An Intelligent Robotic Wheelchair For Physically Challenged People

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Abstract- *Our project is specifically related to the Smart Android phone handling the wheelchair system using the application. The wheelchair System is recommended to control a wheelchair by using the android application in the mobile device and system. The system is designed to control a wheelchair by using an android device. The objective of this project is to facilitate the movement of disabled people or handicapped and also the senior people who are not able to move well. The result of this design will allow the special people to live a life with less dependence on others. Android technology is a key that may provide a new approach to human interaction with machines or tools. Thus, their problem can be solved by using android technology to control the movement of a wheelchair. The smart robotic wheelchair has a great significance in the life of a disabled person. With several merits, a wheelchair becomes a dilemma for a disabled person when comes to self-propulsion. This project describes an economical solution for robot control systems. The presented wheelchair control system can be used for different sophisticated robotic applications. The robotic wheelchair comprises the features like sensing hindrances and circuitry to avoid colliding with an obstacle.*

Implementing embedded systems solutions on self-propelled wheelchairs enhances upgradability. Physical disability is a curse to human life. The fundamental operation of the wheelchair to the handicapped person with safe movement. For ensuring the safety of movement, obstacle sensing, crack detection and living being identification features have been included. Additionally, a controlled LCD has been provided considering the case of auditory disabled people. Access to control hone appliances has also been offered in this proposed system. This system has one more feature of remotely controlling some devices such as turning ON/OFF lights and also communicating with the caretaker.

I. INTRODUCTION

People with physical disabilities every time find it complicated to navigate through their house without the assistance of someone. But to navigate through one's own home without contributing to anyone all time can be demoralizing for the person as well. It can be handled in wireless methods. The future intelligent robotic wheelchair can learn the layout of its environment (hospital, rehabilitation center, hone, etc.) through a narrated, guided tour given by the user or the uses caregivers. Subsequently, the wheelchair can move to any previously-named location under voice command (e.g., 'Take me to the cafeteria"). This technology is appropriate for people who have lost mobility due to brain injury or the loss of lines, but who retain speech. The technology can be enhanced with Tongue Motion Driver to move the chair by the movement of the tongue which will be easier for totally paradise people. It can be modified by gesture technology or voice-commanded technology. The technology can also enhance safety for users modified by caterpillar tracks which can be used through stairs. The system comprises two major units. The first unit is a simple user of two hand gesture units. The second unit is the wheelchair unit. The first gesture unit consists of a controller which monitors the motions of fingers and transmits the corresponding control signal to the wheelchair unit. The wheelchair unit also consists of a controller for controlling the movement of the wheelchair. The second gesture unit consists of a controller the controller can detect the audio announcement. The bright and innovative design will help the handicapped person along with reducing the lifestyle of those types of patients.The wheelchair will be controlled by voice instructions using the input provided. The Arduino will handle all of the user's desired directives. Each direction's instructions are written in the form of a program in the Arduino itself. The unilateral mic, which will be positioned according to the user's comfort, will provide spoken commands to the wheelchair. The HC05 Bluetooth module will do speech recognition. Arduino then receives the output from this module Arduino's pre-written algorithms assist Arduino in converting these vocal commands into significant output, and the wheelchair will move appropriately. People will gain independence by using a wheelchair control system. The wheelchair control system makes use of a speech recognition technology to trigger and control all of its motions. The technology allows users to operate the wheelchair by just speaking into the wheelchair's microphone. The fundamental movement functions are forward and reverse motion, left and right turns, and stop. The spoken words are sent to the speech recognition processor

II. LITERATURE REVIEW

LITERATURE SURVEY 1: Elias Reichensdörfer , Dirk Odenthal, and Dirk Wollherr "On the Stability of Nonlinear Wheel-Slip Zero Dynamics in Traction Control Systems" @2021 The development of modern engines with increasing power, fast dynamics, and responsiveness, as well as changes in system architecture, set new requirements on traction control system design for vehicles. We propose a robust nonlinear control design based on input–output linearization to solve the traction control problem. The oscillatory Behavior of the powertrain is taken into account explicitly during the controller design phase. Previous work has not addressed this case and no results on stability are available so far. We proof global asymptotic stability of the nonlinear zero dynamics analytically using a parametric Lyapunov function. The traction controller is implemented on different test vehicles and validated for different driving maneuvers and road conditions. Experimental results obtained with test vehicles and by simulation demonstrate stability, high performance, and robustness of the proposed approach.

LITERATURE SURVEY 2: Klaus Albert , Karmvir Singh Phogat , Felix Anhalt , Ravi N. Banavar , DebasishChatterjee , and Boris Lohmann "Structure-Preserving Constrained Optimal Trajectory Planning of a Wheeled Inverted Pendulum" 1552-3098 © 2020 IEEE The wheeled inverted pendulum (WIP) is an under actuated, non holonomic mechatronic system, and has been popularized commercially as the Segway. Designing a control law for motion planning, that incorporates the state and control constraints, while respecting the configuration manifold, is a challenging problem. In this article, we derive a discrete-time model of the WIP system using discrete mechanics and generate optimal trajectories for the WIP system by solving a discrete-time constrained optimal control problem. Furthermore, we describe a nonlinear continuous-time model with parameters for designing a closed-loop linear–quadratic regulator (LQR). A dual control architecture is implemented in which the designed optimal trajectory is, then, provided as a reference to the robot with the optimal control trajectory as a feed forward control action, and an LQR in the feedback mode is employed to mitigate noise and disturbances for ensuing stable motion of the WIP system.. This corroborates the validity of the nonlinear model and the control scheme. Finally, these experiments demonstrate the highly nonlinear nature of the WIP system and robustness of the control scheme.

LITERATURE SURVEY 3Fabian Schmida,b, Lina Taubea, Jenny Riecka, Frank Behrendta Electrification of waste collection vehicles: Techno-economic analysis based on an energy demand simulation using real-life operational data" 2020 Waste transport plays an important role in the decarbonization of the transport sector. In this paper diesel-powered (dWCV) and electric waste collections vehicles (eWCV) and their operation are analysed regarding energy demand and total cost of ownership (TCO) integrating Well-to-Wheel emission costs. Further, an open-source simulation tool with a route synthetization approach is presented using extensive real-life operational data of five different route types. Determined WCV energy demand varies greatly between vehicle topologies and analysed route types. eWCV show a mean distance-specific energy demand of 1.85 kWh·km-1, while values for dWCV increase to 5.43 kWh·km-1 respectively. The factors route distance and number of waste containers collected show the highest influence on results. Therefore, battery capacity should be sized according to specific route types. eWCV show higher TCO than dWCV under current economic constraints but fuel price level and annual vehicle mileage show a high influence on economic feasibility. Taking the planned emissions price mechanism of the German Government into account, economic scenarios could be identified, which make eWCV advantageous yet in 2021. In technical terms, there is nothing to stop for the electrification of WCV, and with suitable political instruments eWCV could become profitable in the short-term.

LITERATURE SURVEY 4: Johanne Mattie , Jazzmin Tavares, Bryn Matheson, Emma Smith, Ian Denison,William C. Miller, and Jaimie F. Borisoff Evaluation of the Nino® Two-Wheeled Power Mobility Device: A Pilot Study @ 2020 Novel technologies such as the Nino® two wheeled powered mobility device are

III. PROJECT DESCRIPTION

3.1 PROBLEM STATEMENT

Though the recent developments of science and technology has drastically changed the way a normal person lives his life, there are certain groups of people who have not been able to be benefit from this development. On particular handicapped people with have limited mobility are still living a miserable life. A smart wheel chair aims to provide aid to those handicapped and physically challenged persons by providing them with some sort of mobility which would greatly help them. Smart wheel chair consists of a major controller unit which allows the user to provide the input in the form of sensor or a voice command. The controller unit then synthesizes the command and takes required action so as to move the wheelchair to the particular position. Before making the final decision regarding the choice of the minor project, brief research was conducted to find out the projects

done previously on the related topic. There were only few previous projects that dealt with speech synthesis processing we could find out. After our project proposal was accepted, much effort was made to find the necessary resources on the ultrasonic sensor, speech synthesizer.

3.2 PROJECT SCOP

A wheel chair is a mechanically operated device that allows the user to move about independently. This minimizes the user's personal effort and force required to move the wheel chair wheels. Furthermore, it allows visually or physically handicapped people to go from one location to another. Voice commands and button controls can be used to operate wheel chairs. In recent years, there has been a lot of interest in smart wheel chairs. These gadgets are very handy while traveling from one location to another. The devices can also be utilized in nursing homes where the elderly have difficulties moving about. For individuals who have lost their mobility, the gadgets are a godsend. Different types of smart wheel chairs have been created in the past, but new generations of wheel chairs are being developed and utilized that incorporate the use of artificial intelligence and therefore leave the user with a little to tamper with. The project also intends to develop a comparable wheel chair that has some intelligence and so assists the user in his or her mobility.

3.3 PROJECT OBJECTIVE

Our project is the voice control wheel chair. In this project, we first built a robot chair and then set up numerous systems for sick patients and the elderly. Which may be taken anywhere by using the voice command and button control while seated in the chair. The wheel chair was initially intended to help the sick and aged. The goal of this article is to create a wheelchair that moves in response to the user's orders. This system is controlled by the wheelchair user's voice or button instructions. The technology is completely selfcontained, since the user does not require the assistance of another person to move the wheelchair. There are generally five commands and depending on whatever command is provided by the user, the wheelchair will move appropriately the first stage, the user's vocal instructions are recognized. When a command is acknowledged, it is translated into the corresponding instructions that drive the system. This system is made up of two primary apps and modules: voice recognition and motor driving. The voice recognition is performed via a voice recognition software. The output of this Bluetooth module is sent to Arduino, which drives the motors with a motor driver IC. The unilateral voice recognition app, Bluetooth, motor driver module, Arduino, and motors are used to power the voice-controlled wheelchair. The phone app serves as the system's input. It can take voice commands from the user and ignore other sounds. The mobile app will be positioned according to the user's preference the output is in the form of speech signals, which are sent to the voice recognition software, which serves as a bridge between the Bluetooth module and the Arduino. The output from the speech recognition software is then received by the Arduino, which converts it to binary code. Any language other than binary code is unintelligible to the system. As a result, the produced voice command is translated into machine-readable form. The Arduino Mega is used in this setup. It is linked to motors that allow the wheelchair to be driven anywhere. The wheelchair's mobility is controlled by motors. As a result, motors get input from the Arduino and move in accordance with the kind of instruction.

3.4 EXISTING METHODOLOGY

Several studies have concluded that independent mobility or movement which is included powered wheelchairs, manual wheelchairs, and walkers access benefit all disabled human beings. Independent mobility increases vocational and educational opportunities,

3.6 WORKING

3.6.1BLOCK DIAGRAM

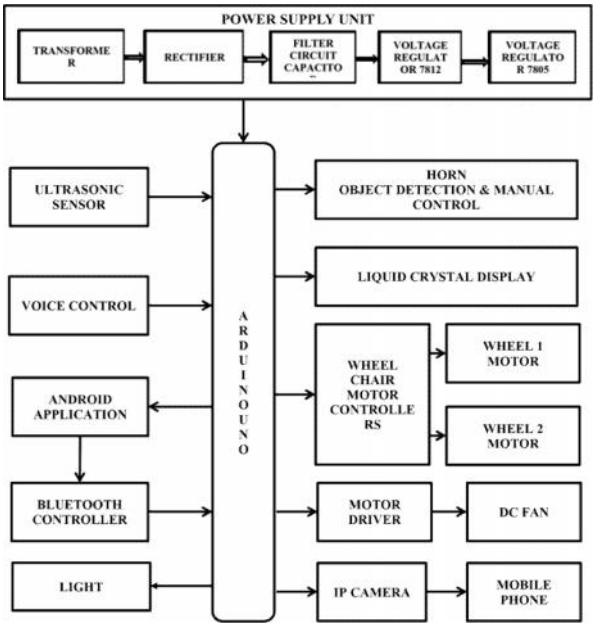

Figure 3.6 Block Diagram

IV. HARDWARE DESCRIPTION

4.1.1 ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328. 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 a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

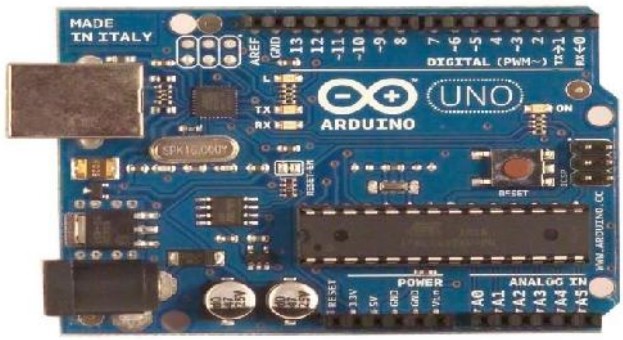

Figure 4.1.1 Arduino

POWER:

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of

V. CONCLUSION

The smart robotic wheelchair has a great significance in the life of a disabled person. With several merits, a wheelchair becomes a dilemma for a disabled person when comes to self-propulsion. This project describes an economical solution for robot control systems. Finally implemented using Arduino UNO. By using an Android app, we have successfully designed and implemented a motorized wheelchair. For most of the commands. This project will help all the disable people who are dependent on wheelchairs for their mobility. All the common man can reach out for this smart wheelchair to become independent for mobility if they hold a smartphone.

VI. FUTURE SCOPE

As the future work, we can provide a friendly atmosphere for disabled persons that is alerting in case of obstacles and updating the whole indoor environment condition to wheel chair and giving controlling of the devices at wheel chair itself which avoids the problem of approaching the switch. A seat belt should be used in order to keep the patient/user in the chair while attempting the transfer.

REFERENCES

[1] Based Intelligent Wheelchair Design. vol:2, issue:2, Apr,May, 2014.
[2] Uddhavkhadilkar, NarendraWagdarika Android phone controlled Voice, Gesture and Touch screen operated Smart Wheelchair, IEEE,2015.
[3] Prof. Vishal V. Pande, Nikita S.Ubale, Darshana P. Masurkar, Nikita R. Ingole, Pragati P. Mane, I Hand Gesture Based Wheelchair Movement Control for Disabled Person Using MEMS.ISSN:2248-9622, Vol. 4, Issue 4(Version 4), April 2014, pp.152158 4. D . Suryawanshi, Mr. J. S. ChitodeMs. S. S. Pethakar, Nelson S Voice Operated Intelligent Wheelchair Ms. S., Volume 3, Issue 5, May 2013 ISSN: 2277 128X
[4] “Smartphone Accelerometer Controlled Automated Wheelchair” by Vigneshwar.Santhanam and Vignesh. Viswanathan. 2017
[5] “Voice OperatedWheelchair” by JayeshK.Kokate Available online at www.ijret.org
[6] Chen, Joy Songz Zong. "5G TECHNOLOGY AND ADVANCEMENTS IN CONNECTED LIVINGCOMPREHENSIVE SURVEY." Journal of Electronics 1, no. 02 (2019): 71-79.
[7] Sungheetha, Akey, and Rajesh Sharma. "Cost-Effective Energy-Saving System in Parking Spots." Journal of Electronics 2, no. 01 (2020)