a flat surface when seen the object from above, Pitch- Vertical rotation as seen the object from front, Roll- the horizontal rotation when seen the object from front. The concept of Coriolis force is used in Gyroscope sensors. In this sensor to measure the angular rate, the rotation rate of the sensor is converted into an electrical signal. Working principle of Gyroscope sensor can be understood by observing the working of Vibration Gyroscope sensor[25]. This sensor consists of an internal vibrating element made

up of crystal material in the shape of a double – T-structure. This structure comprises a stationary part in the center with ‘Sensing Arm’ attached to it and ‘Drive Arm’ on both sides. This double-T-structure is symmetrical. When an alternating vibration electrical field is applied to the drive arms, continuous lateral vibrations are produced. As Drive arms are symmetrical, when one arm moves to leave the other moves to the right, thus canceling out the leaking vibrations. This keeps the stationary part at the center and sensing arm remains static. When the external rotational force is applied to the sensor vertical vibrations are caused on Drive arms. This leads to the vibration of the Drive arms in the upward and downward directions due to which a rotational force acts on the stationary part in the center. Rotation of the stationary part leads to the vertical vibrations in sensing arms. These vibrations caused in the sensing arm are measured as a change in electrical charge. This change is used to measure the external rotational force applied to the sensor as Angular rotation.

Arduino Application

The application to control the vehicle was coded and created using app available on the Google play store known as MIT AI2[26] Companion. This app was developed by MIT Figure 7. Shows MIT AI2 App. Developed Android app with the help of the app we developed an app and named it as AMR_VOICE. The app contains the option to connect to Bluetooth and access the Bluetooth settings of the phone.

Ultrasonic Sensor

The sensor systems emit ultrasonic waves to the environment, which are reflected by the object; the system detects the obstacle based on the latency in the emission and reception of ultrasonic rays from the ultrasonic sensor. It can measure up to 2cm to 3m distance. It uses 40 KHz radio frequency signal for the detection. Working Voltage: 5V (DC), Static current: Less than 2mA. Output signal: Electric frequency signal, high level 5V, low level 0V. , Sensor angle: Not more than 15 degrees. Detection distance: 2cm-300cm, High precision: Up to 2mm, Input trigger; signal: 10us TTL impulse, Echo signal: output TTL PWL[24] signal.

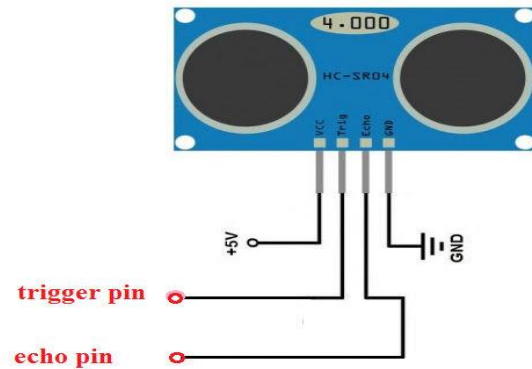


Figure 6: Ultrasonic Sensor

SOFTWARE REQUIREMENTS

- Arduino IDE
- My SQL
- JDBC
- Android Application

VI. RESULTAND CONCLUSION



The proposed system reduces the external dependency on a central database, which would involve some tedious work in putting together a lot of information on mapping the desired locations. Since, each tag is separately programmed to relay-time information; this system is more advantageous and requires lesser implementation of time. For the welfare of the visually impaired people in mind, the system could still be used by all people, making the system economically feasible. For example, it could be implemented in huge unfamiliar places like museums, people tend to get lost, for guidance. Thus this could be applied to the majority of the population, enhancing the system usage. The

“Voice Controlled Robotic Vehicle”[28] project has many applications and in present and future. The project can be made more effective by adding features to it in the future. The project has applications in wide variety of areas such as military, home security, rescue missions, industries, medical assistance etc. We were successful in implementing a simple model of voice controlled robotic vehicle using the available resources. The implementation of this project is easy, so this robot is beneficial for human life. The Voice Control Robot is useful for disable people and monitoring purpose. It works on simple voice command, so it is easy to use. It is useful for those areas where humans can't reach. The size of this robot is small, so we can use this robot for spying purpose. It can be used for surveillance. We Figure 7: Prototype For EV Control Unit.

can implement web cam in this robot for security purpose. The voice recognition software has an accuracy and for identify a voice command and it is also highly sensitive to the surrounding noise.

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