

DESIGN AN ELECTRO MECHANICAL VENTILATOR BASED ON DOUBLE CAM INTEGRATION MECHANISM (COVID-19)

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering degree in
Electrical and Electronics Engineering

By

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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC I 12B Status by UGC I Approved by AICTE

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI-600119

MAY – 2022



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of

LAVANYA P (Reg.No:38140025) and **SWEATHA S** (Reg.No:38140055) who carried Out the project entitled **Design an electro mechanical ventilator based on Double CAM integration mechanism (COVID-19)** under our supervision from November 2021 to May 2022.

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Internal Guide

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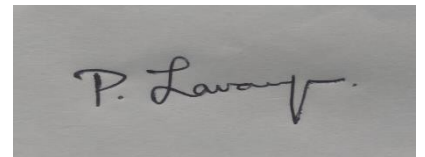
DECLARATION

We, **LAVANYA P** (Reg.No:38140025) and **SWEATHA S** (Reg.No:38140055)

Hereby declare that the Project Report entitled **Design an electro mechanical ventilator based on double CAM integration mechanism (COVID-19)** done by us under the guidance of **Dr. C. BHUVANESHWARI** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in ELECTRICAL AND ELECTRONICS ENGINEERING.

SIGNATURE OF CANDIDATES

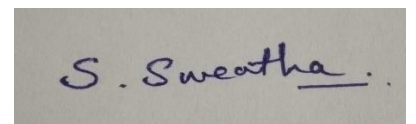
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We would like to express my sincere and deep sense of gratitude to my Project Guide **DR.C. BHUVANESWARI** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electrical and Electronics Engineering who were helpful in many ways for the completion of the project.

ABSTRACT

This project proposes a simplified structure of microcontroller based mechanical ventilator integrated with gear mechanism. Here, an AMBU bag is operated with gear mechanism that is commanded via a microcontroller and android app by sending a control signal to the mechanical system and according to this control signal, the mechanism simultaneously compresses and decompresses the AMBU bag. It is a self-inflating bag and like a one-way valve around its inlet and outlet corner. By compressing the AMBU bag it delivers air and by relaxing, it takes air from the environment through a mechanical scavenger. The wireless control signals are designed with android app it has controlling modes named adult mode based on the respiratory rate. The device is in assist-controlled mode by dint of fixing the tidal volume for all unique control signals. The proposed device is portable, compact, low weight, and efficient performable. It can be supplied around the rural area hospitals for immediate medication with cost efficiency and risk avoidance. Anyone can operate it as no need to study or training of ventilation rules like ICU ventilator. The proposed system is safe, riskless, and repairable. By applying this portable ventilator system immediate attention can be taken up in rural or general hospitals and in ambulances. The device is considered as a wireless device that can be accessed by a specialist to update the parameters according to the patient's health condition.

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LIST OF ABBREVIATIONS

ICU	Intensive Care Unit
CO ₂	Carbon dioxide
RH	Relative Humidity
IAQ	Indoor Air Quality
BVM	Bag-Valve-Mask
CAM	Computer-Aided Manufacturing
bpm	breaths per minute
AVR	Alf and Vegan's RISC
AMBU	Artificial Manual Breathing Unit
MAC	Media Access Control
psi	pounds per square inch
kPa	Kilopascal
IDE	Integrated Development Environment
FAB	Floating Action Button
SDK	Software Development Kit
XML	Extensible Markup Language
HTML	Hypertext Markup Language
UI	User Interface
JVM	Java Virtual Machine
CAD	Computer-Aided Design
VSS	Voltage Source Supply
VDD	Voltage Drain Drain
EN	Enable
TX	Transmit
RX	Receive
GND	Ground
DC	Direct Current
AC	Alternating Current
SMPS	Switched-Mode Power Supply
EMI	Electromagnetic Interference
IC	Integrated Circuit
TTL	Transistor-transistor Logic
KB	Kilo Byte
SRAM	Static Random Access Memory
EEPROM	Electrically Erasable Programmable Read-Only Memory
PWM	Pulse-Width Modulation
ADC	Analog-to-Digital Converter
TQFP	Thin Quad Flat Package
QFN/MLF	Quad-Flat no-leads/Micro Lead Frame

USART	Universal Synchronous Asynchronous Receiver Transmitter
SPI	Serial Peripheral Interface
PDIP	Program Development Integration Plan
VCC	Common Collector Voltage
ASSR	Auditory Steady-State Response
RSTDISBL	Reset Disable
AREF	Analog Reference
RISC	Reduced Instruction Set Computer
LED	Light-Emitting Diode
CPU	Central Processing Unit
Vee	Voltage at Emitter
I/O	Input/output
R/W	Read/Write
PAN	Personal Area Network
FHSS	Frequency-hopping Spread Spectrum
TXD	Transmit Serial Data
RXD	Receive Data
USB	Universal Serial Bus
EMF	Electromotive Force
CMOS	Complementary Metal-Oxide Semiconductor
PNP	Positive Negative Positive
NPN	Negative Positive Negative
BJT	Bipolar Junction Transistor
MOSFET	Metal-Oxide Semiconductor Field-Effect Transistor
GDT	Gate Drive Transformer
FET	Field Effect Transistor
RPM	Revolution Per Minute
NTC	Negative Temperature Coefficient
PCB	Printed Circuit Board
IPPR	Intermittent Positive Pressure Respiration

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CHAPTER - 1

1. INTRODUCTION

The most pressing shortages facing hospitals during the COVID-19 emergency is a lack of ventilators. These machines can keep patients breathing when they no longer can on their own and they can cost around \$30,000 each. Design and development of a low- cost portable ventilator could be a possible way that can help pneumonia cases of COVID-19 patients in Bangladesh. The Proposed low-cost ventilator delivers breaths by compressing a conventional AMBU bag with a pivoting motor drive mechanism, eliminating the need for a human operator. Among other features, the machine should have invasive and non-invasive feature and supports 500-600 mL tidal volume, with a continuous working capability for several days. The low-power and portable ventilator technology that provides essential ventilator features at a fraction of the cost of existing models. The manual resuscitator is an artificial breathing unit that delivers air to the patient having lung-related problems. Mechanical ventilation is generally considered to be a supportive therapy and is often a life-saving technique. Ventilators are one of the most important devices to keep COVID-19 patients in the most critical condition alive. As the global demand for ventilators is increasing and there is shortage of ventilators in our country as well, also managing patients during this time is a big task, so we have designed portable rechargeable battery operated AMBU bag compressing machine, which sends real time cloud messages to the doctors and other medical authorities about the patient. We have made the prototype and we are improving its performance by adding extra new features. It can be used for emergency purposes, in hospitals, Corona virus quarantine coaches, isolation wards and rural areas as well. The shortage of ventilators can be met effectively by developing this project. This project is a low cost yet effective ventilating system for the people affected with COVID-19. It is compact and Low Weight.

1.1. PROBLEM DEFINITION:

In existing system, the implementing cost is high. The existing method is manual method; need to compress the bag by human operator. This is the problem in existing system which can be rectified by modifying manual method to automatic method, in order to supply oxygen to the patient without the help of human operators and implementation cost is also low.

CHAPTER-2

2. LITERATURE SURVEY

MECHANICAL VENTILATION TO MINIMIZE PROGRESSION OF LUNG INJURY IN ACUTE RESPIRATORY FAILURE

L. Brochard, A. Slutsky, and A. Pesenti has reported that the Mechanical ventilation is used to sustain life in patients who have acute respiratory failure. The ventilator-induced lung injury observed in mechanically ventilated patients is similar to the patient will develop lung injury which is suggested in recent data. To minimize the progression of lung injury from a form of patient self-inflicted lung injury, we argue that application of a lung-protective ventilation, today best applied with sedation and endotracheal intubation, might be considered a prophylactic therapy, rather than just a supportive therapy.

IOT BASED INDUSTRIAL PARAMETERS MONITORING AND ALARMING SYSTEM USING ARDUINO - A NOVEL APPROACH

S. P. Lalwani, M. K. Khurana, S. J. Khandare, O. U. R. Ansari, D. S has investigated IOT has the potential to change the world, it can create information about the connected objects, analyze it, and make decisions; in other words, one can tell that the Internet of Things is smarter than the Internet. The main object of this project is to make a unique device for safely detecting the malfunction of an endangered factory to stop the release of combustible gases to prevent any explosion from taking place while also monitoring a lot of other factors for extra secure.

TELE PRESENT MECHANICAL VENTILATION TRAINING VERSUS TRADITIONAL INSTRUCTION: A SIMULATION- BASED PILOT STUDY

A. Ciullo, J. Yee, J. A. Frey, M. D. Gothard, A. Benner, J. Hammond, R. A. Ahmed has revealed that the use of tele present staff to design suppliers in the utilization of mechanical ventilation including clinical duplication as an it isn't deeply grounded to educate procedure. The sign of this study was to analyze the adequacy of tele present personnel versus standard in-person heading to show mechanical ventilation to clinical understudies. Starting and the it was inspected to lead assemblage of mechanical ventilation. Sensibility was studied by pre-and post-different decision tests, sureness survey and summative entertainment conditions.

USE OF IOT SENSORS FOR INDOOR CONDITION ASSESSMENT AND TUNING OF OCCUPANCY RATES MODELS

S. Rinaldi, A. Flammini, L.C. Tagliabue and A.L.C. Ciribini, shows that the breaking point of IOT plan to take advantage of the utilization of sensor information for various application locales taking on the CO2 fixation limits in blend in with temperature and RH as the pointer for IAQ including sensors to isolate the combination of the limits the indoor spaces of an enlightening mental fundamental working at the clever grounds of the Brescia. The information assembled by the sensors are utilized to chip away at the accuracy of assessment of the inhabitance range in learning spaces, simultaneously giving data about ecological quality and in this way maybe forestalling trouble and conditions that are not extraordinary for understudy's idea and learning shows.

DESIGNING AN ELECTRO MECHANICAL VENTILATOR BASED ON DOUBLE CAM INTEGRATION MECHANISM

M. R. Islam, M. Ahmad, M. S. Hossain, M. M. Islam, and S. F. Uddin Ahmed has revealed that this paper proposes an improved arrangement of microcontroller based mechanical ventilator united with a Bag-Valve-Musk (BVM) ventilation part. Here, an AMBU sack is worked with PC helped conveying (CAM) arm that is educated through a microcontroller and manual switches by giving a control message to the mechanical framework and as exhibited by this control signal, the mechanical computer aided fabricating (CAM) arm at the same time packs and depressurizes the AMBU sack. It is a self-Inflating sack and like a one-way valve around its channel and outlet corner. By squeezing the AMBU sack it conveys air and by relaxing, it takes air from the climate through a mechanical scrounger. the mechanical system and according to this control signal, the mechanical computer- aided manufacturing (CAM) arm simultaneously compresses and decompresses the AMBU bag. It is a self-Inflating bag and like a one-way valve around its inlet and outlet corner. By compressing the AMBU bag it delivers air and by relaxing, it takes air from the environment through a mechanical scavenger.

RESPIRATORY MECHANICS DERIVED FROM SIGNALS IN THE VENTILATOR CIRCUIT

U. Lucangelo, F. Bernabé, and L. Whiten, recommended that the point is to distinguish and decipher the information given by current ventilators that give the best clinical assistance in assessing respiratory mechanics during mechanical ventilation. Pressure-volume circles and stream volume circles give helpful data on the unique patterns of the respiratory framework consistence and obstruction, separately. Current ventilators give total observing of respiratory framework mechanics, which is our rule for enhancing ventilator.

MONITORING RESPIRATORY RATE IN ADULTS

B. Slope and S. H. Annesley has detailed that this article investigates the observing of respiratory rates in grown-up patients. This is a huge actual evaluation ability since breathing is generally the primary essential sign to modify in the weakening patient. Discovering a standard breath capacity will allow an exact breath appraisal to be done, custom-made to the singular patient. The perception and recording of respiratory rate is the mathematical estimation of breaths each moment (bpm) and advises the generally speaking actual evaluation regarding breath.

CHAPTER-3

3. AIM, SCOPE AND SOFTWARE TOOLS

AIM

- The point of this venture revival in crisis circumstances.
- Compressible self-topping off ventilation pack with non-re breathing patient valve with pressure limit valve to limit the gamble of over expanding.
- This gadget is versatile, conservative, low weight, and productive performable.
- It tends to be provided around the provincial region emergency clinics for sure fire medicine with cost proficiency and hazard aversion.
- Anybody can work it as compelling reason need to study or preparing of ventilation rules like ICU ventilator.

SCOPE

Now, we have developed for adult mode only. In future, it can be modified to use for three modes simultaneously. In future, we can develop for both infant and adult in the same system. For infants the breath rate per minute is 30 to 60 per minute. For adult the breath rate is 12 to 18 per minute. It can be set to use for two modes simultaneously in the future enhanced system. We can also develop the tidal volume and respiratory rate automatically using sensors this will be implemented with the ventilator system. In tele machine applications mechanical ventilator is the most important growing technology in the world now for the automation basics.

3.1. BLOCK DIAGRAM

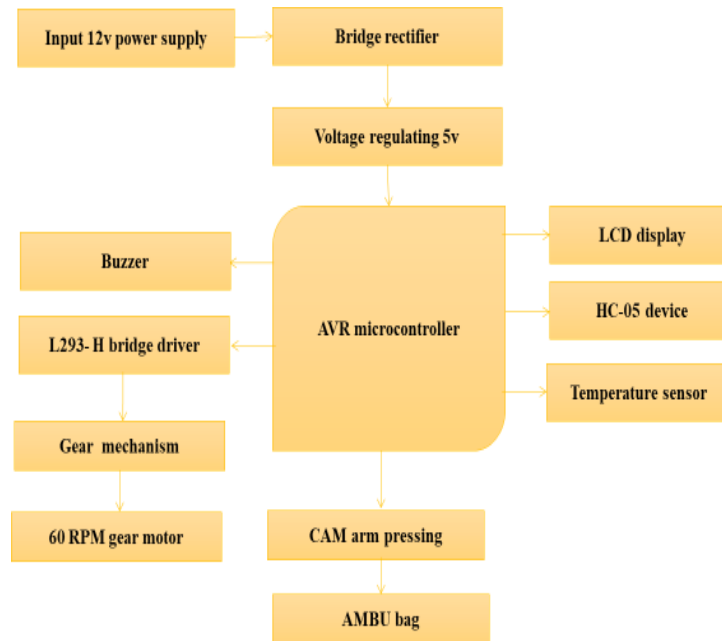


Fig.no.3.1. Block diagram

3.1.1. BLOCK DIAGRAM DESCRIPTION

The conventional mechanical ventilator is executed in this task. The squares comprise of this venture is equipment ventilator and programming versatile application. In this venture the electromechanical ventilator is worked in view of the controlling signs from the portable application. It works effectively and safe. The convenient ventilator is planned in light of the stuff component. The AVR regulator is utilized in this ventilator for controlling. The L293 engine driver is utilized to control AMBU bag with gear engine in view of stuff system. CAM (PC helped fabricating) arm is planned in 3D printing framework for press the AMBU bag. HC-05 wireless gadget is utilized for getting signal structure android application for controlling the AMBU bag. The patient internal heat level is observing by utilizing condition implies ringer alert is initiated. The android

versatile application produced for controlling this ventilator. The portable application can be having the special/nurture mode. The specialist/attendant can be controlling the ventilator by tapping the controlling mode. The regulator will get the info signal from portable application by utilizing remote gadget. After that regulator actuate the stuff engines associating the driver board, the component begins to pack and de-pressurize the AMBU bag and convey the oxygen supply to the patient.

3.2. BLOCK DIAGRAM OF ANDROID APP

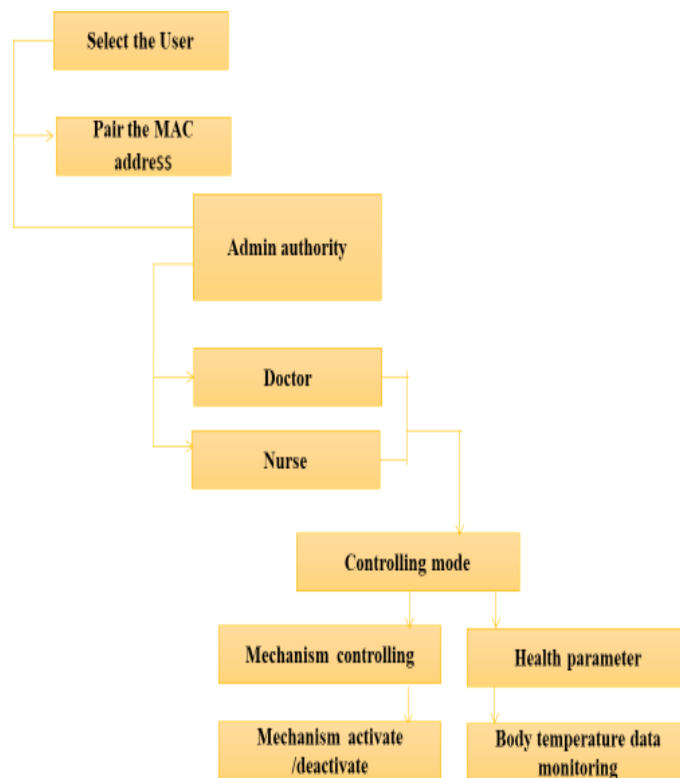


Fig.no.3.2. Block diagram of Android App

3.2.1. ANDROID APP DESCRIPTION

In login page, android app has two modes. User have to select doctor mode or nurse mode. The android app will pair with hardware using MAC address. Only two members can access admin authority. From android app, the instruction will send to hardware because of HC-05 wireless device. Then, we have to click on mechanism activate and the hardware will get activated i.e. CAM arm will compress and decompress the AMBU bag automatically and oxygen will deliver to patient. We also monitor the patient body temperature using health monitor.

3.3. HARDWARE REQUIREMENTS

- AVR microcontroller
- Power supply
- Bridge rectifier
- Voltage regulator
- LCD display
- HC-05 device
- L293 driver board
- Gear motor
- Temperature sensor
- Buzzer
- AMBU bag

3.4. SOFTWARE REQUIREMENTS

- Android studio
- Java program
- Embedded c program for hardware
- Autodesk fusion 360

3.5. EXISTING SYSTEM

- The current versatile ventilators which can be extensively arranged as pneumatic and electronic.
- Pneumatic ventilators are impelled utilizing the energy of packed gas, frequently a standard 50 psi (345 kPa) pressure source ordinarily accessible in emergency clinical.
- In this strategy the ventilator conveys breaths by compacting an ordinary sack they need for a human administrator to set the strain levels as indicated by their ages.
- Execution cost is excessively high.

DISADVANTAGE OF EXISTING SYSTEM:

- In existing framework, the it is high to carry out cost.
- The current technique is manual strategy; they need to pack the sack by human administrator.

3.6. PROPOSED METHOD

- In this proposed framework we are involving AVR miniature regulator for controlling the gadget.
- Input voltage is 12 v to power supply and this voltage regulated to 5v using power regulators.
- The L293 engine driver is utilized to control AMBU sack with gear engine in view of stuff instrument. Remote gadget is utilized for getting signal structure android application for controlling the component.
- The framework utilized an AMBU sack as a one-way valve and oxygen pressure age.
- The CAM arm alludes to the Computer-Aided Manufacturing arm. This arm can be planned by the 3D printing framework.
- This framework additionally checking and show the patient internal heat level information by utilizing temperature sensor. In the event that internal heat level is unusual condition implies signal alarm is enacted.
- In PDA we are making android application for control the equipment gadget. It is minimal and power is utilization is low.

ADVANTAGES OF PROPOSED SYSTEM:

- This proposed electromechanical ventilator is convenient, reduced, low weight, and effective performable.
- It very well may be provided around the provincial region clinics for guaranteed prescription with cost proficiency and hazard aversion.
- Anybody can work it as compelling reason need to study or preparing of ventilation rules like ICU ventilator.

CHAPTER-4

4. HARDWARE MODULE

4.1. CIRCUIT DIAGRAM

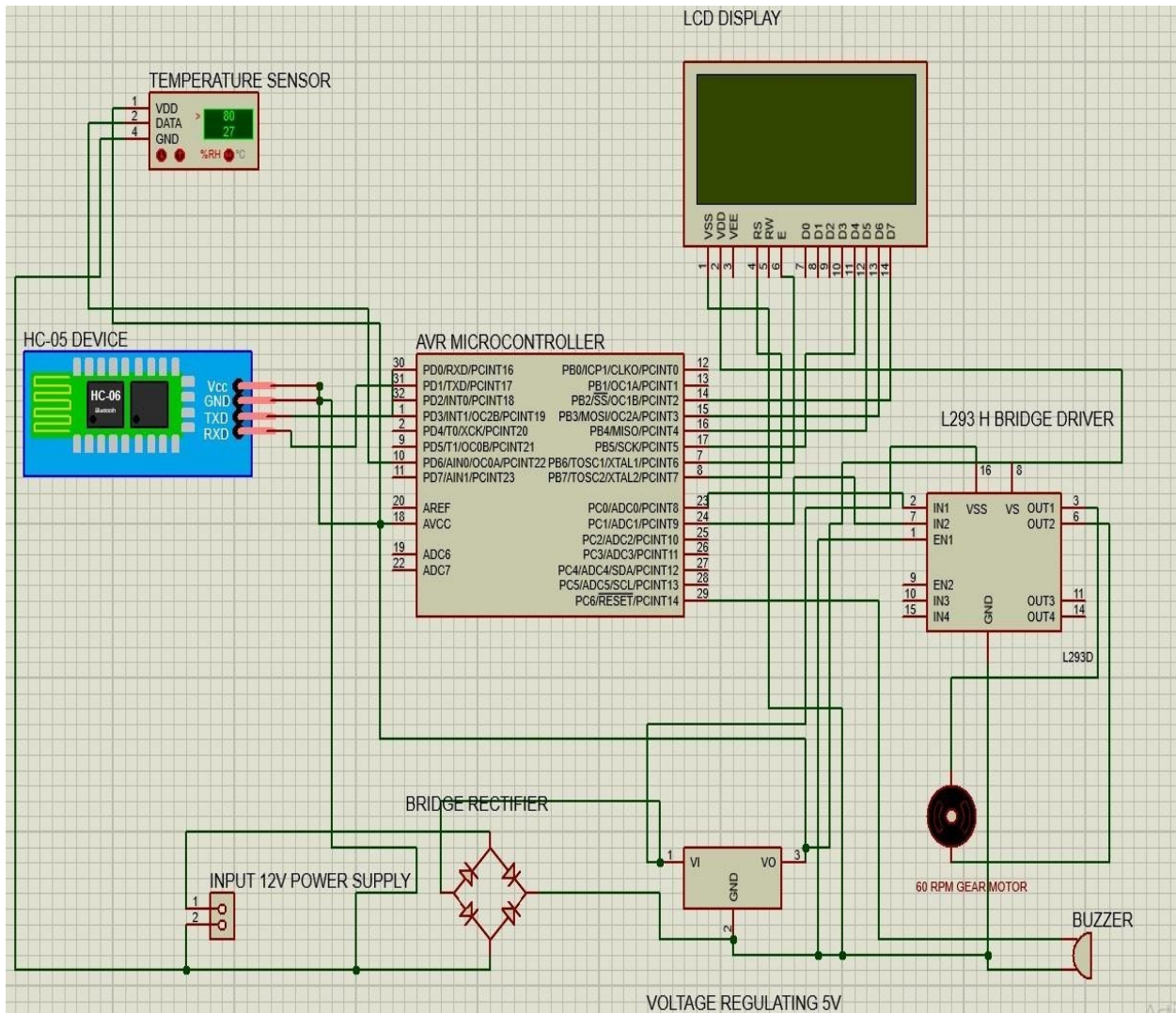


Fig.no.4.1. Circuit Diagram for Proposed System

4.1.1. WORKING PRINCIPLE

- The above circuit consist the core components of pro mini controller, LCD display, L293 H bridge driver, gear motor, HC-05 device.
- The AVR controller is heart of the circuit.it controls the whole circuit.
- The 12v supply is converting to 5v with the help of voltage regulator. Then the 5v supply is given to controller board.
- LCD Display is connected to controller digital pins like d2, d3, d4, d5, d6, d7 respectively.VSS is connected to ground, VDD is connected to 5v.
- In L293 driver board is connecting for controlling the gear motors. EN1 is connected to 5v supply. Gear motor is connected in driver board OUT1 and OUT2 pins.
- HC-05 Wireless device has four pins. Wireless device is connecting to controller for transmitting and receiving the signal. TX and RX pin is connected to controller RX and TX pin respectively pin is connected to 5V and GND pin is connected to ground.
- Temperature sensor has 3 pins GND, VDD, DATA pins. VDD pin is connected to 5v supply, DATA pin is connected to controller digital pin, and GND pin is grounded.
- Buzzer has two pins, positive pin is connected to digital pin, negative pin is connected to ground.

4.2. POWER SUPPLY

12V power supplies (or 12V DC power supplies) are one of the most common power supplies in use today. In general, a 12V DC output is obtained from a 120V AC or 240V AC input using a combination of transformers, diodes and transistors. 12V power supplies can be of two types: 12V regulated power supplies, and 12V unregulated power supplies. 12V regulated power supplies come in three styles: Switching regulated AC to DC, Linear regulated AC to DC, and Switching regulated DC to DC.



Fig.no.4.2. 12V Power supply

Exchanging controlled 12V DC power supplies, once in a while alluded to as SMPS power supplies, switchers, or exchanged mode power supplies, direct the 12V DC yield voltage utilizing a perplexing high recurrence exchanging method that utilizes beat width tweak and criticism. A Copian exchanging directed power supplies additionally utilize broad EMI separating and safeguarding to weaken both normal and differential mode clamor led to the line and burden. Galvanic disengagement is standard in our 12V DC switchers, bearing the cost of our clients contribution to result to unendingly ground confinement for greatest adapt. Copian exchanging managed power supplies are exceptionally proficient, little and lightweight, and are accessible in both AC-DC single and wide-change result and DC setups. Our Low Profile wide change yield switchers can be voltage or current controlled and are remotely programmable.

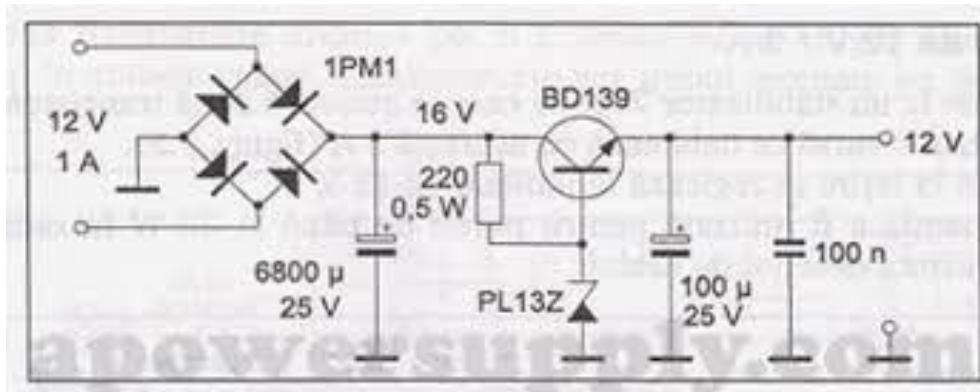


Fig no:4.3. 12V Power supply circuit diagram

Direct controlled 12V DC power supplies manage the result utilizing a dissipative directing circuit. They are incredibly steady, have extremely low wave, and have no changing frequencies to deliver EMI. Galvanic confinement is standard in our 12V DC straight, managing the cost of our clients contribution to result to interminably ground disconnection for greatest adaptability. Copian straight managed power supplies are accessible AC to DC single and wide change yields.

Unregulated 12V DC power supplies are fundamental power supplies with an AC input and an unregulated 12V DC yield. The result voltage changes with the information voltage and burden. These power supplies are reasonable and incredibly solid.

Normal APPLICATIONS FOR 12V DC POWER SUPPLIES

- PC Peripherals and Networking Applications
- Broadcast communications and Fiber Optic Network
- Voice, Data and Analog Communications
- Colleges and Educational Facilities
- Instrumentation and Electronics
- Utility and Power Industries
- Information Acquisition
- Clinical
- Military
- Engine control

4.3. BRIDGE RECTIFIER

A power supply takes the AC from the divider outlet, switches it over completely to unregulated DC, and diminishes the voltage utilizing an info power transformer, normally venturing it down to the voltage expected by the heap. For wellbeing reasons, the transformer additionally isolates the result power supply from the mains input.

Figure 4.4, Figure 4.5, and Figure 4.6 represent the overall change from AC to DC. Substituting current appears as a sinusoidal wave with the voltage rotating.

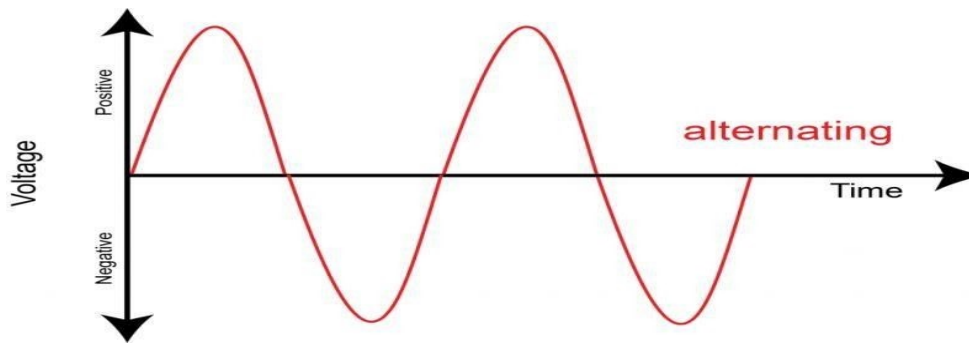


Fig.no.4.4. Alternating Current from Wall Outlet

POWER SUPPLY COMPARISONS

AC power supplies come in two varieties, unregulated and regulated. Unregulated is the most basic type of power supply and does not have the ability to supply consistent voltage to a load, while regulated power supplies do and have many different design options.

In the initial step of the cycle, the voltage is amended utilizing a bunch of diodes. Amendment changes the sinusoidal AC. The rectifier changes over the sine waves into a progression of positive pinnacles.

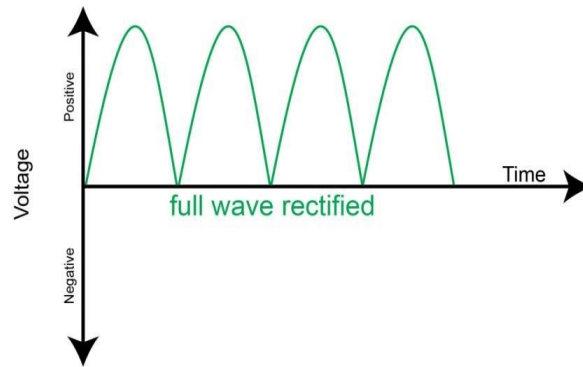


Fig.no. 4.4. Full wave rectified

When the voltage has been redressed, there is still variance in the waveform — the time between the pinnacles — that should be taken out. The redressed AC voltage is then separated or "smoothed" with a capacitor.

The capacitor is normally very enormous and makes a repository of energy that is applied to the heap when the corrected voltage drops. The approaching energy is put away in the capacitor on the rising edge and exhausted when the voltage falls. This fundamentally decreases how much voltage hang and smooths out the voltage. Expanding the capacity limit of the capacitor for the most part creates a more excellent power supply.

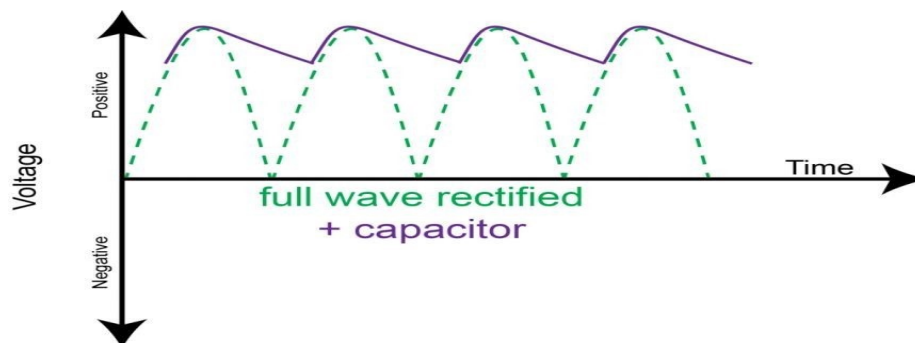


Fig.no.4.6. Full Wave Rectified + Capacitor

When the voltage change is finished, there is still some variety in yield, called swell. In a controlled power supply, the voltage is then gone through a controller to make a decent DC yield with less wave. Direct converters are the most un-complex yet additionally make the most hotness, while exchanged converters are more unpredictable and cooler however

make more commotion. Batteries are commonly exchanged converters. Each enjoys benefits and downsides however which to utilize will be founded for the most part on the kind of utilization and the circumstances under which it will be run.

4.4. 7805 IC VOLTAGE REGULATOR

4.4.1. INTRODUCTION

In this instructional exercise, we will see around one of the most generally utilized controller Ic's, the 7805 Voltage Regulator IC. A directed power supply is a lot of fundamental for a considerable length of time gadgets because of the semiconductor material utilized in them have a decent pace of current as well as voltage. The gadget might get harmed on the off chance that there is any deviation from the decent rate. One of the significant wellsprings of DC supply are batteries. Yet, involving batteries in touchy electronic circuits is definitely not a smart thought as batteries in the long run empty out and lose their true capacity over the long run.

Additionally, the voltage given by batteries are commonly 1.2V, 3.7V, 9V and 12V. This is really great for circuits whose voltage prerequisites are there. However, the greater part of the TTL IC's work on 5V rationale and subsequently we really want an instrument to give a steady 5V Supply.

Here comes the 7805 Voltage Regulator IC to the salvage. It is an IC in the 78XX group of straight voltage controllers that produce a managed 5V as result. A portion of the significant highlights of the 7805 IC are as per the following:

- It can convey up to 1.5 A of current (with heat sink).
- Has both inside current restricting and warm closure highlights.
- Requires exceptionally least outer parts to work completely.

4.4.2. PIN DIAGRAM OF 7805 VOLTAGE REGULATOR IC

As referenced before, 7805 is a three-terminal gadget with the three pins being 1. INPUT, 2. GROUND and 3. Yield. The accompanying picture shows the pins on a common 7805 IC in To-220 Package.

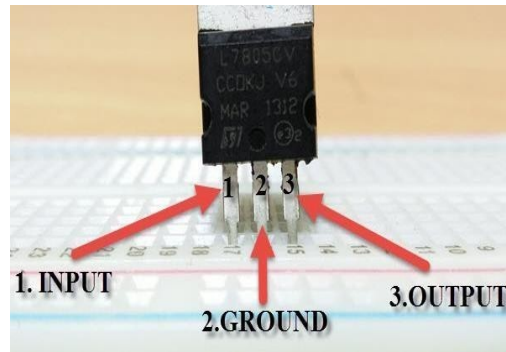


Fig no:4.7. Pin Diagram of 7805 Voltage Regulator IC

4.4.3. WORKING

The AC power supply from mains initially gets changed over into an unregulated DC and afterward into a steady managed DC with the assistance of this circuit. The circuit is comprised of transformer, span rectifier made up from diodes, straight voltage controller 7805 and capacitors.

In the event that you notice, the working of the circuit can be separated into two sections. In the initial segment, the AC Mains is changed over into unregulated DC and in the subsequent part, this unregulated DC is changed over into directed 5V DC. Along these lines, let us begin talking about the working in light of this.

At first, a 230V to 12V Step down transformer is taken and its essential is associated with mains supply. The optional of the transformer is associated with Bridge rectifier (either a devoted IC or a blend of 4 1N4007 Diodes can be utilized).

A 1A wire is put between the transformer and the scaffold rectifier. This will restrict the ongoing attracted by the circuit to 1A. The redressed DC from the extension rectifier is smoothened out with the assistance of 1000 μ F Capacitor.

Along these lines, the result across the 1000 μ F Capacitor is unregulated 12V DC. This is given as a contribution to the 7805 Voltage Regulator IC. 7805 IC then switches this over completely to a managed 5V DC and the result can be acquired at its result terminals.

Voltage Regulator	Input voltage V_{in}	Output Voltage	
		V_{min}	V_{max}
7805	7 – 20V	4.75V	5.25V
7809	11.5 - 24V	8.6V	9.4V
7812	14.5 – 27V	11.4V	12.6V

Table No:4.1.7805 IC Voltage Regulator

4.5 AVR MICROCONTROLLER

The low-power Atmel 8-bit AVR RISC-based microcontroller joins 8KB of programmable glimmer memory, 1KB of SRAM, 512K EEPROM, and a 6 or 8 channel 10-cycle A/D converter. The gadget upholds throughput of 16 MIPS at 16 MHz and works between 2.7-5.5 volts.

4.5.1. FEATURES

Elite PERFORMANCE, LOW-POWER ATMEL AVR8-BIT MICROCONTROLLER

- Progressed RISC Architecture
- 130 Powerful Instructions - Most Single-clock Cycle Execution
- 32×8 General Purpose Working Registers
- Completely Static Operation
- Up to 16MIPS Throughput at 16MHz
- On-chip 2-cycle Multiplier

HIGH ENDURANCE NON-VOLATILE MEMORY SEGMENTS

- 8Kbytes of In-System Self-Programmable Flash program memory
- 512Bytes EEPROM
- 1Kbyte Internal SRAM
- Compose/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Information maintenance: 20 years at 85°C/100 years at 25°C (1)
- Discretionary Boot Code Section with Independent Lock Bits
- In-System Programming by On-chip Boot Program
- Genuine Read-While-Write Operation
- Programming Lock for Software Security

4.5.2. PERIPHERAL FEATURES

- Two 8-bit Timer/Counters with Separate Prescaler, one Compare Mode
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- Ongoing Counter with Separate Oscillator
- Three PWM Channels
- 8-direct ADC in TQFP and QFN/MLF bundle
- Eight Channels 10-bit Accuracy
- 6-direct ADC in PDIP bundle
- Six Channels 10-bit Accuracy
- Byte-arranged Two-wire Serial Interface
- Programmable Serial USART
- Ace/Slave SPI Serial Interface

- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator

4.5.3. SPECIAL MICROCONTROLLER FEATURES

- Power-on Reset and Programmable Brown-out Detection
- Interior Calibrated RC Oscillator
- Outside and Internal Interrupt Sources
- Five Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, and
- Reserve

I/O AND PACKAGES

- 23 Programmable I/O Lines
- 28-lead PDIP, 32-lead TQFP, and 32-cushion QFN/MLF

WORKING VOLTAGES

- 2.7V - 5.5V (ATmega8L)
- 4.5V - 5.5V (ATmega8)

SPEED GRADES

- 0 - 8MHz (ATmega8L)
- 0 - 16MHz (ATmega8)

POWER CONSUMPTION AT 4Mhz, 3V, 25°C

- Dynamic: 3.6mA
- Inactive Mode: 1.0mA
- Shut down Mode: 0.5μA



Fig no4.8. AVR controller

4.5.4. PIN DESCRIPTIONS

1. VCC Digital inventory voltage.
2. GND Ground.
3. XTAL1/XTAL2/TOSC1/TOSC2 Port B (PB7.PB0)

Port B is a 8-digit bi-directional I/O port with inner draw up resistors (chosed for each piece). The Port B yield supports have balanced drive attributes with both high sink and source capacity. As information sources, Port B sticks that are remotely pulled low will source current assuming the draw up resistors are enacted. The Port B pins are tri-expressed when a reset condition becomes dynamic, regardless of whether the clock isn't running. Contingent upon the clock determination combine settings, PB6 can be utilized as contribution to the transforming Oscillator enhancer and contribution to the inside clock working circuit. Contingent upon the clock choice breaker settings, PB7 can be utilized as result from the altering Oscillator enhancer. Assuming the Internal Calibrated RC Oscillator is utilized as chip clock source, PB 7.6 is utilized as TOSC2.1input for the Asynchronous Timer/Counter2 in the event that the AS2 bit in ASSR is set.

Port C (PC5.PC0)

Port C is a 7-piece bi-directional I/O port with inner draw up resistors (chosed for each piece). The Port C result cradles have balanced drive qualities with both high sink and source ability. As data sources, Port C pins that are remotely pulled low will source current assuming the draw up resistors are enacted. The Port C pins are tri-expressed when a reset condition becomes dynamic, regardless of whether the clock isn't running.

PC6/RESET

Assuming the RSTDISBL Fuse is modified, PC6 is utilized as an I/O pin. Note that the electrical attributes of PC6 vary from those of different pins of Port C. Assuming the RSTDISBL Fuse is uncustomized, PC6 is utilized as a Reset input. A low level on this pin for longer than the base heartbeat length will produce a Reset, regardless of whether the clock isn't running. More limited beats are not ensured to create a Reset.

Port D (PD7.PD0)

Port D is a 8-cycle bi-directional I/O port with inner draw up resistors (chosed for each piece). The Port D result cradles have balanced drive qualities with both high sink and source ability. As data sources, Port D pins that are remotely pulled low will source current assuming the draw up resistors are actuated. The Port D pins are tri-expressed when a reset condition becomes dynamic, regardless of whether the clock isn't running.

RESET

Reset input. A low level on this pin for longer than the base heartbeat length will create a reset, regardless of whether the clock isn't running. More limited beats are not ensured to produce a reset.

ATMEGA8(L)

A VCC is the inventory voltage pin for the A/D Converter, Port C (3.0), and ADC (7.6). It ought to be remotely associated with VCC, regardless of whether the ADC isn't utilized. Assuming the ADC is utilized, it ought to be associated with VCC through a low-pass channel. Note that Port C (5.4) utilize advanced supply voltage, VCC. AREF is the simple reference pin for the A/D Converter.

4.6 ARCHITECTURAL OVER VIEW

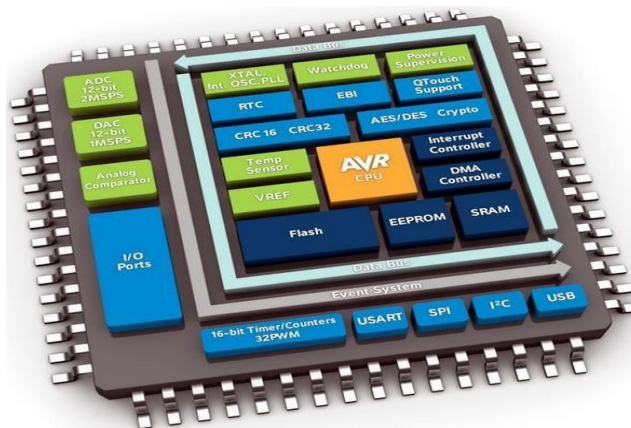


Fig.no.4.9 Overview of architecture

REGISTER FILE

The Register File is upgraded for the AVR Enhanced RISC guidance set. To accomplish the necessary exhibition and adaptability, the accompanying information/yield plans are upheld by the Register File:

- One 8-cycle yield operand and one 8-digit result input
- Two 8-cycle yield operands and one 8-digit result input
- Two 8-cycle yield operands and one 16-digit result input
- One 16-cycle yield operand and one 16-digit result input

APPLICATIONS

- Temperature control frameworks
- Simple sign estimating and controls.
- Installed frameworks like espresso machine, candy machine.
- Engine control frameworks.
- Advanced signal handling.
- Fringe Interface framework.

4.7. LIQUID CRYSTAL DISPLAY

LCD represents Liquid Crystal Display. LCD is observing wide spread use supplanting LEDs (seven fragment LEDs or other multi section LEDs) as a result of the accompanying reasons:

1. The declining costs
2. The capacity to show numbers, characters and illustrations. This is as opposed to LEDs, which are restricted to numbers and a couple of characters.
3. Incorporation of an invigorating regulator into the LCD, in this way letting the CPU free from the errand of reviving the LCD. Interestingly, the LED should be revived by the CPU to continue to show the information.

These parts are "particular" for being utilized with the microcontrollers, and that implies that they can't be actuated by standard IC circuits. They are utilized for composing various messages on a scaled down LCD.

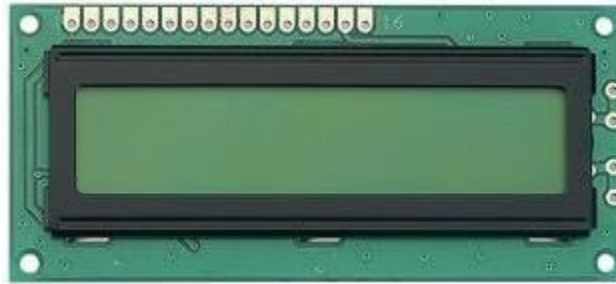


Fig. No.4.10.LCD Display

A model depicted here is at its minimal expense and extraordinary potential outcomes most often utilized practically speaking. It can show messages in two lines with 16 characters each. It shows every one of the letters in order, Greek letters, accentuation marks, numerical images and so on. What's more, it is feasible to show images that client makes up all alone. Programmed moving message in plain view (shift left and right), appearance of the pointer, backdrop illumination and so forth are considered as helpful qualities.

4.7.1. PIN FUNCTIONS:

There are pins along one side of the little printed board utilized for association with the microcontroller. There are absolute of 14 pins set apart with numbers (16 on the off chance that the foundation light is underlying). Their capacity is depicted in the table underneath:

Function	PIN N.O	Name	Logic State	Description
Ground	1	Vss	-	0V
Power supply	2	Vdd	-	+5V
Contrast	3	Vee	-	0 - Vdd
Control of operating	4	RS	0 1	D0 – D7 are interpreted as commands D0 – D7 are interpreted as data
	5	R/W	0 1	Write data (from controller to LCD) Read data (from LCD to controller)
	6	E	0 1 From 1 to 0	Access to LCD disabled Normal operating Data/commands are transferred to LCD
	7	D0	0/1	Bit 0 LSB
Data / commands	8	D1	0/1	Bit 1
	9	D2	0/1	Bit 2
	10	D3	0/1	Bit 3
	11	D4	0/1	Bit 4
	12	D5	0/1	Bit 5
	13	D6	0/1	Bit 6
	14	D7	0/1	Bit 7 MSB

Table.no.4.2. Pin LCD Function

4.7.2. LCD SCREEN:

LCD screen comprises of two lines. Each character comprises of 5x7 speck network. Contrast in plain view relies upon the power supply voltage and whether messages are shown in a couple of lines. Therefore, factor voltage 0-Vdd is applied on pin set apart as Vee. Trimmer potentiometer is typically utilized for that reason; a few variants of presentations have worked in backdrop illumination (blue or green diodes). When utilized during working, a resistor for current impediment ought to be utilized (like with any LE diode).

4.7.3. LCD BASIC COMMANDS:

All information moved to LCD through yields D0-D7 will be deciphered as orders or as information, which relies upon rationale state on pin RS:

RS = 1 - Bits D0 - D7 are addresses of characters that ought to be shown. Inherent processor addresses worked in "guide of characters" and shows relating images.

Showing still up in the air by DDRAM address. This address is either recently characterized or the location of recently moved character is consequently increased.

RS = 0 - Bits D0 - D7 are orders which decide show mode. Rundown of orders forlcd:

4.7.4 LCD CONNECTION:

Contingent upon the number of lines are utilized for association with the microcontroller, there are 8-digit and 4-cycle LCD modes. The proper not entirely set in stone toward the start of the interaction in a stage called "introduction". In the main case, the information is moved through yields D0-D7 as it has been as of now made sense of. In the event of 4-cycle LED mode, for saving important I/O pins of the microcontroller, there are only 4 higher pieces (D4-D7) utilized for correspondence, while other might be left detached. Subsequently, every information is shipped off LCD in two stages: four higher pieces are sent first (that ordinarily would be sent through lines D4-D7), four lower pieces are sent thereafter. With the assistance of instatement, LCD will accurately interface and decipher every information got. Additionally, with respect to the way that information is seldom perused.

LCD (information basically are moved from microcontroller to LCD) another I/O pin might be saved by straightforward associating R/W pin to the Ground. Such saving has its cost.

Despite the fact that message showing will be regularly performed, it won't be imaginable to peruse from occupied banner since it is absurd to expect to peruse from show.

4.7.5. LCD INITIALIZATION:

When the power supply is turned on, LCD is naturally cleared. This cycle goes on for roughly 15mS. From that point onward, show is prepared to work. The method of working is set as a matter of course. This actually intends that:

1. Display is cleared

2. Mode

DL = 1 Communication through 8-digit interface N = 0 Messages are shown in one line

F = 0 Character text style 5 x 8 dabs

3. Display/Cursor on/off D = 0 Display off

U = 0 Cursor off

B = 0 Cursor squint off

4. Character passage

ID = 1 Addresses in plain view are consequently increased by 1 S = 0 Display shift off
Programmed reset is primarily performed with no issues. Basically yet not generally! In the event that under any circumstance power supply voltage doesn't arrive at full worth in that frame of mind of 10mS, show will begin performs totally erratically? On the off chance that voltage supply unit can't meet this condition or on the other hand assuming it is expected to give totally safe working, the course of instatement by which another reset empowering show to work regularly should be applied. Calculation as indicated by the instatement is being performed relies upon whether association with the microcontroller is through 4-or 8-bit interface. All left over to be done after that is to provide fundamental orders and obviously to show messages.

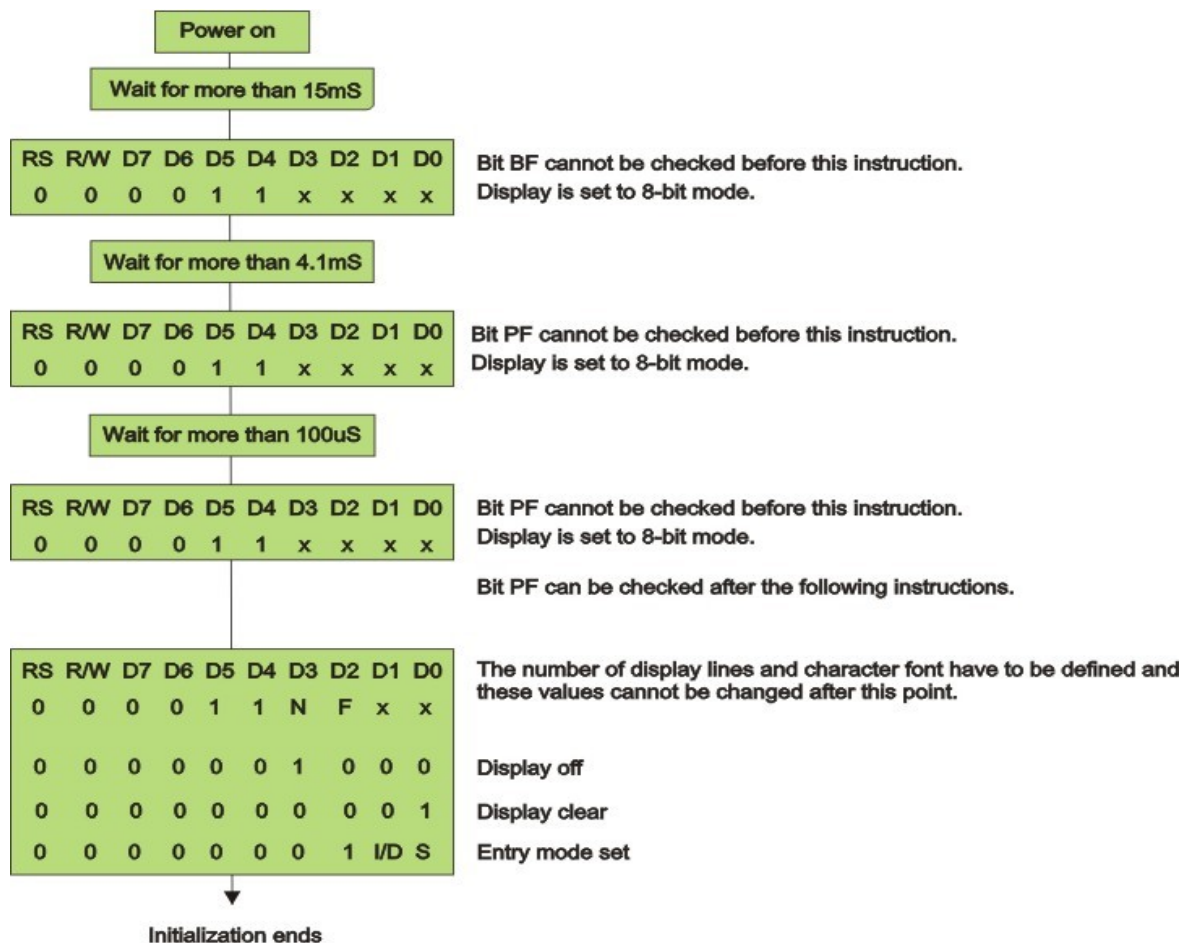


Fig.no:4.11. Procedure on 8-bit initialization

3. Data Logging application
4. Consumer applications
5. Wireless Robots

4.8 HC - O5 DEVICE

4.8.1 INTRODUCTION

- It is utilized for some, applications like remote headset, game regulators, remote mouse, remote console and a lot more buyer applications.
- It has range up to <100m which relies on transmitter and recipient, environment, geographic and metropolitan circumstances.
- It is IEEE 802.15.1 normalized convention, through which one can assemble remote Personal Area Network (PAN). It utilizes recurrence jumping spread range (FHSS) radio innovation to send information over air.
- It utilizes sequential correspondence to speak with gadgets. It speaks with microcontroller utilizing sequential port (USART).

HC-05 BLUETOOTH MODULE

- HC-05 is a Bluetooth module which is intended for remote correspondence.



Fig no:4.12. HC-05 device

Bluetooth sequential modules permit all sequential empowered gadgets to speak with one another utilizing Bluetooth.

It has 6 pins,

1. **Key/EN:** It is accustomed to acquire Bluetooth module AT orders mode. On the off chance that Key/EN pin is set to high, then, at that point, this module will work in order mode. In any case of course it is in information mode. The default baud pace of HC-05 in order mode is

38400bps and 9600 in information mode.

HC-05 module has two modes,

1. **Data mode:** Exchange of information between gadgets.
2. **Command mode:** It utilizes AT orders which are utilized to change setting of HC-05. To send these orders to module sequential (USART) port is utilized.
3. **VCC:** Connect 5 V or 3.3 V to this Pin.
4. **GND:** Ground Pin of module.
5. **TXD:** Transmit Serial information (remotely got information by Bluetooth module communicated out sequentially on TXD pin)
6. **RXD:** Receive information sequentially (got information will be communicated remotely by Bluetooth module).
7. **State:** It tells regardless of whether module is associated.

HC-05 MODULE INFORMATION

- HC-05 has red LED which shows association status, regardless of whether the Bluetooth is associated. Prior to associating with HC-05 module this red LED flickers constantly in an intermittent way. Whenever it gets associated with some other Bluetooth gadget, its flickering dials back to two seconds.
- This module chips away at 3.3 V. We can interface 5V inventory voltage also since the module has on board 5 to 3.3 V controller.
- As HC-05 Bluetooth module has 3.3 V level for RX/TX and microcontroller can distinguish 3.3 V level, in this way, don't bother moving send level of HC-05 module. Be that as it may, we want to move the communicate voltage level from microcontroller to RX of HC-05 module.

4.8.1 BLUETOOTH COMMUNICATION BETWEEN DEVICES

For example Send information from Smartphone terminal to HC-05 Bluetooth module and see this information on PC sequential terminal as well as the other way around.

To convey cell phone with HC-05 Bluetooth module, cell phone requires Bluetooth terminal application for sending and getting information. You can track down Bluetooth terminal applications for android and windows in individual application. store.

BLUETOOTH MODULE SERIAL INTERFACE

Along these lines, when we need to impart through cell phone with HC-05 Bluetooth module, interface this HC-05 module to the PC by means of sequential to USB converter.

Prior to laying out correspondence between two Bluetooth gadgets, first we really want to match HC-05 module to cell phone for correspondence.

Match HC-05 AND SMARTPHONE

1. Search for new Bluetooth gadget from your telephone. You will track down Bluetooth gadget with "HC-05" name.
2. Click on associate/match gadget choice; default pin for HC-05 is 1234 or 0000.

Subsequent to matching two Bluetooth gadgets, open terminal programming (for example Tera term, Real term and so forth) in PC, and select the port where we have associated USB to sequential module. Likewise select default baud pace of 9600 bps.

In advanced mobile phone, open Bluetooth terminal application and associate with matched gadget HC-05.

It is easy to impart; we simply need to type in the Bluetooth terminal utilization of cell phone. Characters will get sent remotely to Bluetooth module HC-

05. HC-05 will naturally send it sequentially to the PC, which will show up on terminal. Same way we can send information from PC to cell phone

Command	Description	Response
AT	Checking communication	OK
AT+PSWD=XXXX	Set Password e.g. AT+PSWD=4567	OK
AT+NAME=XXXX	Set Bluetooth Device Name e.g. AT+NAME=MyHC-05	OK
AT+UART=Baud rate, stop bit, parity bit	Change Baud rate e.g. AT+UART=9600,1,0	OK
AT+VERSION?	Respond version no. of Bluetooth module	+Version: XX OK e.g. +Version: 2.0 20130107 OK
AT+ORGL	Send detail of setting done by manufacturer	Parameters: device type, module mode, serial parameter, passkey, etc.

Table no:4.3. HC-05 command description

Order MODE

- At the point when we need to change settings of HC-05 Bluetooth module like change secret key for association, baud rate, Bluetooth gadget's name and so forth.
- To do this, HC-05 has AT orders.
- To utilize HC-05 Bluetooth module in AT order mode, interface "Key" pin to High (VCC).
- Default Baud pace of HC-05 in order mode is 38400bps.

- Following are some AT order commonly used to change setting of Bluetooth module.
- To send these orders, we need to interface HC-05 Bluetooth module to the PC by means of sequential to USB converter and communicate these orders through sequential terminal of PC.

4.8.3. APPLICATIONS

1. Wireless correspondence between two microcontrollers
2. Communicate with Laptop, Desktops and cell phones

4.9 L293 H-BRIDGE DRIVER

Span Circuit involving semiconductors for bidirectional driving of DC engine. H-Bridges in IC's to lessen the drive circuit intricacy. L293D is a double H-Bridge engine driver, so with one IC we can interact two DC engines which can be controlled in both clockwise and counter clockwise course and assuming you have engine with fix bearing of movement the you can utilize all the four I/O to interface up to four DC engines. L293D has yield current of 600mA and top result current of 1.2A per channel. Additionally, for security of circuit from back EMF yield diodes are incorporated inside the IC. The result supply (VCC2) has a wide reach from 4.5V to 36V, which has settled on L293D a best decision for DC engine driver.

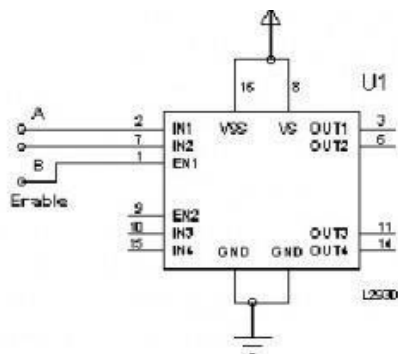


Fig no:4.13. L293 H-bridge drive

4.9.1. H-BRIDGE MOTOR CONTROL

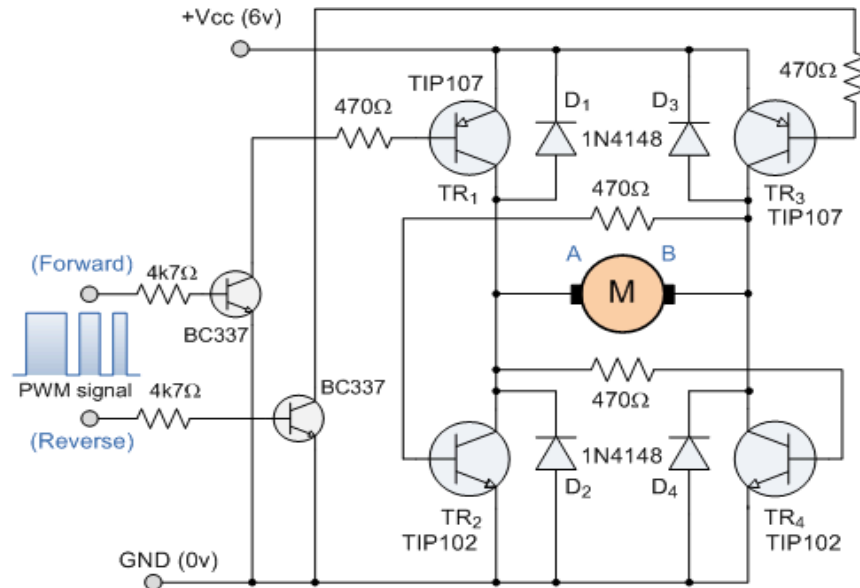


Fig no:4.14. H-bridge Motor Control

To cause the engine to pivot in the forward course, a high (rationale "1" or +5V) signal is applied to the forward input, while no sign is applied to the converse info (applying a voltage to the two contributions simultaneously isn't permitted). The speed of the engine is constrained by utilizing the beat width tweaking signal as in the past. Semiconductors TR1 and TR4 lead. Current streams from terminal A through to terminal B (left-to-right bearing) of the engine. To turn around the engine's heading a high sign is applied to the converse information and semiconductors TR3 and TR2 lead, permitting current to go through the engine the other way from terminal B through to terminal A (right-to-left course). The flywheel diodes, D1 to D4 across the semiconductors of the H-span engine control circuit help to shield the semiconductors from any actuated back emf created by the engine during slowing down. Any reasonable PNP or NPN semiconductor can be utilized other than the ones above, yet every one of the semiconductors ought to have high power appraisals, on the off chance that not use heatsinks.

While it is feasible to develop the H-span engine control circuit without any preparation utilizing individual parts, there are loads of IC's and "secret elements" accessible off-the-rack to make engine speed control and plan far more straightforward and normally less expensive. Two H-span engine control IC's that are famous and simple to interface are the National Semiconductors LMD18200 and the Texas Instruments L293D engine driver chips. Both are not difficult to use with in-constructed diodes, shorted circuit insurance and are TTL and CMOS viable.

4.9.2 WAVE FORM

The PWM fringe works by providing the right sign to the H-Bridge DC engine circuit, for example, speed controlling and adjusting the DC engine course.

PWM is utilized in numerous modern for the most part for controlling the engine speed. How this PWM signal could change the DC motor speed is showed on this following PWM signal timing diagram:

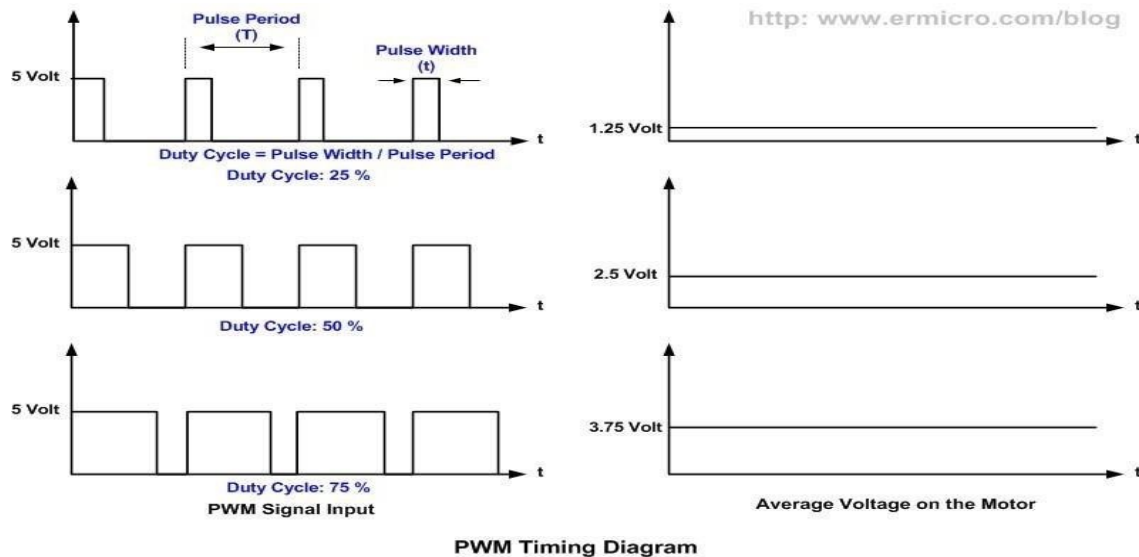


Fig no4.15. L293 Circuit Diagram

From the PWM timing chart above we could see that by changing the beat width we could change the typical voltage receipt by the DC engine; the more extensive the beat width;

the higher the typical voltage receipt by the DC engine. Accordingly, by shifting the beat width we could differ the DC engine speed. The proportion between the beat width and the all out length of the beat (time on in addition to downtime) is called obligation cycle, so by saying 100 percent obligation cycle implies the DC engine is in its max throttle and 10% obligation cycle the DC engine.

4.9.3 CONSTRUCTION



Fig.no.4.16. Construction of H-bridge

A strong state H-span is ordinarily developed utilizing reverse extremity gadgets (i.e., PNPBJTs or P-channel MOSFETs associated with the high voltage transport and NPN BJTs or N-channel MOSFETs associated with the low voltage transport). The most effective MOSFET plans use N-channel MOSFETs on both the high side and low side since they commonly have 33% of the ON obstruction of P-channel MOSFETs. This requires a more perplexing plan since the entryways of the great side MOSFETs should be driven positive as for the DC supply rail. Be that as it may, many incorporated circuit MOSFET drivers incorporate a charge siphon inside the gadget to accomplish this. On the other hand, a switch-mode DC converter can be utilized to give confined ('drifting') supplies to the door drive hardware. A various result fly back converter is appropriate to this application. One more strategy for driving MOSFET-spans is the utilization of a specific transformer known as a GDT (Gate Drive Transformer), which gives the disconnected results for driving the upper FETs doors. The transformer center is typically a ferrite toroid, with 1:1 or 4:9 winding proportion. Nonetheless, this strategy must be utilized with high recurrence signals. The plan of the transformer is additionally

vital, as the spillage inductance ought to be limited, or cross conduction might happen. The results of the transformer likewise should be normally clasped by zener diodes, since high voltage spikes could annihilate the MOSFET doors.

A typical variety of this circuit utilizes only the two semiconductors on one side of the heap, like a class AB intensifier. Such a setup is known as a "half scaffold". The half scaffold is utilized in some exchanged mode power supplies that utilization simultaneous rectifiers and in exchanging speakers. The half H-span type is ordinarily condensed to "Half-H" to separate it from full ("Full-H") H-spans. Another normal variety, adding a third 'leg' to the extension, makes a 3-stage inverter. The 3-stage inverter is the center of any AC engine drive.

A further variety is the half-controlled span, where one of the great and low-side exchanging gadgets (on inverse sides of the scaffold) are supplanted with diodes. This disposes of the shoot-through disappointment mode and is ordinarily used to drive variable/exchanged hesitance machines and actuators where bi-directional current stream isn't needed.

A "twofold shaft twofold toss" transfer can by and large accomplish a similar electrical usefulness as a H-span (thinking about the standard capacity of the gadget). A H-scaffold would be desirable over the transfer where a more modest actual size, high velocity exchanging, or low driving voltage is required, or where the wearing out of mechanical parts is bothersome.

4.9.4. CIRCUIT DIAGRAM

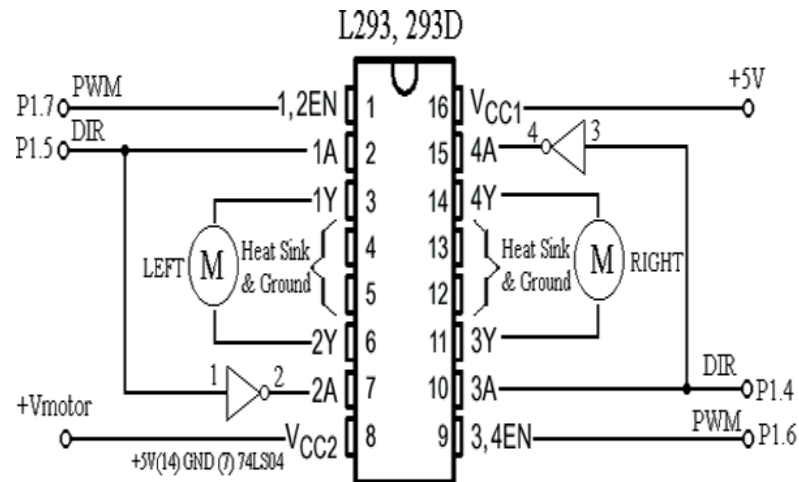


Fig no:4.17. L293 H- Bridge Driver Circuit Diagram

4.10 60 RPM GEAR MOTOR

Equipped DC engines can be characterized as an augmentation of DC engine which previously had its Insight subtleties demystified here. An equipped DC Motor has a stuff gathering joined to the engine. The speed of engine is included as far as revolutions of the shaft each moment and is named as RPM. The stuff get together aides in expanding the force and lessening the speed. Involving the right blend of pinion wheels in a stuff engine, its speed can be decreased to any beneficial figure. This idea where cog wheels decrease the speed of the vehicle yet increment its force is known as stuff decrease. This Insight will investigate every one of the minor and significant subtleties that make the stuff head and consequently the working of equipped DC engine.



Fig no:4.18. gear motor

4.11 TEMPERATURE SENSOR

DHT11 Temperature and Humidity Sensor includes an aligned computerized signal result with the temperature and mugginess sensor complex. Its innovation guarantees the high dependability and magnificent long haul soundness. An elite exhibition 8-digit microcontroller is associated. This sensor incorporates a resistive component and a feeling of wet NTC temperature estimating gadgets. It has superb quality, quick reaction, hostile to impedance capacity and significant expense execution benefits.



Fig:4.19. Temperature sensor

Each DHT11 sensors includes incredibly exact adjustment of moistness alignment chamber. The adjustment coefficients put away in the OTP program memory, inside sensors identify signals all the while, we ought to call these alignment coefficients. The single-wire sequential point of interaction framework is incorporated to turn out to be fast and simple. Little size, low power, signal transmission distance up to 20 meters, making it an assortment of utilizations and, surprisingly, the most requesting applications. The item is 4-pin single column pin bundle. Helpful association, extraordinary bundles can be given by clients need.

Pin No.	Pin Name	Description
1	VCC	Power Supply; 3.3V to 5.5V DC
2	DATA	Digital Output
3	NC	Not Connected; Not in use
4	GND	Ground

Table.no.4.4. temperature sensor pin description

Particular

- Supply Voltage: +5 V
- Temperature range :0-50 °C blunder of ± 2 °C
- Stickiness :20-90% RH $\pm 5\%$ RH blunder
- Interface: Digital

POWER AND PIN

DHT11's power supply is 3-5.5V DC. At the point when power is provided to the sensor, send no guidance to the sensor in the span of one second to pass the shaky status. One capacitor esteemed 100nF can be added among VDD and GND for power sifting.

Highlights

- Standard gathering swagger (two 3mm openings with various of 5cm as stretch).
- Easy to use interfaces ("A" for simple and "D" for computerized).
- Symbols to streamline represent sensor work.
- Top notch connector.

4.12 BUZZER

A ringer is a little yet effective part to add sound elements to our task/framework. It is tiny and conservative 2-pin structure henceforth can be handily utilized on breadboard, Perf Board and, surprisingly, on PCBs which makes this a broadly involved part.

There are two sorts are ringers that are ordinarily accessible. The one displayed here is a straightforward ringer which when controlled will make a Continuous signal sound, the other kind is known as a readymade bell which will look bulkier than this and will deliver a Beep. Signal. Be that as it may, the one displayed here is most broadly utilized on the grounds that it very well may be altered with assistance of different

circuits to fit effectively in our application. This ringer can be utilized by basically driving it utilizing a DC power supply going from 4V to 9V. A straightforward 9V battery can likewise be utilized, however it is prescribed to utilize a controlled +5V or +6V DC supply. The ringer is regularly connected with a changing circuit to turn ON or switch OFF the signal at demanded investment and require span.



Fig no: 4.20. buzzer

4.13 AMBU BAG

- They are instruments used to give oxygen during discontinuous positive tension breath (IPPR) by means of an end tracheal cylinder or a facemask. They are utilized in crises when someone is confronting breathing troubles to give fake ventilation.
- It is a compressible, self-blowing up, non-rebreathing silicon sack, which has a delta through which air and extra O₂ is provided and an outlet through this can be moved to the patient. The gas enters in oneself extending sack through one-manner valve which limits the stream back from the bay. Whenever the sack is compacted, the air is pushed forward through the cover in the pharynx or throat which thusly prompts wind line and afterward in the lungs, henceforth aiding fake ventilation.



Fig no:4.21. AMBU BAG

CHAPTER-5

5. RESULT AND DISCUSSION

5.1. HARDWARE RESULTS

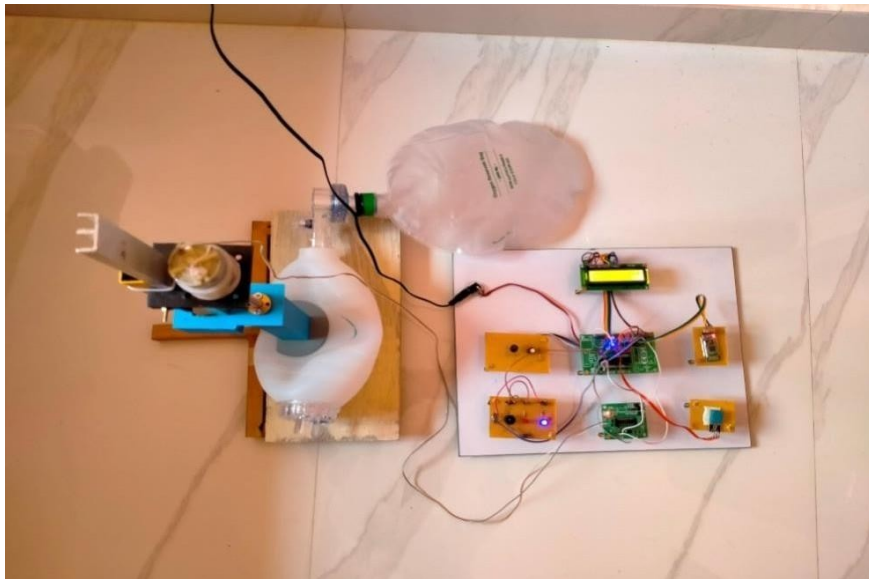


Fig.no.5.1. Hardware after execution

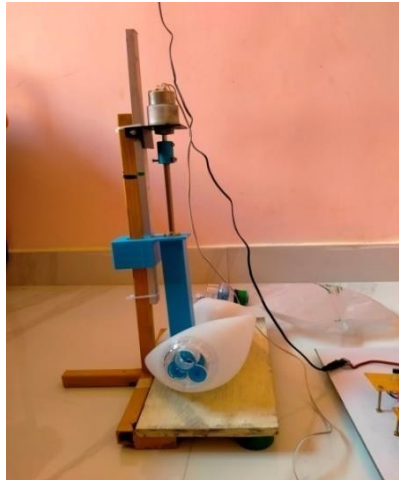


Fig.no.5.2. AMBU bag after execution

- First, we are connecting the hardware kit to supply using adapter. Bridgerectifier is used to convert AC to DC and 12v supply is given to AVR controller, L293H driver board and gear motor. Voltage regulator is used to reduce 12v to 5v DC supply.
- AVR is the heart of the hardware. All instructions are passed by AVR controller.
- 5v dc supply is given to LCD display, HC-05 wireless device, temperature sensor, and buzzer.
- Now, we have to pair the hardware and android app by using HC-05 wireless device (blue tooth).
- Then, we have to login in android app by using user ID and password. After pairing we have to click on the mechanism activate.
- The mechanism will get activated. By using CAM, the AMBU bag will compressed and decompressed.

- Oxygen will observe from the environment and delivers to the patient through AMBU bag.
- LCD display will show the humidity and body temperature of the patient using temperature sensor.
- When the patient body temperature gets high, the temperature sensor will detect and buzzer will give continuous beep sound.

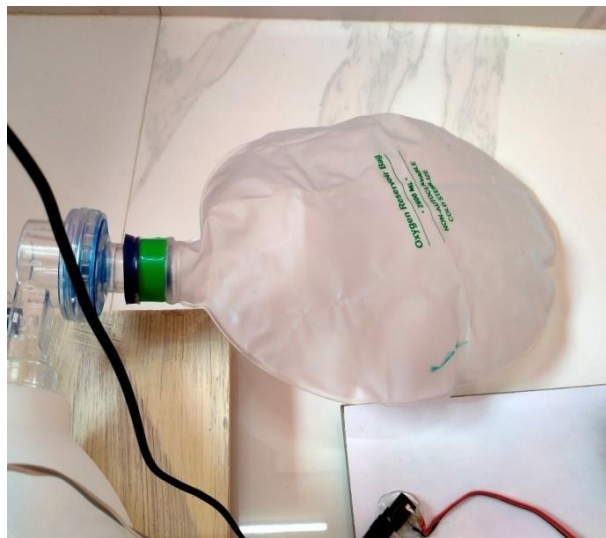


Fig.no. 5.3. Oxygen filled bag

This oxygen reservoir bag will receive the oxygen from the AMBU bag. The AMBU bag delivers the oxygen to patient by automatic compression and decompression. Here, we fixed the oxygen reservoir bag to check whether the oxygen get filled or not. If we want to supply oxygen to patient means, we have to connect the nasal mask.

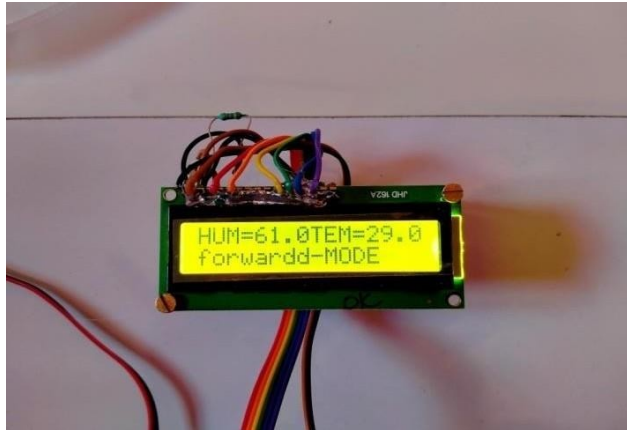


Fig.no. 5.4. CAM is forwarded (compressed)



Fig. No.5.5. CAM is backward (decompressed)

When CAM is compressing the AMBU bag, the LCD Display will show forward mode. While decompressing, it shows the backward mode.

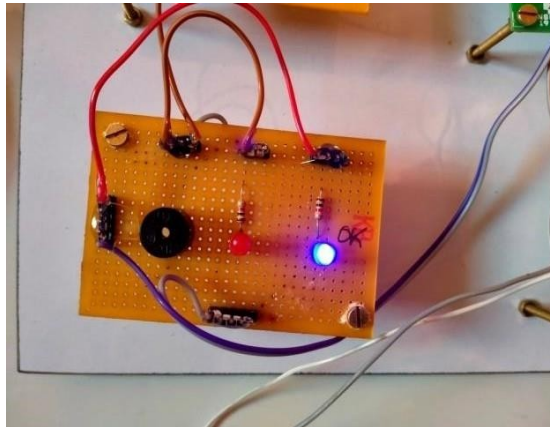


Fig.no. 5.6. Buzzer OFF

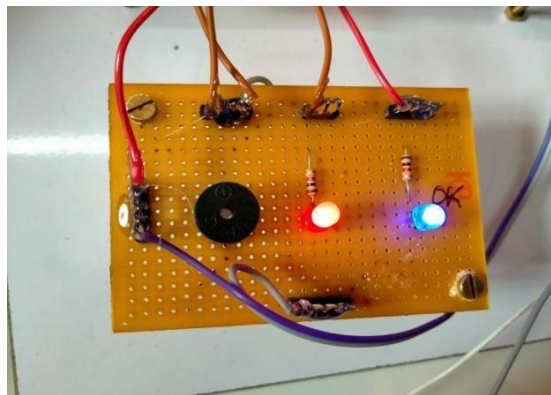


Fig. no.5.7. Buzzer ON

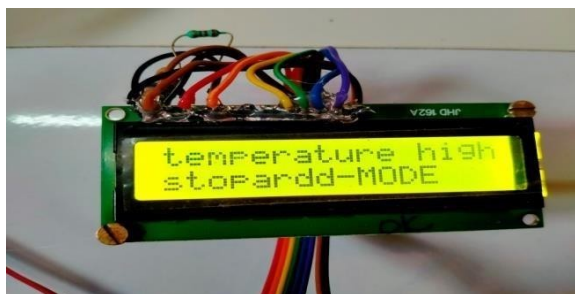


Fig. no.5.8. When temperature high

When body temperature gets high, the buzzer will give beep sound

5.9. ANDRIOD APP RESULTS

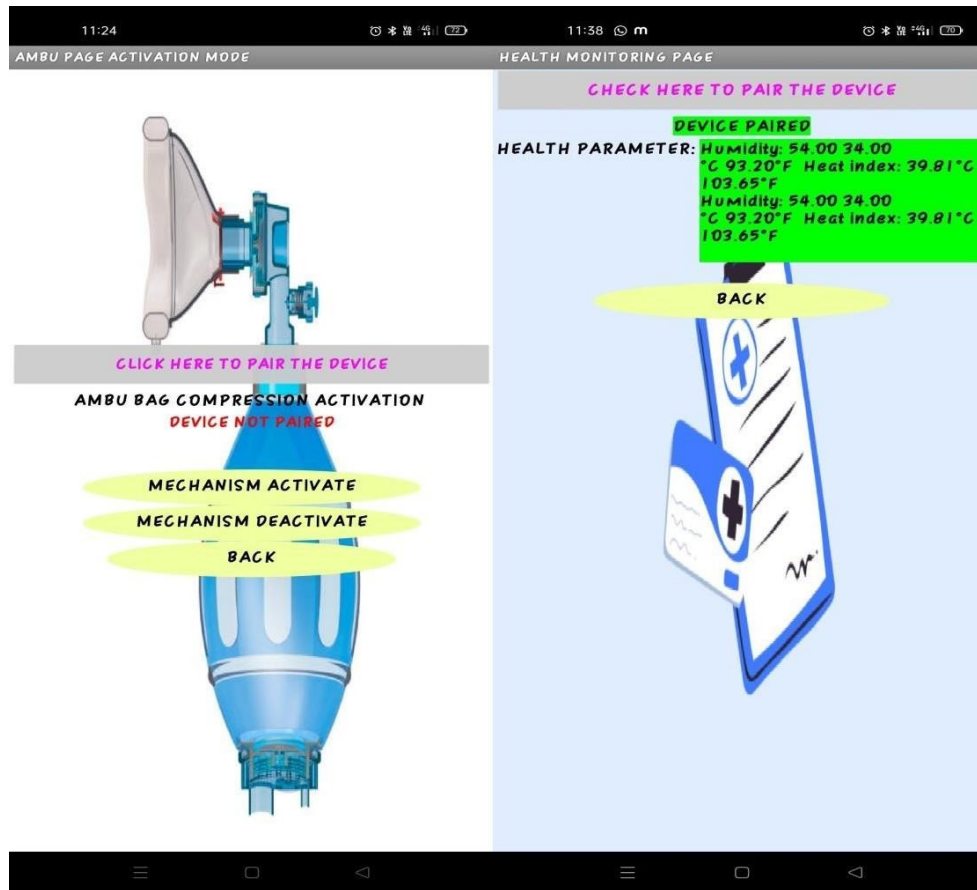


Fig. No. 5.9. Android results

In login page, android app has two modes. User have to select doctor mode or nurse mode. The android app will pair with hardware using MAC address. Only two members can access admin authority. From android app, the instruction will send to hardware because of HC-05 wireless device. Then, we have to click on mechanism activate and the hardware will get activated i.e. CAM arm will compress and decompress the AMBU bag automatically and oxygen will deliver to patient. We also monitor the patient body temperature using health monitor.

CHAPTER-6

6. CONCLUSION

Our final target was to make such a prototype of an electro mechanical ventilator based on double cam integration mechanism which will include some essential medical parameters measurement facilities with portability, lightweight, low cost, efficient, and telemedicine application. This smart ventilator can be controlling through mobile application, based the control signal received from the android application the ventilator can be deliver the o2 patient lung by using gear mechanism. Now, we have developed for adult mode only. In future, we can develop for both infant and adult in the same system. For infants the breath rate per minute is 30 to 60 per minute. For adult the breath rate is 12 to 18 per minute. it can be set to use for two modes simultaneously in the future enhanced system. we can also develop the tidal volume and respiratory rate automatically using sensors this will be implemented with the ventilator system. In tele machine applications mechanical ventilator is the most important growing technology in the world now for the automation basics.

GEOTAGGED PHOTO:



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