Intelligent ROBOTIC WHEELCHAIR

An Helping Hand for Disabled

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ABSTRACT

**Being disabled brings about a feeling of isolation from the outside world and a sense of dependability as we have to depend on others help for just moving from one place to other and many other basic needs. Wheelchair has solved this problem to an extent as it’s provides personal mobility for the aged and disabled. But it is very difficult for the disabled people to use the manual power of the wheelchair independently. As a solution to this problem, the approach is to develop a power wheelchair which can be controlled with a simple android device using IOT technology. In this approach the technology initially used to control robots i.e., to control a power wheelchair using an android device either by touch joysticks or by voice commands or by gesture.**

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Keywords— Wheel Chair, Disabled Persons, IOT Technology, Joystick, Gesture

# INTRODUCTION

The developed prototype has a mechanism that permits the consumer to seriously change from sit-to-stand (STS) posture and vice versa. With the assist of the developed wheelchair, the consumer will additionally be in a position to modify the posture of his higher physique the usage of an adjustable lower back help the use of two linear actuators. This configuration will permit the person to use the wheelchair as a mobility gadget as properly as for rehabilitation functions besides the want of exterior support. The availability of STS and again adjustment mechanisms will enable the consumer to do ordinary exercising which will decorate blood circulation as sitting for lengthy intervals inflates decrease limbs disability. The proposed configuration will assist in improving the useful skills of end-users permitting for elevated independence and finally exceptional of life.

Product diagram is the thinking of systematic strategy in perception the person requirement, current deficits, feasible enchancment and inventing new designs thru thinking generation, notion development, and thinking recognition thereby bringing more recent merchandise and options for the higher satisfactory of life. A chair with wheels designed as a substitute for taking walks is recognized as wheel chair. This is used for motion of bodily disabled, elder people, kids who have situation and are unable to walk. This machine comes in many editions like self propelled, propelled by way of the motor or with the assist of an attendee to push. Figure 1 & two indicates the components of inflexible body and X body wheel chair and its parts. At existing sufferers are dealing with trouble whilst defecating. Patients desires to be lifted up and helped to eliminate the gown and make them defecate, which is discomforting to the sufferers in emergency condition. The layout of returned rest in the current wheel chair creates repetitive stress harm if the affected person is sitting for a lengthy time. The existing graph of brake desires to be multiplied for higher have an impact on and utility of brake in slope area. Arm relaxation creates obstruction whilst moving the affected person from wheel chair to vehicles, no answer in the current layout to make ease of moving of affected person to transportation vehicle.

**Problem Statement :**

Robotic applied sciences have the viable to enhance the existence of human beings struggling from one or greater disabilities. Related trends are regularly grouped beneath the phrases Rehabilitation Technologies or Assistive Technologies. They strive to repair human skills that have been decreased or misplaced by means of disease, accident, or historic age. Mobility is one such function.

There are many motives why a character might also now not be capable to tour freely, inclusive of motor manipulate problems, spinal injuries, and amputation. A wheelchair is a mechanical system that can frequently assist. It efficaciously makes use of wheels and mechanical aid to overcome a loss of legs or leg control. Manual wheelchairs can be operated by way of folks who have the use of their top physique or anybody on hand to assist. Powered wheelchairs have been developed for when both of these instances does now not apply. However, these units commonly require a excessive stage of consumer manipulate and this is some thing precluded by way of many extreme types of disablement. In current a long time many companies have researched the probabilities of robotic wheelchairs. These endeavours are aimed at developing ‘intelligent’ gadgets that can experience facts from their surroundings and reply in beneficial ways.

**II. LITERATURE SURVEY**

A wholesome man or woman discharge his obligations efficaciously except taking assist of different individual however regrettably on the different hand, bodily handicapped character both from beginning or due to some misshaped in his lifestyles or at some stage of lifestyles is based on others to function any form of work. They want aid of different character for performing their activities duties such as for going hospital, shops for advertising etc. Considering these in mind, the current work is centered on the records of wheel chairs, market surveys, and bodily challenged humans requirements. On the groundwork of gathered facts graph the wheelchair which has low fee and approachable for terrible and center type population. It is appropriate for such man or woman who has no leg(s). The designed wheel chair is battery operated and can take flip in both course (left/right) via handle, having bicycle kind breaking association and additionally strikes on curbs, steep inclinations and ordinary roads with a pace of 6 km/hr or travels 32km in 5.32 hours at a stretch. For protection of the man or woman there is a provision of security belt in the wheel chair. [1]

The wants of many humans with disabilities can be relaxed with standard guide or powered wheelchairs, a phase of the disabled neighborhood finds it tough or not possible to use wheelchairs. There is widespread lookup on computer-controlled chairs the place sensors and smart manage algorithms have been used to limit the stage of human intervention. This task describes a wheelchair for bodily disabled people. Our purpose is to graph and enhance a machine that permits the consumer to robustly have interaction with the wheelchair at distinct ranges of the manage and sensing. A dependent-user awareness the usage of Head actions and infrared sensor built-in with wheelchair. A wheelchair can be pushed the usage of acceleration sensor and Head Movements with the opportunity of averting obstacles. Our task Automatic wheelchair essentially works on the precept of acceleration, one acceleration sensor, offers two axis, acceleration sensors whose output varies in accordance to acceleration utilized to it, via making use of easy system we calculate the quantity of tilt &amp; output of tilt will figure out to pass in which direction. Sensor offers x-axis &amp; y-axis o/p independently which is fed to ADC &amp; then µC &amp; relying on the pulse width it decides to cross or not. On chair Obstacle sensors will be installed. Total four sensors will be hooked up for detection of wall/obstacle in the forward, backward, left &amp; proper direction. We are attempting to construct a managed wheelchair; the machine will recognize and obeys herbal language action instructions such as “Take a right.” Various applied sciences are used for growing such a system. [2]

Robotic wheelchairs extend the capabilities of traditional powered devices by introducing control and navigational intelligence. These devices can ease the lives of many disabled people, particularly those with severe impairments, by increasing their range of mobility. A robotic wheelchair has been under development at the University of Wollongong for some years. This thesis describes on going work towards the ultimate aim of an intelligent and useful device. [3]

Hand gesture wheelchair machine is trending presently for disabled peoples. In this we designed a hand gesture wheelchair gadget for a disabled man or woman the use of the raspberry pi. This is beneficial for disabled peoples who face situation in transferring one location to any other in each day life. Normally wheelchairs are pushed by way of the assist of different people or by using ourselves. Various kind of wheelchairs is built like joystick control, eye manipulate and head manage systems. And in the proposed is required to function the joystick for the motion of the chair. The redecorate of guide wheel chair used to be viewed for this project. The sketch of wheel chair commenced via capacity of literature assessment to be aware of its comparison from in the past to the existing generation. Market find out about was once carried out to understand the current opponents handy in the market with price evaluation of the current product. Ethnography learn about was once performed to study the need, the significance of the current product and to tackle the plan hole in the current product to the consumer want thru questionnaires. The feed again was once taken from special customers and attendees, idea era and format execution was once performed by way of the implementation of layout methodologies like Quality Function Deployment, Mind mapping, Product Design Specification. The closing output is a wheel chair which offers a couple of choice to the person and attendee with the aid of supplying ease of defecation, cleansing and altering of clothes. Adjustable again rest, arm rest, leg relaxation offers alleviation for the affected person whilst resting. The adjustable arm relaxation furnish ease of transferring the affected person from chair to the bed or to the vehicle. Facility supplied for retaining plate whilst having food, studying and retaining water bottle. Additional to this alarm facility is furnished to inform the attendee that there is a want of his / her presence to the patient. Validation of the prototype is completed and utilization is discovered satisfactory. [5]

The paper based on the work “Robotic wheelchair using android, touch-setup, speech and gesture control” is designed with the help of above surveys which was taken as a reference for building the project. The entire project is mainly processed with the help of Raspberry-Pi.

# III. METHODOLOGY

## **Block Diagram**

The below block diagram tells us about the connections of entire circuit diagram of wheel chair using raspberry-pi according to software implementation.

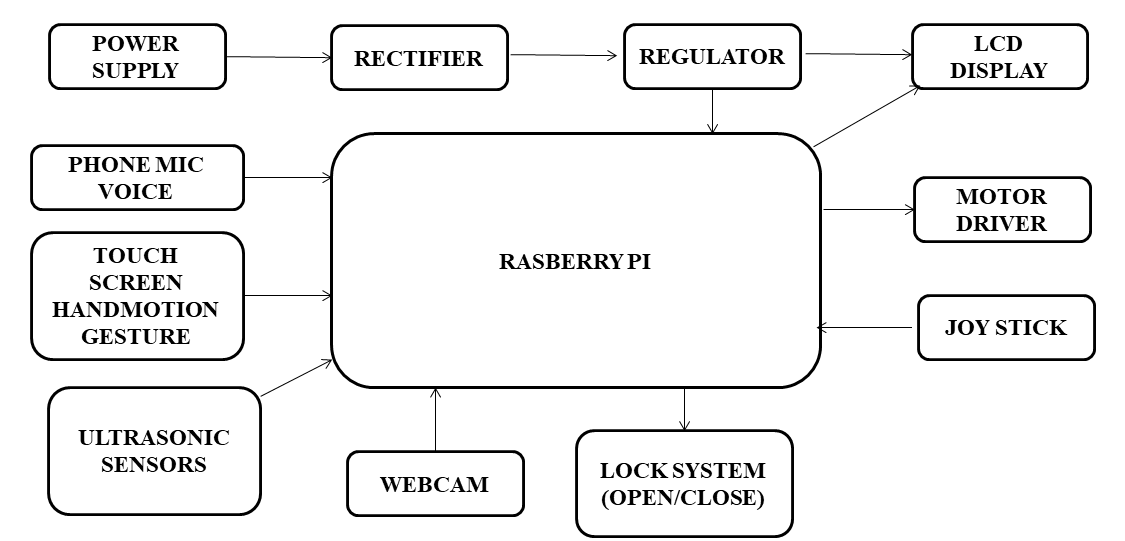


Fig 1: Block Diagram

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## **Methodology**

Raspberry-pi is mainly used for controlling the robotic wheel chair. A separate power supply cable is plugged in to one of the slot of USB charger connected to power supply and another c-type cable of phone adapter is used to connect the raspberry-pi. Initially the c-type cable is connected to power supply. Further 12v phone adapter cable is connected to the power supply and external power supply of 5v is used. ADC converter is used in the circuit as raspberry-pi does not have any internal converters . L293D driver is used to control the motors and power extension board is used to distribute the power to all the modules. plug in the two USB cables of camera and mick to the raspberry-pi. An ultrasonic distance sensor is used to detect the obstacle, a buzzer is interconnected to the sensor which will sounds when object is less than 40m. External ON/OFF Switch is used to control the whole application. after the application starts running the external switch is made off so that the face recognition program will run and further whole program will be executed. the operation of robotic wheel chair is functioned using commands obtained from joystick, Mems and USB microphone.

This signal is used to control the direction of the motors. The axis of movement and the corresponding commands that are given to the motors for driving the wheel-chair. In case of lifting the wheelchair, the directions forward and backward of the joystick will be as the command for sit and stand. A tolerance is taken into consideration in reading the values of the joystick, for some stability issues.

The joystick is selected to control the movement of the four motors; the two lifting and two driving motors. The joystick is considered to be an input to the system where it consists of two potentiometers, one controls the vertical direction and the other controls the horizontal direction by moving the stick. When the stick is moved vertically or horizontally the values of the potentiometers change respectively and give an analogue signal (0– 1,024) to the raspberry-pi.

**IV. SOFTWARE IMPLEMENTATION**

March 14 is known as Pi Day because the date represents the first three numbers in the mathematical constant π (3.14). We're celebrating with our coverage of everything Raspberry Pi related. If you've never even thought of what HTML means, you can still create amazing gadgets using Raspberry Pi and a bit of imagination.

What you'll need to get started with Raspberry Pi:

* The Pi: Raspberry Pi 4.
* For downloading the software: SanDisk Ultra 16GB micro-SD card.
* For adapting the micro-SD card to your computer: SanDisk Mobile Mate micro-SD card reader.
* The power supply: Cana-kit 5V Raspberry Pi Power supply.
* You'll need this to type: Verbatim Slim-line Keyboard.
* For pointing & clicking: Logitech B100.
* The monitor connector: Amazon Basics HDMI.
* For internet hardwire: Amazon Basics Ethernet cable.
* You'll also need a monitor or TV that accepts either HDMI or composite video input. HDMI works best, but composite video is workable. Many Raspberry Pi projects use an internet connection, so you'll also want a Wi-Fi dongle or Ethernet cable.

Download the Raspbian operating system on the Raspberry Pi :

1. Select Raspbian.
2. Click Install.
3. When the warning window pops up. Click yes to confirm. This is just letting you know that the micro-SD card will be overwritten with an uncompressed version of the Raspbian operating system.
4. Wait for the installation process to complete.

Once the installation process is finished, Raspbian will automatically begin to boot.

Configure your Raspberry Pi :

1. Click Menu in the higher left nook of the screen.

2. Select Preferences in the dropdown menu.

3. Select Raspberry Pi Configuration underneath Preferences

4. When the configuration window appears, click on the Localisation tab.

5. Click on Set Locale… to set your location.

6. Click on Set timezone… to set your nearby time.

7. Click on Set Keyboard… to set your keyboard language.

8. Reconfiguring your Raspberry Pi will require a reboot. When the reboot window appears, click on Yes to continue.

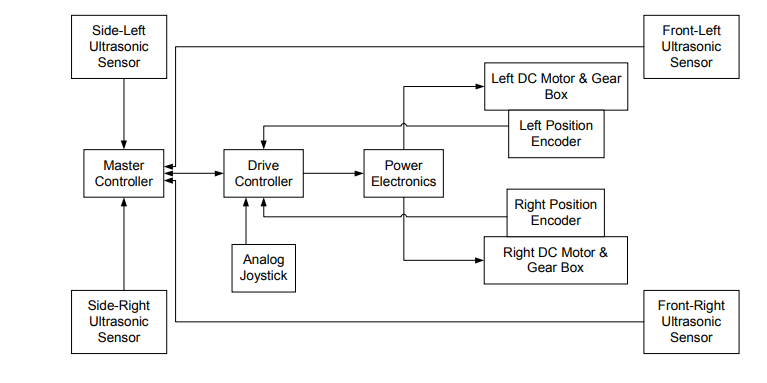
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Fig 2: Design Flow.

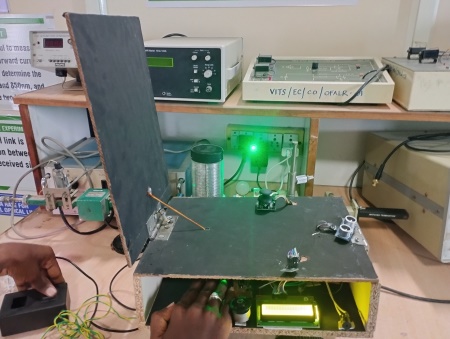
L293D driver is used to manage the motors and energy extension board is used to distribute the electricity to all the modules. plug in the two USB cables of digi-cam and mick to the raspberry-pi. An ultrasonic distance sensor is used to notice the obstacle, a buzzer is interconnected to the sensor which will sounds when object is much less than 40m. External ON/OFF Switch is used to manage the entire application. after the software starts off evolved strolling the external change is made off so that the face attention software will run and similarly complete application will be executed. the operation of robotic wheel chair is functioned the use of instructions got from joystick, Mems and USB microphone.

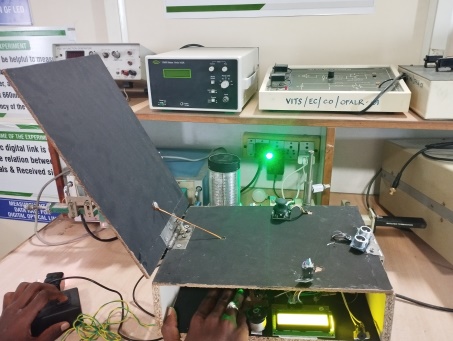
**V. RESULTS**

At the point when the whole circuit is ON hotspot management setup should be done to the raspberry-pi. The project should be connected to a particular mobile hotspot system with a username : “**project**” and password : “**project1234**”. The entire hotspot settings should be done for getting connected to the raspberry-pi.

At the point when the whole circuit is connected to the network as mentioned the raspberry-pi window is displayed by connecting it to the VNC Viewer.

The face detection is done and the working process starts as mentioned in the flow chart and program.





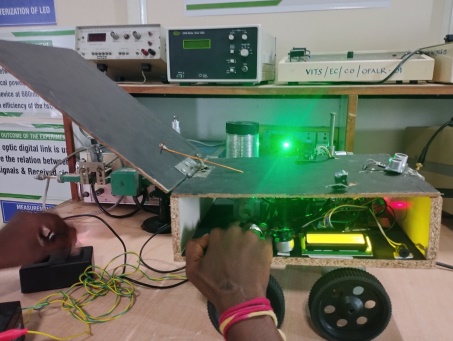


Fig 2: Inclination of wheel chair in .

**VI. CONCLUSION**

The knowledge gained for the product design education is used to analyze the existing wheel chair product by means of detailed Market research, product study, problem identification, concept generation, concept finalization, detailing, and mock up modeling of the finalized concept. Validation of the prototype is done and usage is found satisfactory.

**AcknowledgementS**

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