A Project Report

On

STEPHEN HAWKING WHEELCHAIR CONTROLLED BY USING MEMS MOTION

Submitted in partial fulfillment for the award of the degree of

Bachelor of Technology

in

Electronics & Communication Engineering

by

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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE & Affiliated to JNTUA, Ananthapuramu)
(Accredited by NBA for Civil, EEE, ECE, MECH and CSE, New Delhi)
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Siddharth Nagar, Narayanavanam road, Puttur-517583, A.P

2022

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the Project entitled " STEPHEN HAWKING WHEELCHAIR MODEL CONTROLLED USING MEMS MOTION "that is being submitted by

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is in partial fulfillment of the requirements for the award of BACHELOR OF TECHNOLOGY in ELECTRONICS & COMMUNICATION ENGINEERING *to* JNTUA, ANANTHAPURAMU. *The results embodied in this Project report have not been submitted to any other University or Institute for the award of any degree.*

Internal Guide **Head of the Department**

Submitted for the project report viva-voce examination held on _____

Internal Examiner **External Examiner**

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LIST OF ACRONYMS

S.NO	ACRONYM	ABBREVATION
1	MEMS	Micro Electro Mechanical Systems
2	DC	Direct Current
3	URAI	Ubiquitous Robots & Ambient Intelligence
4	IEEE	Institute of Electrical & Electronics Engineering
5	SMS	Short Message Service

ABSTRACT

This project is to develop a wheelchair control which is useful to the physically disabled person with his hand movement or his hand gesture recognition using acceleration technology. Tremendous leaps have been made in the field of wheelchair technology. However even these significant advances haven't been able to help quadriplegics navigate wheelchair unassisted. It is wheelchair which can be controlled by simple hand gestures. It employs a sensor which controls the wheelchair hand gestures made by the user and interprets the motion intended by user and moves accordingly. In Acceleration we have Acceleration sensor. When we change the direction, the Sensor registers values are changed and that values are given to microcontroller. Depending on the direction of the Acceleration, microcontroller controls the wheelchair directions like LEFT, RIGHT, FRONT, and BACK. The aim of this project is to implement wheelchair direction control with hand gesture reorganization.

This project is to develop a wheelchair control which is useful to the physically disabled person with his hand movement or his hand gesture recognition using MEMS technology. The use of powered wheelchair with high navigational intelligence is one of the great steps towards the integration of severely physically disabled people. Driving wheelchair in domestic environments is a difficult task for people with arm or hands impairments. The wheelchair is developed to overcome the above problem described above allowing the end users to just perform safe movements and accomplish some daily life important tasks.

Key Words:

Acceleration sensor, Position LEFT, Position RIGHT, Position FRONT, Position BACK,

MEMS technology, Gesture Reorganization.

CHAPTER 1

INTRODUCTION

Robotics is the system which deals with construction, design and operation. This systemis related to robot and their design, manufacturer, application. Robotics research today is focused on developing systems that modularity, flexibility, redundancy, fault tolerance and some other researchers are on completely automating a manufacturing process or a task, by providing sensor based to the robot arm. In this highly developing industry and man power are critical constraints for completion of task. To save human efforts the automation playing important role in system. This system is useful for regular and frequently carried works. One of the major and most commonly performed works is picking and placing of jobs from source to destination. In the earlier system, the motion of the human hand are sensed by the robot through sensors and it follow the same. As the person moves their hand, the accelerometer also start moving accordingly motion of the hand sensor displaces and this sensor senses object or parameter according to motion of hand. In this system, a gesture driven robotic vehicle is developed, in which how the vehicle is moving i.e., control and handling is depend on user gesture. This type of control is mostly used in virtual world compute games. This control make switching system is more real and give more freedom touser.

1.1 Embedded system implementation

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

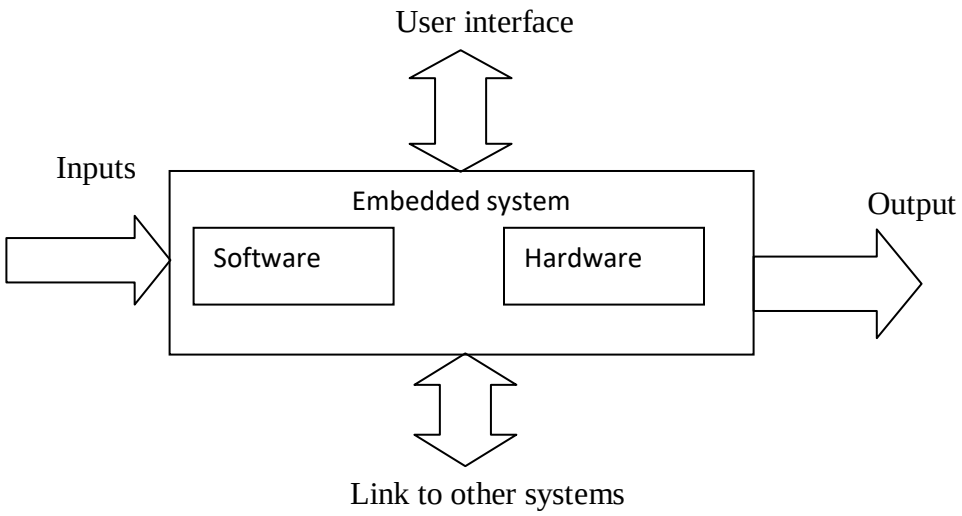


Fig 1.1: Overview of embedded system

1.2 Embedded system:

Embedded system includes mainly two sections, they are:

1.Hardware

2.Software

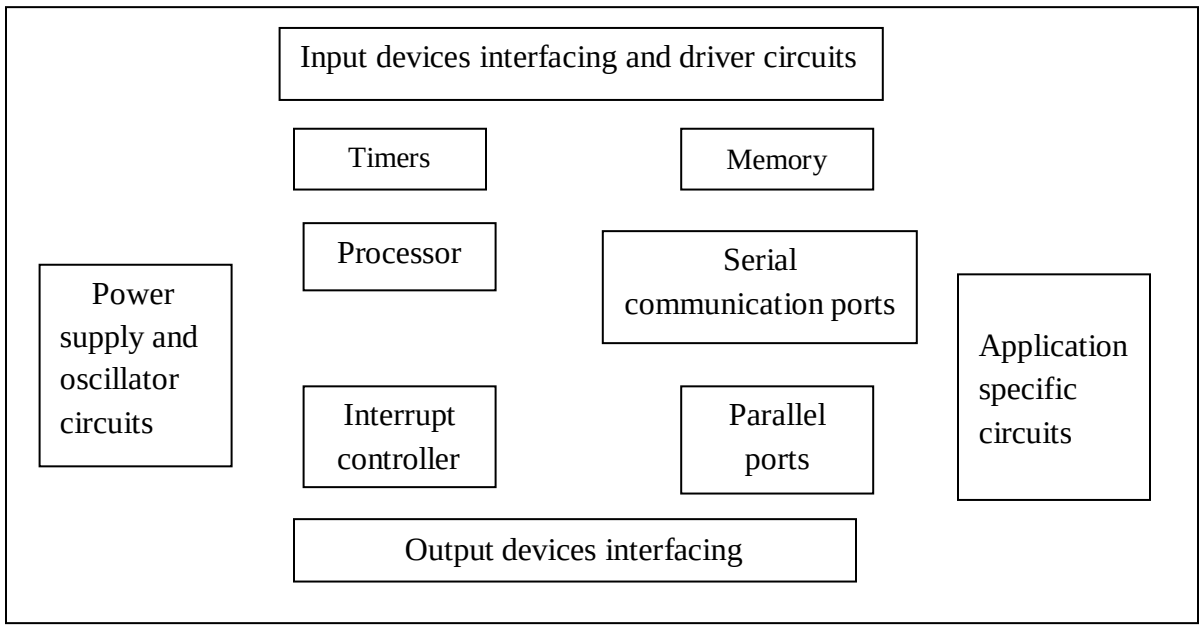


Fig 1.2: Block diagram of embedded system

1.2.1 Embedded System Hardware:

As with any electronic system, an embedded system requires a hardware platform on which it performs the operation. Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the display. Usually, an embedded system consists of:

- Power Supply
- Processor
- Memory
- Timers
- Serial communication ports
- Output/Output circuits
- System application specific circuits

Embedded systems use different processors for its desired operation. Some of the processors used are

1.Microprocessor

2.Microcontroller

3.Digital signal processor

1.2.2 Embedded System Software:

The embedded system software is written to perform a specific function. It is typically written in a high-level format and then compiled down to provide code that can be lodgedwithin a non-volatile memory within the hardware. An embedded system software is designed to keep in view of the three limits:

- Availability of system memory
- Availability of processor's speed

When the system runs continuously, there is a need to limit power dissipation for events likestop, run and wake up.

1.3 Bringing software and hardware together for embedded system:

To make software to work with embedded systems we need to bring software and hardware together for this purpose we need to burn our source code into microprocessor or microcontroller which is a hardware component and which takes care of all operations to be done by embedded system according to our code. Generally, we write source codes for embedded systems in assembly language, but the processors run only executable files. The process of converting the source code representation of your embedded software into an executable binary image involves three distinct steps:

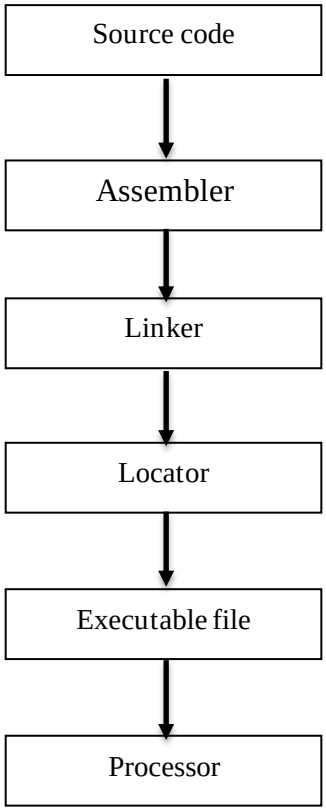


Fig 1.3 Flow of burning source code to processor

- Each of the source files must be compiled or assembled into an object file.

- All of the object files that result from the first step must be linked together to produce asingle object file, called the re-locatable program.
- Physical memory addresses must be assigned to the relative offsets within the re-locatableprogram in a process called relocation.

The result of the final step is a file containing an executable binary image that is ready to run on the embedded system.

CHAPTER 2

LITERATURE SURVEY

[1]. Ronny mardiyanto, heri suryoatmojo "Development of hand gesture recognition sensorbased on accelerator and gyroscope for controlling arm of underwater remotely operated robots". In this paper hand gesture sensor depends on accelerometer and gyroscope. Gyroscope is the sensor which is used to capture the position the operator hand when he is working in underwater operatedvehicle and it is attached with a hand. The expert operator may use the joystick for aquatic managesystem easily and it is little bit complex for the starting users. This system has two main part, ground station and aquatic remotely operated robot arm. in this paper the hand gesture recognizingsensor used by the user and the floor station and he can able to control the arms of robot at the underwater. Here accelerator and gyroscope are fitted in arm joint, arms. The device assess the 3Dimensional spot of every part for making 3Dimensional spot of hand. Here we used the CAD software. This device can be operated without any training. Underwater application can be easilydone with this device.

[2]. Anala pandit, Dhairya Dand A simple wearable hand gesture device using institute of medical and early modern studies. Interacting with systems is done with the help touch screen, wired or wireless mouse and with the keyboard. In this paper people machine communicating device, most intuitive communicating device, to interacts to the device and the other appliance. In case of communicating to the machine commands re being implemented use of hand gesture. Hereaccelerometer used to migrate the touchpad to revolve 3Dimensional object. Accelerometer changed to wireless communication 3Dimensional graphics can be done easily. Effective interaction.

[3]. Christian manery "hugging a robot weird? Investigating the influence of robot appearance on user's perception of hugging". Humanoid robots are able to interact with humans using physical interaction like hugging and handshaking. Here the physical interaction has to be planned carefully as a user-friendly system which interact normally and minimize repulsion. The

experiments consist of physical interaction between the participants and the humanoid robot ARMAR – lllb. It gives the best result after testing among the various factor. User-friendly, Easyto work.

[4]. Akitoshi Harada "Robot finger design for myoelectric hand and recognition of finger motion via surface Electromyography". In this paper, robots hand layout forcing to the software to a ME prosthetic hand and action of finger operation through ground Electromyography are detailed. The robots consist of index fingers or thumb fingers, is produced to apply basic actions needed in real time, holding or grabbing. A driven is operated to the system to follow the human'smechanism. For controlling each finger of the developed myoelectric prosthetic hand independently, Manpower is reduced in case of lifting objects. High weight can be lifted.

[5]. Jianhua Ren, Huichao Wang, "A portable artificial robotic hand controlled by EMG signal using ANN classifier." In this paper, creating a transportable robot for the physically challenged humans to do primary actions. Electromyography input and output are gathered Musclemass of human being arm to get the intensions of actions, where 6 types of Gesture are chosen toexchange ideas. An ANNis skilled in steps with the feature took up from the ME signal. The robot's hand is made with 7 stages of freedom and hardware with sign acquisition electricity control and microprocessor are designed. wirelessly connected to the computer. Simple to use. Have no constraint. Efficient and accurate performance.

[6]. Vinayak Kamath, Sandeep Bhat "Kinetic sensor based real-time robot path planning using gesture and clap sound. "At present many of the indoor works like cleaning., object reputation and so on. Are carried out by using the robotic. For the indoors works we must managethe course of a robots the use of gestures and clap sounds. Here superior approach is used for adjusting the clap sound gesture commands from kinetic sensor related to the computer and mobilephone is hooked up via RF hyper link. The hardware is predicted on microcontroller code to keepaway from unessential motion of the robots. The clap sound is to actuate the gesture tracking modeto transport the robot and deactivate the gesture monitoring mode after last ceasing the robot.

CHAPTER 3

PROPOSED SYSTEM

- To regulate the robot's motion in this suggested system, we use a MEMS sensor (Accelerometer sensor).
- Accelerometer is used to give commands for robot movement. The MEMS Sensor will send the changes to the Robot.
- The robot will then move in the appropriate direction if any threshold value is exceeded.

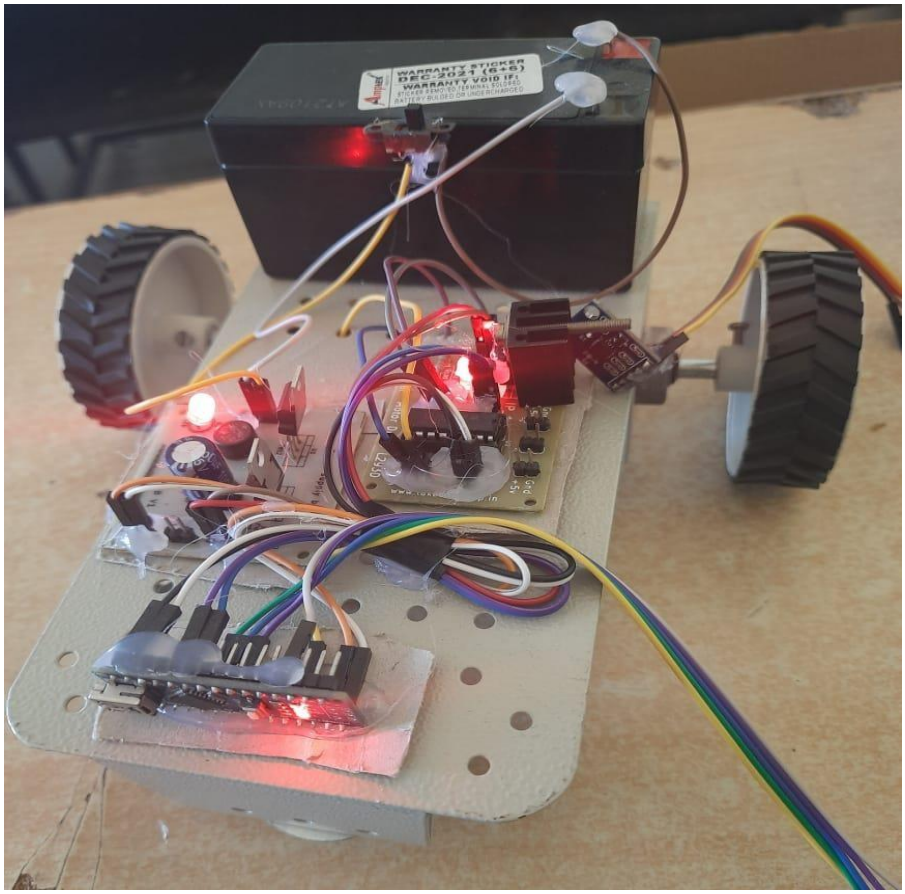


Fig 3.1: Wheel chair based on MEMS motion

3.2 BLOCK DIAGRAM:

- The Arduino UNO program will be installed into Arduino UNO.
- 5V power supply, LDRs acts as an input module.
- DC Motors acts as an output module.

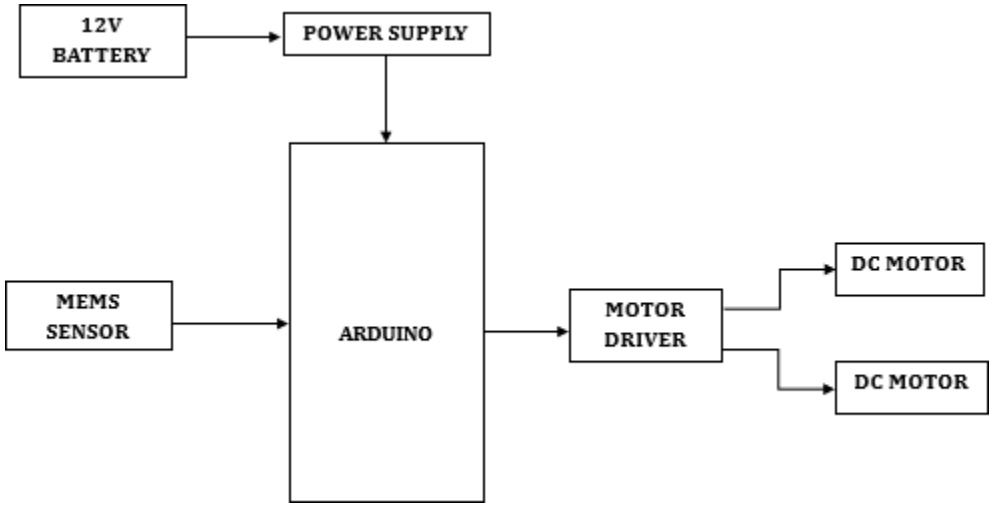


Fig 3.2 Block Diagram

3.3 Arduino IDE:

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that isan open source and is readily available to install and start compiling the code on the go.

3.3.1 Introduction to Arduino IDE:

- Arduino IDE is an open-source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where formeris used for writing the required code and later is used for compiling and uploading the codeinto the given Arduino Module.
- This environment supports both C and C++ languages.

3.3.2 How to install Arduino IDE:

You can download the Software from Arduino main website. As I said earlier, the software is available for common operating systems like Linux, Windows, and MAX, so make sure you are downloading the correct software version that is easily compatible with your operating system.

If you aim to download Windows app version, make sure you have Windows 8.1 or Windows 10, as app version is not compatible with Windows 7 or older version of this operating system.

The IDE environment is mainly distributed into three sections:

- **Menu Bar**
- **Text Editor**
- **Output Panel**

As you download and open the IDE software, it will appear like an image below.

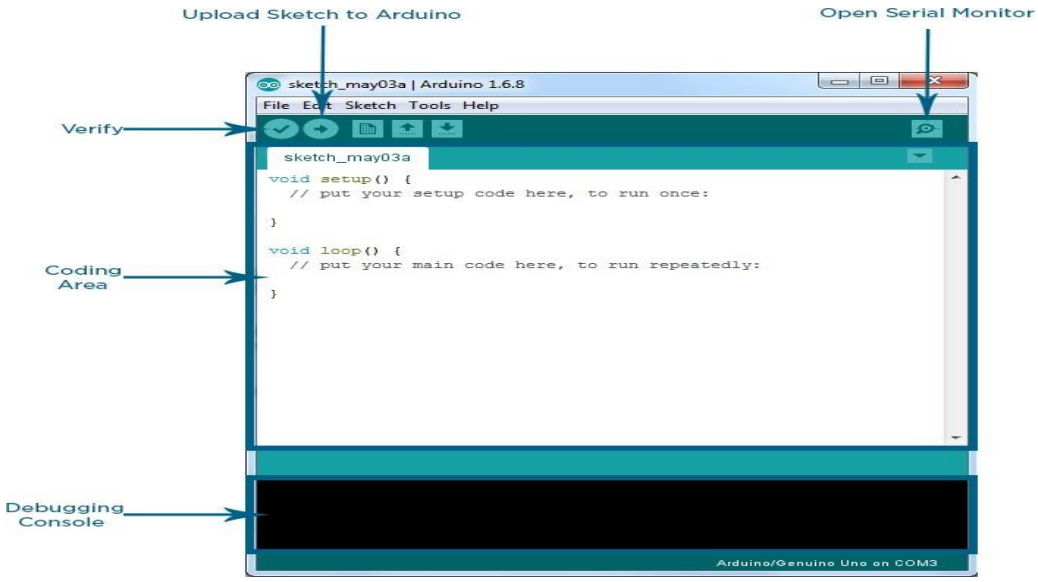


Fig 3.3: IDE interface

The bar appearing on the top is called **Menu Bar** that comes with five different options as follow

- **File** – You can open a new window for writing the code or open an existing one. Followingtable shows the number of further subdivisions the file option is categorized into.

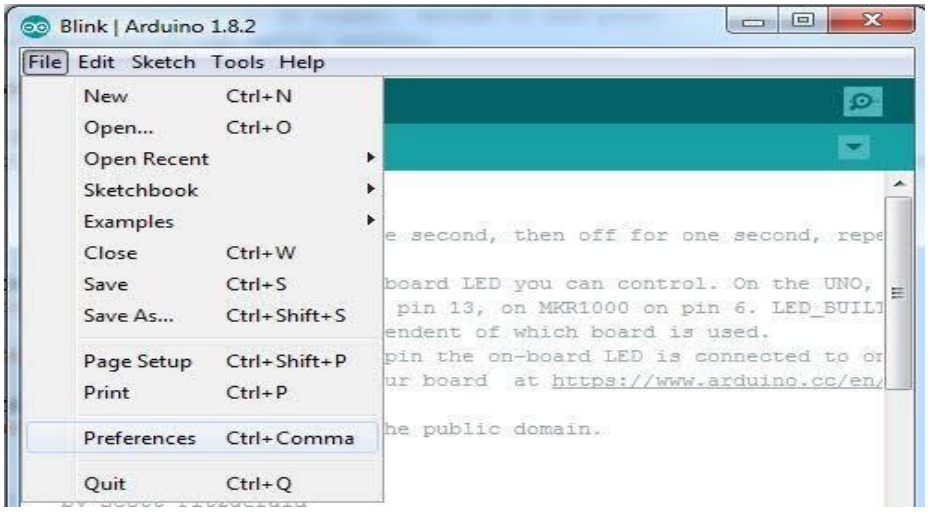


Fig 3.4: Writing the code

As you go to the preference section and check the compilation section, the Output Panel will show the code compilation as you click the upload button.

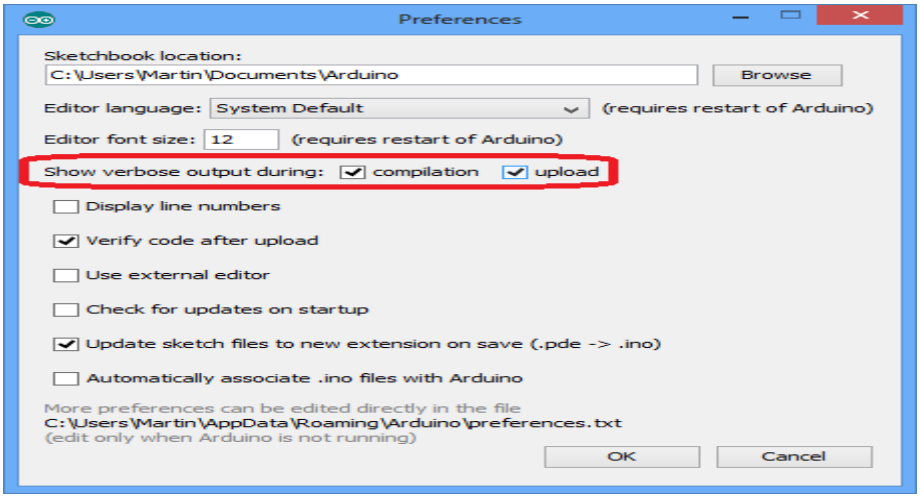


Fig 3.5: Code Compilation

And at the end of compilation, it will show you the hex file it has generated for the recentsketch that will send to the Arduino Board for the specific task you aim to achieve.

Fig 3.6: Output panel

- **Edit** – Used for copying and pasting the code with further modification for font
- **Sketch** – For compiling and programming
- **Tools** – Mainly used for testing projects. The Programmer section in this panel is used for burning a bootloader to the new microcontroller.

- **Help** – In case you are feeling skeptical about software, complete help is available from getting started to troubleshooting.

The **Six Buttons** appearing under the Menu tab are connected with the running program as follow.

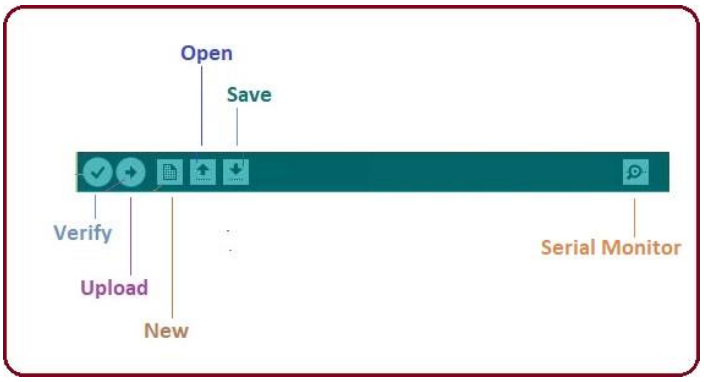


Fig 3.7: Running the program

- The check mark appearing in the circular button is used to verify the code. Click this once you have written your code.
- The arrow key will upload and transfer the required code to the Arduino board.
- The dotted paper is used for creating a new file.
- The upward arrow is reserved for opening an existing Arduino project.
- The downward arrow is used to save the current running code.
- The button appearing on the top right corner is a **Serial Monitor** – A separate pop-up window that acts as an independent terminal and plays a vital role for sending and receivingthe Serial Data.
- You can also go to the Tools panel and select Serial Monitor, or pressing Ctrl+Shift+M allat once will open it instantly. The Serial Monitor will actually help to debug the written Sketches where you can get a hold of how your program is operating.
- Your Arduino Module should be connected to your computer by USB cable in order to activate the Serial Monitor.

- You need to select the band rate of the Arduino Board you are using right now. For my Arduino Uno Baud Rate is 9600, as you write the following code and click the Serial Monitor, the output will show as the image below.

Fig 3.8: Arduino output

The main screen below the Menu bard is known as a simple text editor used for writing the required code.

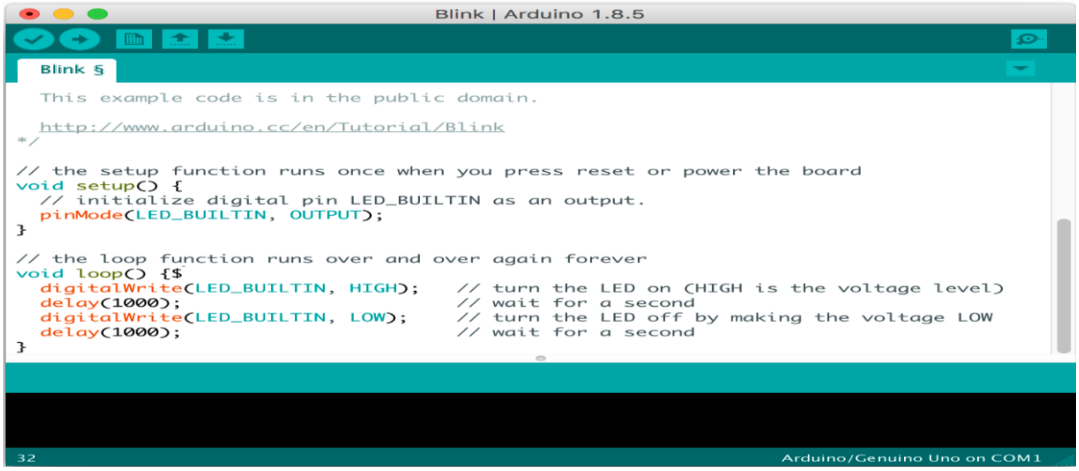


Fig 3.9: Text editor

The bottom of the main screen is described as an Output Panel that mainly highlights the compilation status of the running code: the memory used by the code, and errors occurred in the program.

You need to fix those errors before you intend to upload the hex file into your ArduinoModule.

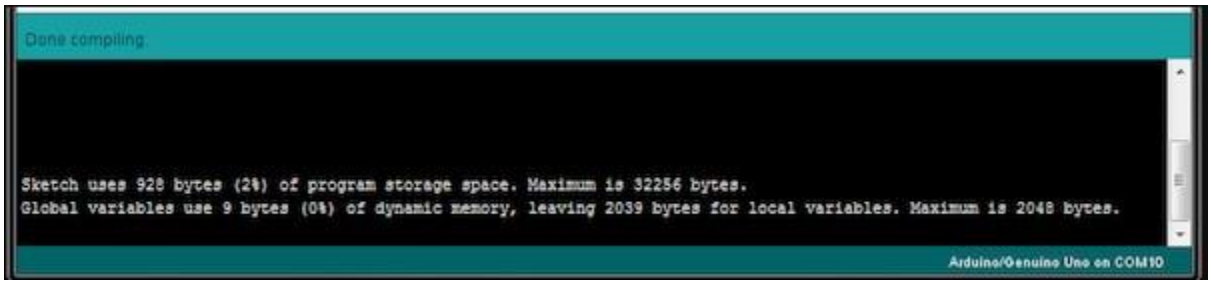


Fig 3.10: Error detection

More or less, Arduino C language works similar to the regular C language used for any embedded system microcontroller, however, there are some dedicated libraries used for calling and executing specific functions on the board.

3.3.3 Libraries:

Libraries are very useful for adding the extra functionality into the Arduino Module. There is a list of libraries you can add by clicking the Sketch button in the menu bar and going to Include Library.

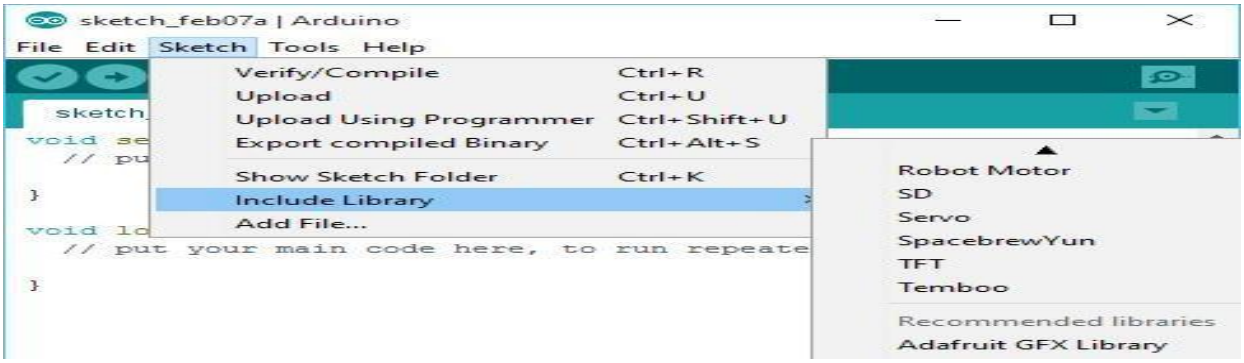


Fig 3.11: Adding Library

As you click the Include Library and Add the respective library it will on the top of the sketch with a #include sign. Suppose, I Include the EEPROM library, it will appear on the text editor as

#include <EEPROM.h>.

Most of the libraries are preinstalled and come with the Arduino software. However, you can also download them from the external sources.

3.3.4 Making pins Input and output:

The digital Read and digital Write commands are used for addressing and making the Arduino pins as an input and output respectively. These commands are text sensitive i.e., you need to write them down the exact way they are given like digital Write starting with small "d" and write with capital "W". Writing it down with Digital write or digital write won't be calling or addressing any function.

3.3.5 How to select the board:

In order to upload the sketch, you need to select the relevant board you are using and the ports for that operating system. As you click the Tools on the Menu, it will open like the figure below.

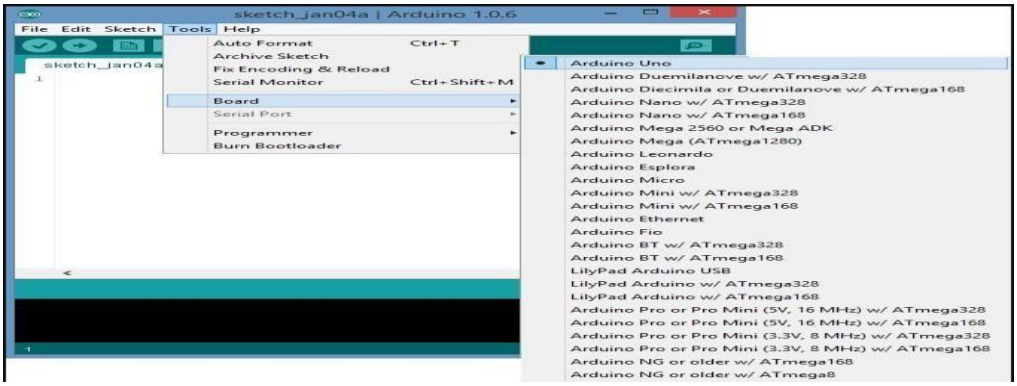


Fig 3.12: Selecting the board

Just go to the "Board" section and select the board you aim to work on. Similarly, COM1,COM2, COM4, COM5, COM7 or higher are reserved for the serial and USB board. You can lookfor the USB serial device in the port section of the Windows Device Manager.

Following figure shows the COM4 that I have used for my project, indicating the Arduino Uno with COM4 port at the right bottom corner of the screen.

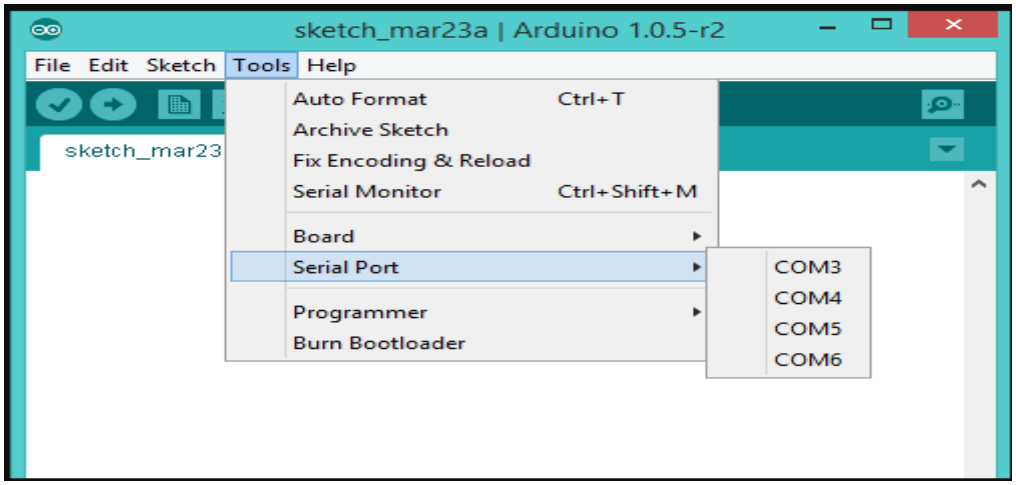


Fig 3.13: Selecting the ports

- After correct selection of both Board and Serial Port, click the verify and then upload button appearing in the upper left corner of the six-button section or you can go to the Sketch section and press verify/compile and then upload.
- The sketch is written in the text editor and is then saved with the file extension. ino.
- It is important to note that the recent Arduino Modules will reset automatically as you compile and press the upload button the IDE software, however, older version may requirethe physical reset on the board.
- Once you upload the code, TX and RX LEDs will blink on the board, indicating the desired program is running successfully.
- The amazing thing about this software is that no prior arrangement or bulk of mess is required to install this software, you will be writing your first program within 2 minutes after the installation of the IDE environment.

3.3.6 Bootloader:

As you go to the Tools section, you will find a bootloader at the end. It is very helpful to burn the code directly into the controller, setting you free from buying the external burner to burn the required code.

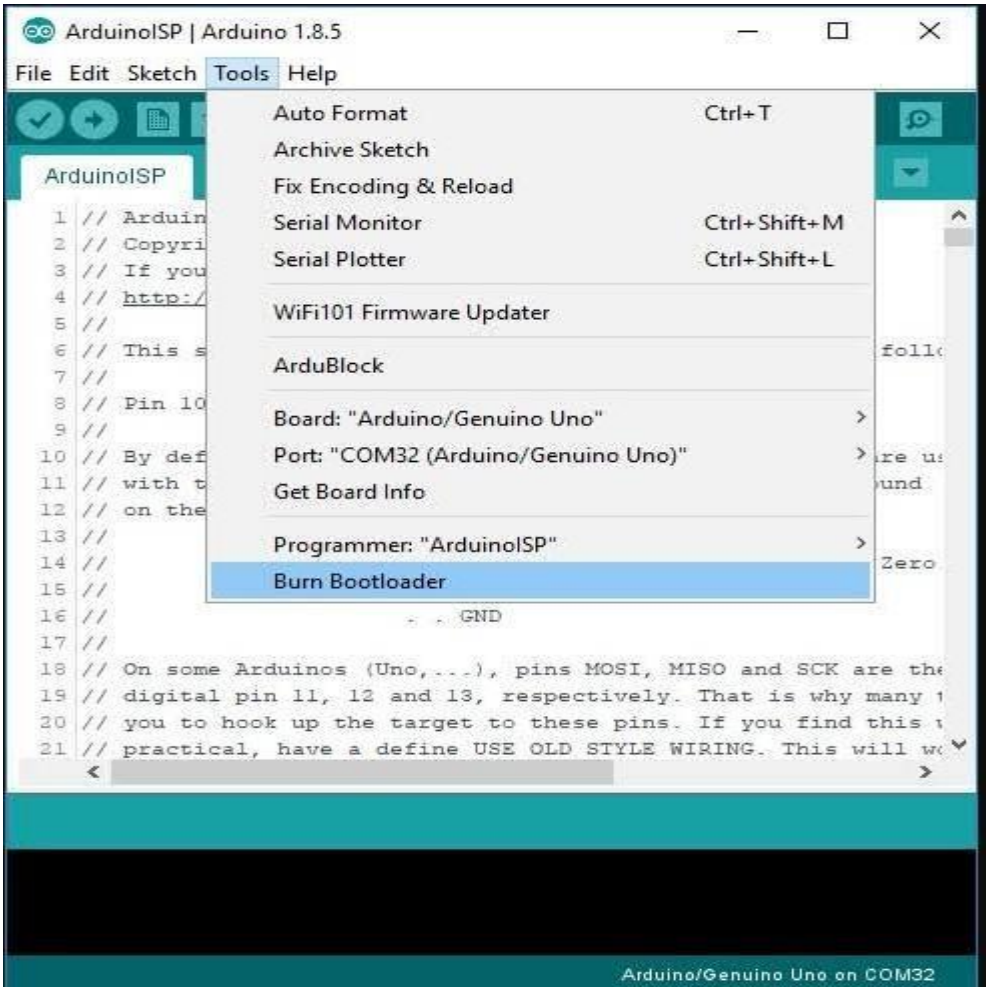


Fig 3.14: Burning Bootloader

When you buy the new Arduino Module, the bootloader is already installed inside the controller. However, if you intend to buy a controller and put in the Arduino module, you need toburn the bootloader again inside the controller by going to the Tools section and selecting the burnbootloader.

3.3 Working Principle:

- Wheelchair Model Controlled by Mems Motion moves according to hand movement as we place transmitter in our hand. When we tilt hand in front side, robot start to moving forward and continues moving forward until next command is given.
- When we tilt hand in backward side, robot change its state and start moving in backwards direction until other command is given. When we tilt it in left side Robot get turn left till next command.
- When we tilt hand in right side robot turned to right. And for stopping robot we keep handin stable.

3.4 Connection Diagram:

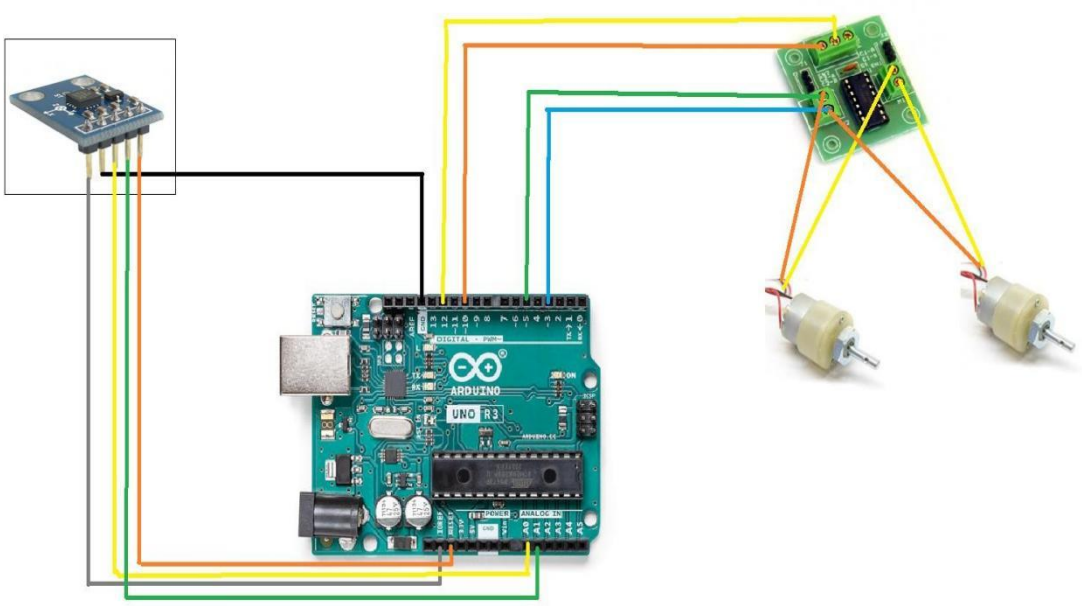


Fig 3.15: Connection Diagram

CHAPTER 4

HARDWARE DESCRIPTION

4.1 DC Motor:

A machine that converts D.C power into mechanical power is known as a D.C. motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of this force is given by Fleming's left-hand rule and magnitude is given by:

F = BIl newton's B =

Magnetic FieldI =Current

L = Length of wire

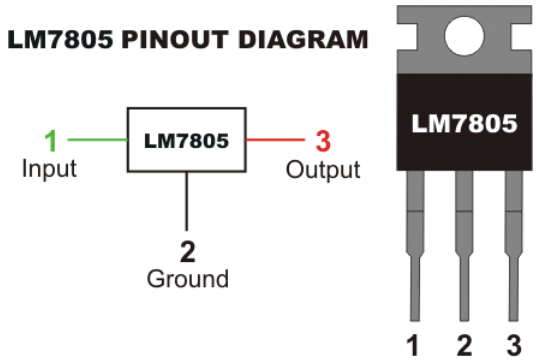
Basically, there is no constructional difference between a D.C. motor and a D.C. generator. The same D.C. machine can be run as a generator or motor.

Fig 4.1: DC Motor

4.2 Capacitors:

Capacitors are used to attain from the connector the immaculate and smoothest DC voltage in which the rectifier is used to obtain throbbing DC voltage which is used as part of the light of

the present identity. Capacitors are used to acquire square DC from the current AC experience



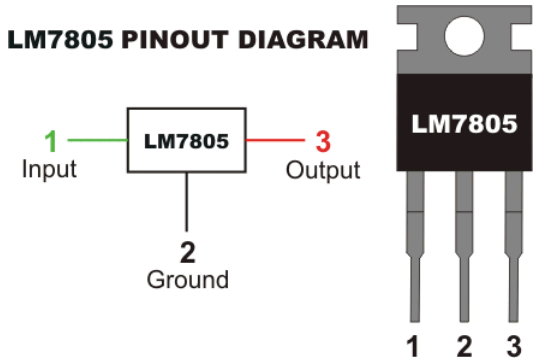
ofthe current channels so that they can be used as a touch of parallel yield.

Fig 4.2: Capacitor

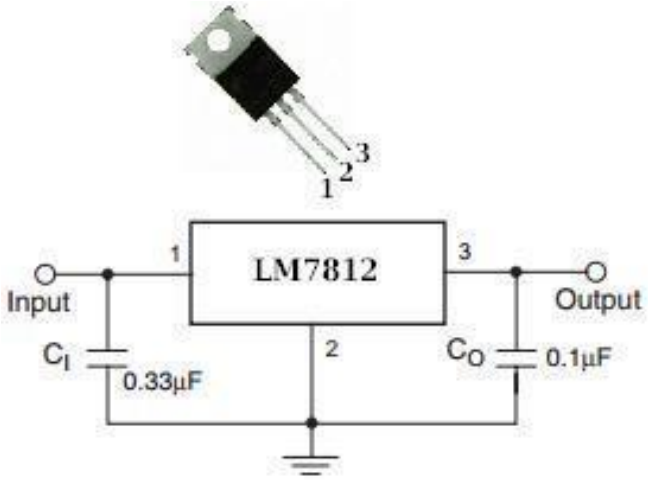
4.3 Voltage regulators:

The 78XX voltage controller is mainly used for voltage controllers as a whole. The XX speaks to the voltage delivered to the specific gadget by the voltage controller as the yield. 7805 will supply and control 5v yield voltage and 12v yield voltage will be created by 7812.

The voltage controllers are that their yield voltage as information requires no less than 2 volts. For example, 7805 as sources of information will require no less than 7V, and 7812, no less than 14 volts. This voltage is called Dropout Voltage, which should be given to voltage controllers.



4.3.1: 7805 voltage regulator with pinout



4.3.2: 7812 voltage regulator with pinout

4.4 Battery:

A rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals. Rechargeable batteries allow for multiple usages from a cell, reducing waste and generally providing a better long-term investment in terms of dollars spent for usable device time. This is true even factoring in the higher purchase price of recharge. A rechargeable battery is generally a more sensible and sustainable replacement to one-time use batteries, which generate current through a chemical reaction in which a reactive anode is consumed.

The anode in a rechargeable battery gets consumed as well but at a slower rate, allowing for many charges and discharges.

In use, rechargeable batteries are the same as conventional ones. However, after discharge the batteries are placed in a charger or, in the case of built-in batteries, an AC/DC adapter is connected. While rechargeable batteries offer better long-term cost and reduce waste, they do have a few cons. Many types of rechargeable cells created for consumer devices, including AA and AAA, C and D batteries, produce a lower voltage of 1.2v in contrast to the 1.5v of alkaline batteries. Though this lower voltage doesn't prevent correct operation in properly-designed electronics, it can mean a single charge does not last as long or offer the same power in a session. This is not the case, however, with lithium polymer and lithium-ion-batteries.

Some types of batteries such as nickel-cadmium and nickel-metal-hydrate can develop a battery memory effect when only partially discharged, reducing performance of subsequent charges and thus battery life in a given device.

Rechargeable batteries are used in many applications such as cars, all manner of consumer electronics and even off-grid and supplemental facility power storage.

Fig 4.4: Rechargeable battery

4.5 MEMS Sensor:

The term MEMS stands for micro-electro-mechanical systems. These are a set of devices, and the characterization of these devices can be done by their tiny size & the designing mode. The designing of these sensors can be done with the 1- 100-micrometer components. These devices can differ from small structures to very difficult electromechanical systems with numerous moving elements beneath the control of incorporated micro-electronics. Usually, these sensors include mechanical micro-actuators, micro-structures, micro-electronics, and micro-sensors in one package. This article discusses what is a MEMS sensor, working principle, advantages and its applications

MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that it responds to the pressure which is measured pressure with the help of some mechanical actions. The best examples of this mainly include revolving of a motor for compensating the pressure change.

The MEMS accelerometers can be divided into two important micro system architectures: piezo resistive and capacitive. Even though both of these two types of accelerometers possess internal proof masses which are excited by acceleration, the differences of these two architectures lie in the transduction mechanism which is used to the movement correlation of the internal proof mass to accelerate.

The Capacitive accelerometers possess a differential capacitor whose balance is disrupted by the proof mass movement. Piezo resistive accelerometers commonly rely on inducing, which attach the proof mass to the sensor which is used for identification of the movement of the mass.

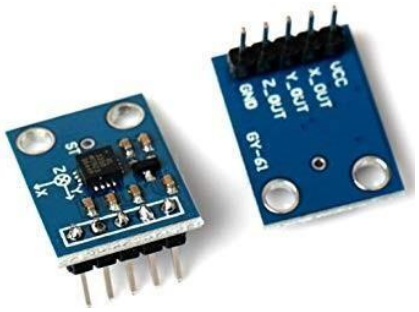


Fig 4.5: MEMS Sensor

Fujitsu successfully developed the 'FAR-S2AB' series, 3-axis Accelerometer, using state-of-the-art MEMS technology. This small and highly sensitive accelerometer can detect acceleration, inclination and vibration by measuring the motion in the x-, y-, and z-axis simultaneously. The MEMS 3-axis accelerometer consists of a Mass at the Centre of the sensor's chip, which is suspended by 4 Beams doped with Piezo resistive material.

By sensing the mounting angle, the sensor can assist in compensating for the devices mounting angle, and therefore makes it possible to use ACCELEROMETER FACTSHEET MEMS 3-AXIS ACCELEROMETER normal SMD technology in high density boards, and also to realize the precise detection of the inclination angle. An interface IC within the sensor package also has temperature sensing and self-diagnosis functions.

4.6 Motor Driver:

Motor drivers acts as an interface between the motors and the control circuits. Motor requires high amount of current whereas the controller circuit works on low current signals. So, the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor. To control the robot wirelessly through a remote controller we need to interface the motors with the wireless systems such as Bluetooth, 2.4 GHz Rf modules, etc.

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

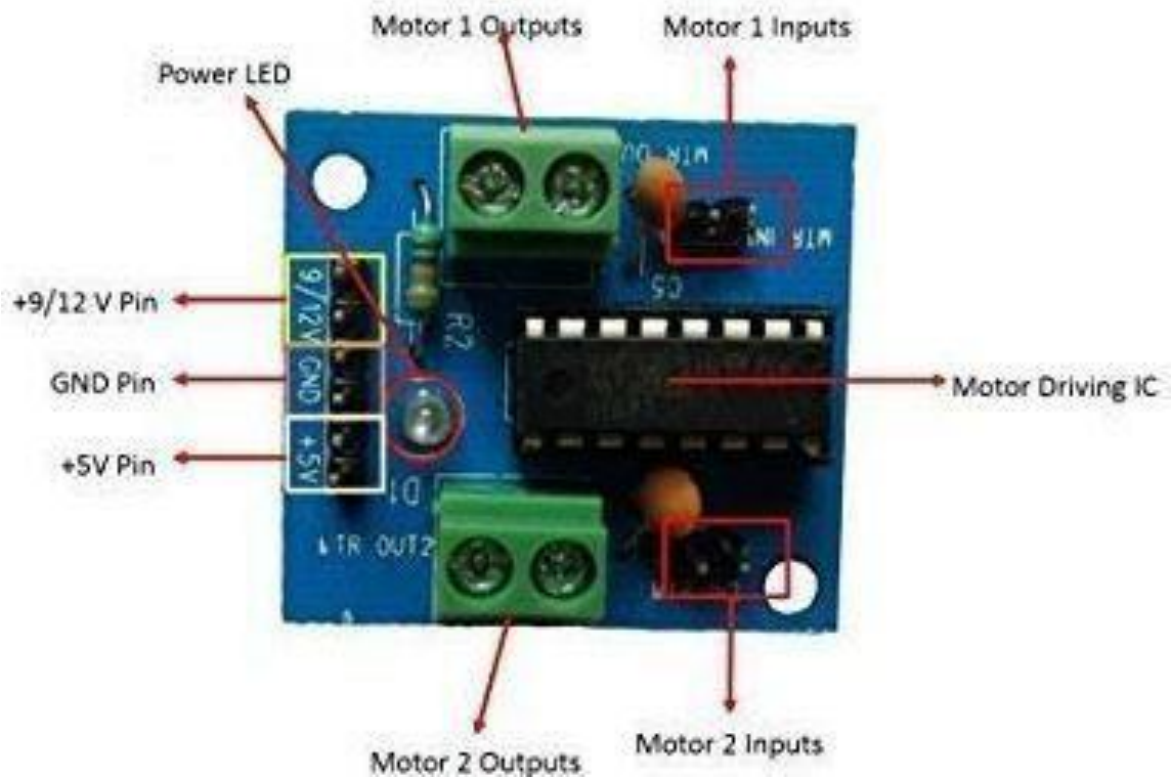


Fig 4.6: L293D Motor Driver

4.7 Arduino UNO:

An Arduino is actually a micro controller-based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open-source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartillas in 2005.

The Uno with Cable is a micro-controller board base 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 ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything need to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

Fig 4.7: Arduino

CHAPTER 5

SOFTWARE DESCRIPTION

5.1 Embedded C:

Implanted C makes use of KEIL IDE programming. The framework program written in implanted C can be placed away in Microcontroller. The accompanying is a portion of the actual motives behind composing applications in C as opposed to get collectively. It is much less disturbing and much less tedious to write down in C then amassing. C is less traumatic to trade and refresh. You can utilize code available in capacity libraries. C code is compact to different microcontrollers with subsequent to 0 alteration. Genuine, installed C programming need nonstandard expansions to the C driver with a view to bolster charming components, as an example, settled point range catching, numerous unmistakable reminiscence banks, and fundamental I/O operations.

In 2008, the C Standards Committee prolonged the C data to deal with these problems via giving a normal well known to all executions to purchaser to contains numerous additives not handy in standard C, for example, settled factor wide variety catching, named address spaces, and vital I/O equipment tending to.

Installed C utilize the greater part of the grammar and semantics of well-known C, e.g., number one() paintings, variable definition, facts type statement, contingent proclamations (if, switch. Case), circles (even as, for), capacities, exhibits and strings, structures and union, piece operations, macros, unions, and so on.

5.2 Embedded systems programming:

Installed frameworks writing computer programs is not quite the same as creating applications on a desktop PCs. Key attributes of an implanted framework, when contrasted with PCs, are as per the following:

Embedded gadgets have asset limitations (restricted ROM, constrained RAM, constrained stack space, less handling power)

Components utilized as a part of installed framework and PCs are distinctive; implanted frameworks ordinarily utilize littler; less power devouring segments. Inserted frameworks are more fixing to the equipment.

Two remarkable components of Embedded Programming are code speed and code estimate. Code speed is represented by the handling power, timing requirements, while code size is administered by accessible program memory and utilization of programming dialect. Objective of implanted framework writing computer programs is to get greatest elements in less space and least time.

Implanted frameworks are modified utilizing distinctive sort of dialects:

- Machine Code
- Low level dialect, i.e., get together
- High level dialect like C, C++, and Java and so on.
- Application-level dialect like Visual Basic, scripts, Access, and so on.,

5.2 ARDUINO IDE:

Download the Arduino Software (IDE): Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers. With the Zip package you need to install the drivers manually. The Zip file is also useful if you want to create a portable installation. When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system.

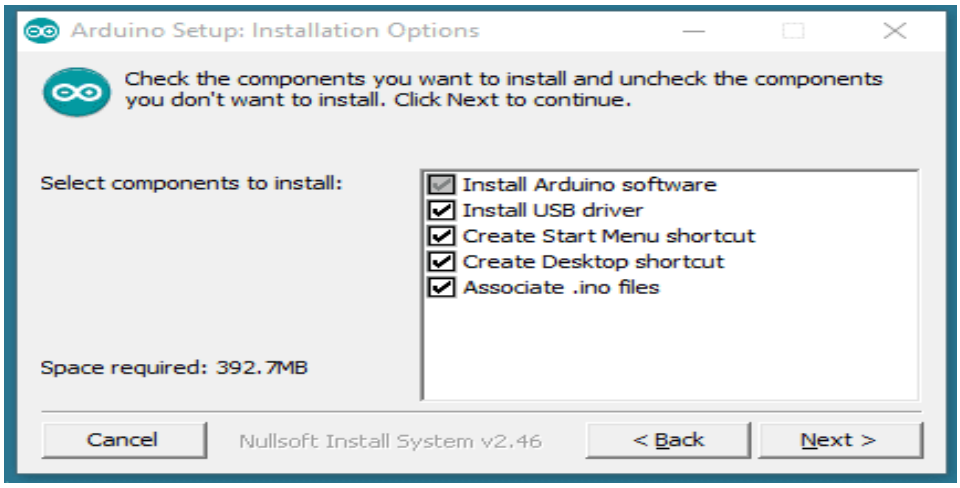


Fig 5.1: Arduino IDE software

Choose the components to install

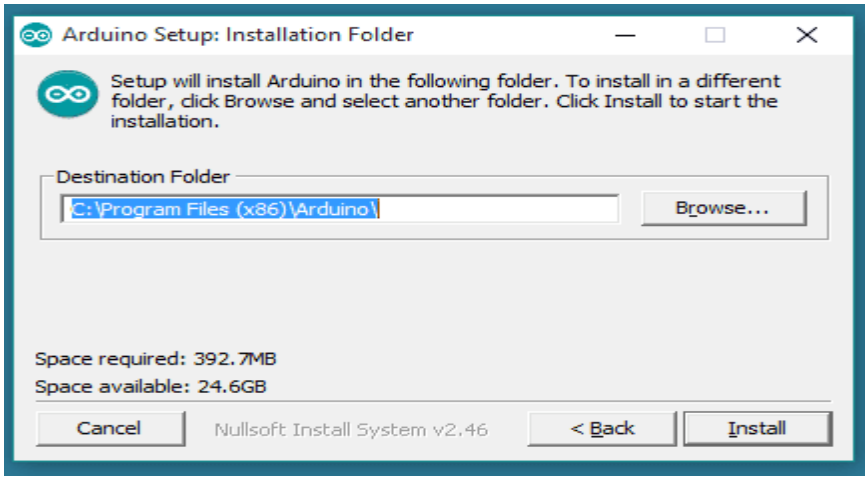


Fig 5.2:Arduino installation

Choose the installation directory (we suggest to keep the default one)

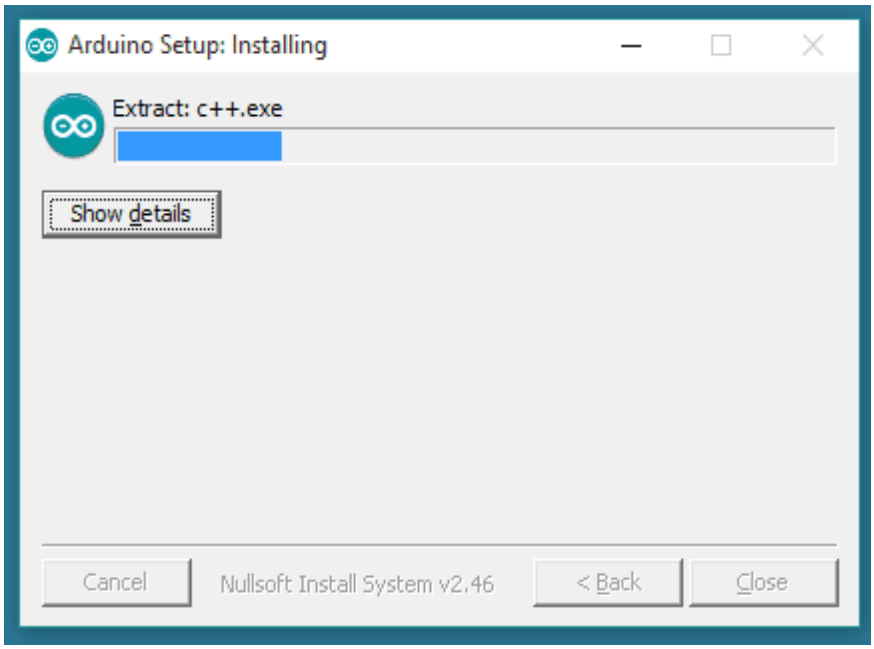


Fig 5.3: Arduino file extract

The process will extract and install all the required files to execute properly the Arduino Software (IDE)

When the Arduino Software (IDE) is properly installed you can go back to the getting started home and choose your board from the list on the right of the page. The text of the Arduinogetting started guide is licensed under a creative common attribution share a link 3.0 Code samplesin the guide are released into the public domain.

CHAPTER 6

APPLICATIONS

- Wireless controlled robots are very useful in many applications like remote surveillance, military etc.
- Hand gesture-controlled robot can be used by physically challenged in wheelchairs.
- Hand gesture controlled industrial grade robotic arms can be developed.
- In Hospitals for handicapped patients: Some patients that cannot manipulate the wheelchair with their arms due to a lack of force or psychomotor problems in the superior members require electric wheelchair.
- The wheelchair is operated with the help of accelerometer, which in turn controls the wheelchair with the help of hand gesture. The wheelchair moves front, back, right and left. Due to which disabled and partially paralyzed patient can freely move.

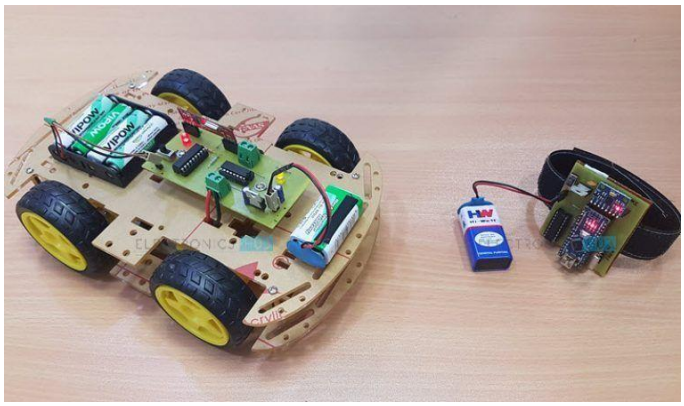


Fig 6.1: Hand Gesture Robots

Fig 6.2: Electric wheelchair

CHAPTER 7

RESULTS

This robot is meant to move in response to human hand gestures. When we move our hand, the robot moves in the order of suitable responses. Left, right, forward, and backward hand motions can be used to move the robot in different directions.

Fig 7.1: Position FRONT

- Motor moving in the forward direction based on movement of MEMS sensor.

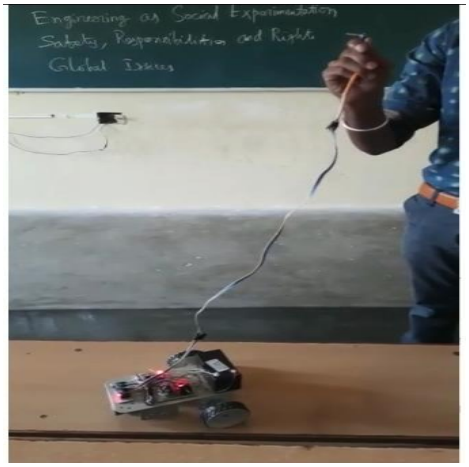


Fig 7.2: Position BACK

- Motor moving in the backward direction based on movement of MEMS sensor.

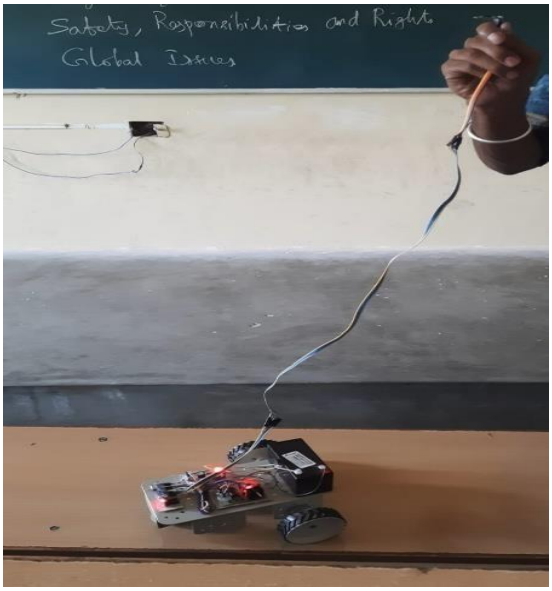


Fig 7.3: Position LEFT

- Motor moving in the leftward direction based on movement of MEMS sensor.

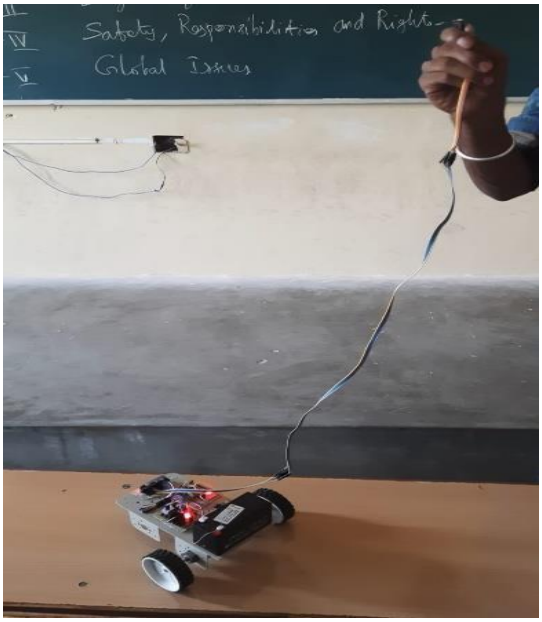


Fig 7.4: Position RIGHT

- Motor moving in the rightward direction based on movement of MEMS sensor.

CONCLUSION

This robot is meant to move in response to human hand gestures. When we move our hand, the robot moves in the order of suitable responses. Left, right, forward, and backward hand motions can be used to move the robot in different directions. The SWCS prototype was created and tested to show that a smart wheelchair system might be commercially viable. Rather of designing a completely new wheelchair from the bottom up, we focused on compatibility with a variety of wheelchairs. To this goal, the SWCS prototype was connected to a variety of wheelchairs from various manufacturers. On power wheelchairs with various motor controllers, the prototype matched our design criteria.

FUTURE SCOPE

We intend to replace the wired component with wireless technologies in the future. It is also predicted to function more efficiently, such as increasing the robot's travel distance and overcoming physical limitations. This robot can be modified to detect human life styles such as earthquakes and landslides by enforcing the sensor, and it can also be upgraded to detect bombs because it has a robotic arm that can lift bombs that are positioned at a distance. This type of methodology can also be utilized in rescue operations to view the scene in a simple manner. Clearly, there is still a lot of work to be done before the SWCS is ready for commercialization. This work entails the creation of hardware, software, and enclosures.

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APPENDIX-A

SOURCE CODE

```
const int xpin=A1;
const int ypin=A2;
const int zpin=A3; int
motorPin1 = 7; int
motorPin2 = 8; int
motorPin3 =11; int
motorPin4 = 12;#define
buzzer 9 void setup()
{
  // put your setup code here, to run once:
  Serial.begin(9600);

  pinMode(motorPin1,     OUTPUT);
  pinMode(motorPin2,     OUTPUT);
  pinMode(motorPin3,     OUTPUT);
  pinMode(motorPin4,     OUTPUT);
  pinMode(buzzer,OUTPUT);
}

void loop()
{
  // put your main code here, to run repeatedly:int
  x=analogRead(xpin);

  int y=analogRead(ypin);int

  z=analogRead(zpin);


  Serial.print(x);
  Serial.print("\t");

  Serial.print(y);
  Serial.print("\t");

  Serial.print(z);
  Serial.print("\n");

  if(x<380)
  {
    digitalWrite(buzzer,HIGH);
    digitalWrite(motorPin1, HIGH);
    digitalWrite(motorPin2, LOW);
    digitalWrite(motorPin3, LOW);
    digitalWrite(motorPin4, LOW);
    Serial.print("left");
  }
  else if(x>400)
  {
    digitalWrite(buzzer,HIGH);
    digitalWrite(motorPin1, LOW);
    digitalWrite(motorPin2, LOW);
    digitalWrite(motorPin3, HIGH);
    digitalWrite(motorPin4, LOW);
    Serial.print("right");
```

```
  }
   else if(y>400)
  {
    digitalWrite(buzzer,HIGH);
    digitalWrite(motorPin1, HIGH);
    digitalWrite(motorPin2, LOW);
    digitalWrite(motorPin3, HIGH);
    digitalWrite(motorPin4, LOW);
    Serial.print("front");
  }
  else if(y<370)
  {
    digitalWrite(buzzer,HIGH);
    digitalWrite(motorPin1, LOW);
    digitalWrite(motorPin2, HIGH);
    digitalWrite(motorPin3, LOW);
    digitalWrite(motorPin4, HIGH);
     Serial.print("back");
  }
  else
  {
    digitalWrite(buzzer,LOW);
    digitalWrite(motorPin1, LOW);
    digitalWrite(motorPin2, LOW);
    digitalWrite(motorPin3, LOW);
    digitalWrite(motorPin4, LOW);
     Serial.print("stop");
  }
}
```

APPENDIX-B

APPENDIX-B
BUDGET

PROJECT BUDGET:

SL.NO	COMPONENT	QUANTITY	PRICE
1	**Arduino UNO**	1	700\-
2	**Battery 12v**	2	600\-
3	**Power Supply**	1	2,300\-
4	**DC Motors**	2	400\-
5	**Mems Sensor**	1	700\-
6	**Motor Driver**	1	400\-
7	**wheels**	4	400\-
8	**Dummy Shaft**	2	400\-
9	**Connectors**	20	200\-
	TOTAL		Rs 6,100\-

APPENDIX-C

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Research Paper

Stephen Hawking Wheelchair Model controlled by MEMS motion

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[1,2,3,4,5]*Department of Electronics and Communication Engineering Siddharth Institute of Engineering & Technology (Autonomous),Puttur - 517583, Andhra Pradesh.*

ABSTRACT:
This project is to develop a wheelchair control which is useful to the physically disabled person with his hand movement or his hand gesture recognition using acceleration technology. Tremendous leaps have been made in the field of wheelchair technology. However even these significant advances haven't been able to help quadriplegics navigate wheelchair unassisted. It is wheelchair which can be controlled by simple hand gestures. It employs a sensor which controls the wheelchair hand gestures made by the user and interprets the motion intended by user and moves accordingly. In Acceleration we have Acceleration sensor. When we change the direction, the Sensor registers values are changed and that values are given to microcontroller. Depending on the direction of the Acceleration, microcontroller controls the wheelchair directions like LEFT, RIGHT, FRONT, and BACK. The aim of this project is to implement wheelchair direction control with hand gesture reorganization.

KEY WORDS:
Acceleration sensor, Position LEFT, Position RIGHT, Position FRONT, Position BACK, MEMS technology, Gesture Reorganization

***R**eceived 14 Apr, 2022; **R**evised 28 Apr, 2022; **A**ccepted 30 Apr, 2022 © The author(s) 2022.*
P**ublished with open access at **www.questjournals.org

I. INTRODUCTION

Robotics is the system which deals with construction, design and operation. This system is related to robot and their design, manufacturer, application. Robotics research today is focused on developing systems that modularity, flexibility, redundancy, fault tolerance and some other researchers are on completely automating a manufacturing process or a task, by providing sensor based to the robot arm. In this highly developing industry and man power are critical constraints for completion of task. To save human efforts the automation playing important role in system. This system is useful for regular and frequently carried works. One of the major and most commonly performed works is picking and placing of jobs from source to destination. In the earlier system, the motion of the human hand are sensed by the robot through sensors and it follow the same. As the person moves their hand, the accelerometer also start moving accordingly motion of the hand sensor displaces and this sensor senses object or parameter according to motion of hand. In this system, a gesture driven robotic vehicle is developed, in which how the vehicle is moving i.e., control and handling is depend on user gesture. This type of control is mostly used in virtual world compute games. This control make switching system is more real and give more freedom to user.

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

*Corresponding Author: K.D. Mohana Sundaram

II. LITERATURE SURVEY

Ronny mardiyanto, heri suryoatmojo "Development of hand gesture recognition sensor based on accelerator and gyroscope for controlling arm of underwater remotely operated robots". In this paper hand gesture sensor depends on accelerometer and gyroscope. Gyroscope is the sensor which is used to capture the position the operator hand when he is working in underwater operated vehicle and it is attached with a hand. The expert operator may use the joystick for aquatic manage system easily and it is little bit complex for the starting users. This system has two main part, ground station and aquatic remotely operated robot arm. Here accelerator and gyroscope are fitted in arm join. The device assess the 3Dimensional spot of every part for making 3Dimensional spot of hand. Here we used the CAD software. This device can be operated without any training. Underwater application can be easily done with this device. Anala pandit, Dhairya Dand A simple wearable hand gesture device using institute of medical and early modern studies. Interacting with systems is done with the help touch screen, wired or wireless mouse and with the keyboard. In this paper people machine communicating device, most intuitive communicating device, to interacts to the device and the other appliance. In case of communicating to the machine commands re being implemented use of hand gesture. Here accelerometer used to migrate the touchpad to revolve 3Dimensional object. Accelerometer changed to wireless communication 3Dimensional graphics can be done easily. Effective interaction.

III. PROPOSED METHOD

To regulate the robot's motion in this suggested system, we use a MEMS sensor (Accelerometer sensor). Accelerometer is used to give commands for robot movement. The MEMS Sensor will send the changes to the Robot. The robot will then move in the appropriate direction if any threshold value is exceeded.

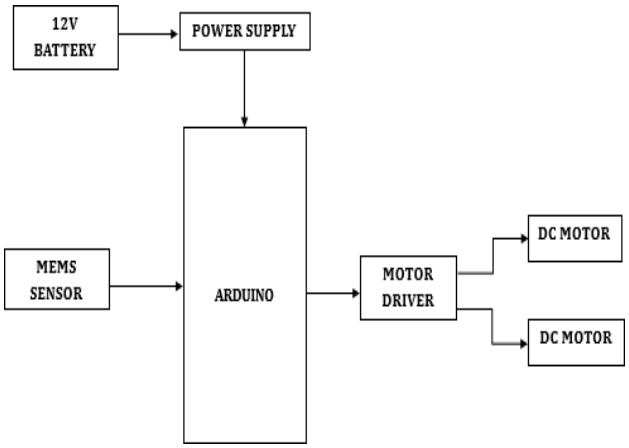

Fig 1 : Block Diagram of Proposed System

IV. HARDWARE REQUIREMENTS

The hardware requirements we are used in this project are:

4.1. Arduino :

An Arduino is actually a micro controller-based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open-source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartillas in 2005. The Uno with Cable is a micro-controller board base 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 ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything need to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

.

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Fig 2 : Structure of Raspberry Pi

4.2. MEMS Sensor:

The term MEMS stands for micro-electro-mechanical systems. These are a set of devices, and the characterization of these devices can be done by their tiny size & the designing mode. The designing of these sensors can be done with the 1- 100-micrometer components. These devices can differ from small structures to very difficult electromechanical systems with numerous moving elements beneath the control of incorporated micro-electronics. Usually, these sensors include mechanical micro-actuators, micro-structures, micro-electronics, and micro-sensors in one package. This article discusses what is a MEMS sensor, working principle, advantages and its applications

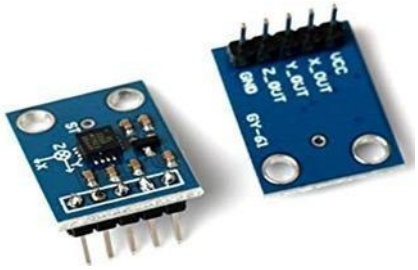

Fig 3: MEMS Sensor

4.3. DC Motor :

A machine that converts D.C power into mechanical power is known as a dc. motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

4.4. Battery:

A rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals.

Rechargeable batteries allow for multiple usages from a cell, reducing waste and generally providing a better long-term investment in terms of dollars spent for usable device time. This is true even factoring in the higher purchase price of rechargeable and the requirement for a charger.

4.5. L293D Motor Driver:

L293D is a dual H-Bridge motor driver, So with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction and if you have motor with fix direction of motion the you can make use of all the four I/Os to connect up to four DC motors.

4.6. Capacitor:

Capacitors are used to attain from the connector the immaculate and smoothest DC voltage in which the rectifier is used to obtain throbbing DC voltage which is used as part of the light of the present identity. Capacitors are used to acquire square DC from the current AC experience of the current channels so that they can be used as a touch of parallel yield.

4.7. Voltage Regulator:

The 78XX voltage controller is mainly used for voltage controllers as a whole. The XX speaks to the voltage delivered to the specific gadget by the voltage controller as the yield. 7805 will supply and control 5v yield

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voltage and 12v yield voltage will be created by 7812. The voltage controllers are that their yield voltage as information requires no less than 2 volts. For example, 7805 as sources of information will require no less than 7V, and 7812, no less than 14 volts. This voltage is called Dropout Voltage, which should be given to voltage controllers.

IV. SOFTWARE REQUIREMENTS

Embedded C:

Implanted C makes use of KEIL IDE programming. The framework program written in implanted C can be placed away in Microcontroller. The accompanying is a portion of the actual motives behind composing applications in C as opposed to get collectively. It is much less disturbing and much less tedious to write down in C then amassing. C is less traumatic to trade and refresh. You can utilize code available in capacity libraries. C code is compact to different microcontrollers with subsequent to 0 alteration. Genuine, installed C programming need nonstandard expansions to the C driver with a view to bolster charming components, as an example, settled point range catching, numerous unmistakable reminiscence banks, and fundamental I/O operations. In 2008, the C Standards Committee prolonged the C data to deal with these problems via giving a normal well known to all executions to purchaser to contains numerous additives not handy in standard C, for example, settled factor wide variety catching, named address spaces, and vital I/O equipment tending to. Installed C utilize the greater part of the grammar and semantics of well-known C, e.g., number one() paintings, variable definition, facts type statement, contingent proclamations (if, switch. Case), circles (even as, for), capacities, exhibits and strings, structures and union, piece operations, macros, unions, and so on.

V.RESULT

This robot is meant to move in response to human hand gestures. When we move our hand, the robot moves in the order of suitable responses. Left, right, forward, and backward hand motions can be used to move the robot in different directions.

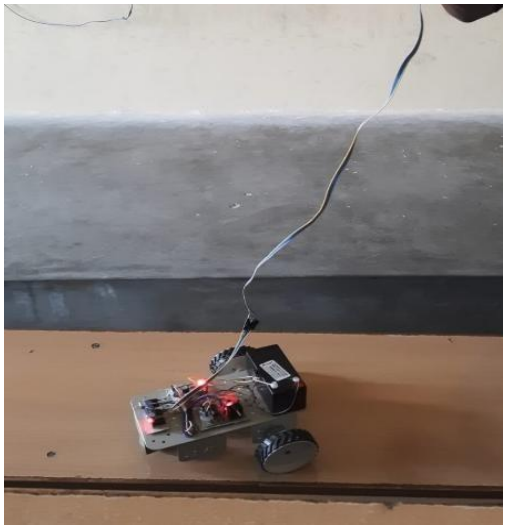

Fig 4: Electronic Wheelchair

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