IMAGE FORGERY DETECTION USING OVER-SEGMENTATION AND FEATURE POINT MATCHING

A PROJECT – II REPORT

Submitted by

M.LAHARI	M.SANJANA	P.SHIVANI
19RH1A04E9	19RH1A04D5	19RH1A04G5

Under the Esteemed Guidance of

Dr.K. SUDHAKAR
Professor &Head

in partial fulfillment of the Academic Requirements for the Degree of

BACHELOR OF TECHNOLOGY

Electronics and Communication Engineering

MALLA REDDY ENGINEERING COLLEGE FOR WOMEN
(Autonomous Institution-UGC, Govt. of India)
Accredited by NBA & NAAC with 'A' Grade
NIRF Indian Ranking, Accepted by MHRD, Govt. of India | Rank Band – Excellent by ARIIA, Accepted by MHRD, Govt. of India
Approved by AICTE, Permanently Affiliated to JNTUH, ISO 9001:2015 Certified Institution
Platinum Rated by AICTE-CII Survey, AAAA+ Rated by Digital Learning Magazine, AAAA Rated by Careers 360,
National Ranking-Top 100 Rank band by Outlook Magazine, Ranked as Top Engineering Colleges of Eminence in India – 2022 by CSR Rankings,
51st National Ranking & 5th Telangana State Ranking by Times of India News Magazine, 86th National Ranking by the Week Magazine of India
Maisammaguda, Dhullapally, Secunderabad, Kompally-500100

2022-23

MALLA REDDY ENGINEERING COLLEGE FOR WOMEN

(Autonomous Institution-UGC, Govt. of India)

Accredited by NBA & NAAC with 'A' Grade

NIRF Indian Ranking, Accepted by MHRD, Govt. of India | Rank Band – Excellent by ARIIA, Accepted by MHRD, Govt. of India

Approved by AICTE, Permanently Affiliated to JNTUH, ISO 9001:2015 Certified Institution

Platinum Rated by AICTE-CII Survey, AAAA+ Rated by Digital Learning Magazine, AAAA Rated by Careers 360,

National Ranking-Top 100 Rank band by Outlook Magazine, Ranked as Top Engineering Colleges of Eminence in India – 2022 by CSR Rankings,

51st National Ranking & 5th Telangana State Ranking by Times of India News Magazine, 86th National Ranking by the Week Magazine of India

Maisammaguda, Dhullapally, Secunderabad, Kompally-500100

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the Project-I work entitled " **IMAGE FORGERY DETECTION USING OVER-SEGMENTATION AND FEATURE POINT MATCHING** " is carried out by **M.LAHARI(19RH1A04E9),M.SANJANA(19RH1A04D5),P.SHIVANI(19RH1A04G5)** in partial fulfillment for the award of degree of **BACHELOR OF TECHNOLOGY** in Electronics and communication Engineering, Jawaharlal Nehru Technological University, Hyderabad during the academic year 2022-2023.

Supervisor's Signature	**Head of the Department**
Dr. K. Sudhakar	**Dr. K. Sudhakar**
Professor of ECE	**Professor of ECE**

External Examiner

Date: 03-11-2022

PROJECT COMPLETION CERTIFICATE

This is to certify that the Project work titled " IOT based coal mine safety monitoring and alerting system " by the Students of " Malla Reddy Engineering College for Women " has successfully completed Project Work under our guidance during at Dcode soft tech solution pvt ltd , Hyderabad .Their performance in this period is satisfactory.

M.Akhila	**20RH5A0413**
N.Shivani	**20RH5A0415**
P.Nalini Priya	**20RH5A0416**

Director,
Dcode Soft Tech Solutions Pvt Ltd

No. 1-7-286/1, First Floor, Opp. Genius Grammar School,
Chaitanyapuri, Kothapet, Dilsukhnagar, Hyderabad - 500 060.
Whatsapp & Phone : 7989919045, 9491838806
Email : hr@dcodetechnologies.in, info@dcodetechnologies.in
Website : www.dcodetechnologies.in

ACKNOWLEDGEMENT

We feel ourselves honored and privileged to place our warm salutation to our college **Malla Reddy Engineering College for Women** and Department of **Electronics and Communication Engineering** which gave us the opportunity to have expertise in engineering and profound technical knowledge.

We would like to deeply thank our Honorable Minister of Telangana State **Sri**.**Ch. Malla Reddy Garu,** founder chairman MRGI, the largest cluster of institutions in the state of Telangana for providing us with all the resources in the college to make our project success.

We wish to convey gratitude to our **Principal Dr. Y. Madhavee Latha,** for providing us with the environment and mean to enrich our skills and motivating us in our endeavor and helping us to realize our full potential.

We express our sincere gratitude to **Dr. K. Sudhakar, Head of the Department** of Electronics and Communication Engineering for inspiring us to take up a project on this subject and successfully guiding us towards its completion.

We would also like to thank our Project coordinator **Dr.T.S.Ghouse Basha,** for his kind encouragement and overall guidance in viewing this program a good asset with profound gratitude.

We would like to thank our internal guide **K. Sudhakar,** and all the Faculty membersfor their valuable guidance and encouragement towards the completion of our project work.

With Regards and Gratitude

M.Lahari (19RH1A04E9)

M.Sanjana (19RH1A04D5)

P.Shivani (19RH1A04G5)

DECLARATION

We hereby declare that our project entitled **"IMAGE FORGERY DETECTION USING OVERSEGMENTATION AND FEATURE POINT MATCHING"** submitted to **Malla Reddy Engineering College for Women,** affiliated to **Jawaharlal Nehru Technological University, Hyderabad** for the award of the Degree of Bachelor of Technology in **Electronics and Communication Engineering** is a result of original research work done by us.

It is declared that the project report or any part thereof has not been previously submitted to any University or Institute for the award of Degree.

M.Lahari (19RH1A04E9)

M.Sanjana (19RH1A04D5)

P. Shivani (19RH1A04G5)

IMAGE FORGERY DETECTION USING OVERSEGMENTATION AND FEATURE POINT MATCHING

ABSTRACT

The advancements of technology in every aspect of the current age are leading to the misuse of data. Researchers, therefore, face the challenging task of identifying these manipulated forms of data and distinguishing the real data from the manipulated. Splicing is one of the most common techniques used for digital image tampering; a selected area copied from the same or another image is pasted in an image. Image forgery detection is considered a reliable way to verify the authenticity of digital images. In this study, we proposed an approach based on the state-of-the-art deep learning architecture of ResNet50v2. The proposed model takes image batches as input and utilizes the weights of a YOLO convolutional neural network (CNN) by using the architecture of ResNet50v2. In this study, we used the CASIA_v1 and CASIA_v2 benchmark datasets, which contain two distinct categories, original and forgery, to detect image splicing. We used 80% of the data for the training and the remaining 20% for testing purposes. We also performed a comparative analysis between existing approaches and our proposed system. We evaluated the performance of our technique with the CASIA_v1 and CASIA_v2 datasets. Since the CASIA_v2 dataset is more comprehensive compared to the CASIA_v1 dataset, we obtained 99.3% accuracy for the fine-tuned model using transfer learning and 81% accuracy without transfer learning with the CASIA_v2 dataset. The results show the superiority of the proposed system

INDEX

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION:

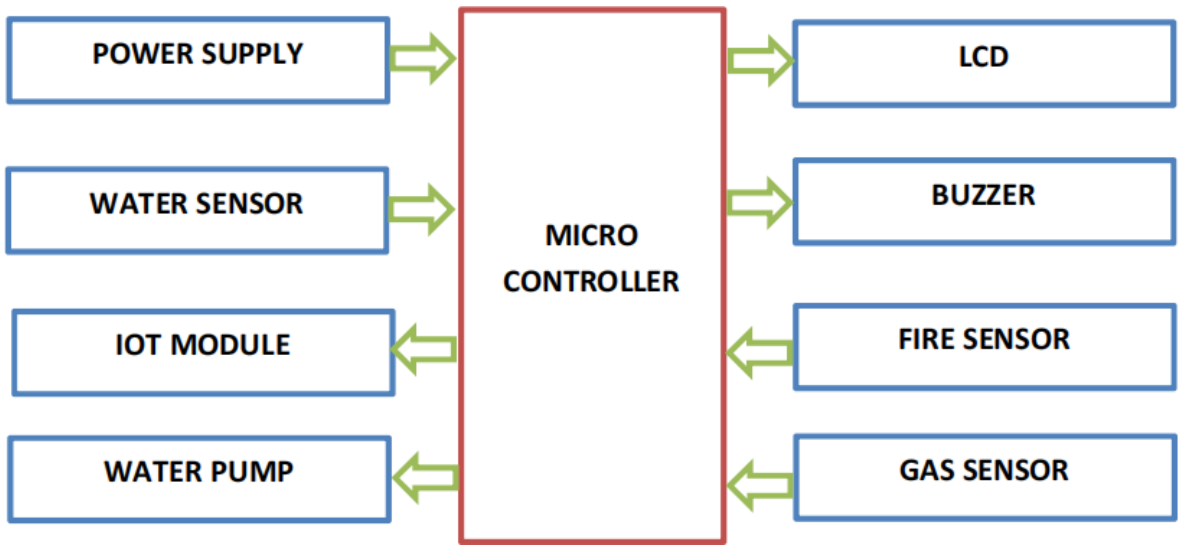
Mines are the world's most dangerous place to work because in the mines, explosion often happens and thousand people are dying. And a recent report states that in such mine accidents an average of around 12,000 people have died. Coal is a non sustainable origin that cannot be widely replaced by humans, there are several mishaps of coalmines occurring in the mines, and the diggers are putting their lives at risk, by working in the coal mines, even once in a while they end up losing their lives in the coal mines that are an unfortunate part. Mainly such mishaps happen as a direct result of the old equipment and wired devices, resulting in the end, mishandling, spillage of the noxious gases in the coal mines, pose tremendous hazards to the excavators inside the coal mines. So we've designed the coalmine protection system to stay away from this problem. We tackled the issues in our research by testing each of the information collected by the sensors, we use and finishing the analysis using the thing system. Controlling can be done automatically or manually.

1.2 LITERATURE SURVEY:

Yongping Wu and Guo Feng implement coal mine monitoring using the Bluetooth wireless transmission system. As a standard of unified global short-range wireless communication, Bluetooth technology is to establish a common low-power, low-cost wireless air interface and controlling software opening system. This paper describes the development background, technical features and the structure of the protocol stack of Bluetooth technology, and proposed the solutions of the Bluetooth host controller interface (HCI) wireless communication for the complexity of its development [1]. Zhenzhen Sun proposed DCS Coal Mine Monitoring System Based on RS485 Bus, RS485 bus structure supports multi-point and two-way communication. So, this type of monitoring system can be developed using common 8-bit microcontrollers. It has the advantages of simple circuit structure and low costs. However, due to the adoption of master-slave structure network, it is difficult to guarantee the reliability of the network structure. Furthermore, the data transmission distance is limited with a poor realtime performance [2-3]. Jingjiang Song, Yingli Zhu proposed automatic monitoring system for coal mine safety based on wireless sensor network. This system design monitoring for coal mine safety constructed by MSP430F and nRF2401. The sensor groups of the system intensively monitor temperature, humidity and other parameters in the underground mine, parameters measured are sent to wireless communication module by the microcontroller. The collected information is sent to long-distance monitoring center by cable [4]. The problem of this implementation is that hardware is placed inside the coal mines, when a natural calamity or a roof fall occurred, the system is damage. So the reliability and long life of conventional communication system is

poor. Due to the harsh environment inside the mine, the installation and maintenance of the system is very difficult. The another problem is that the working condition of coal mine is very noisy and if the distance of miner and system is long, miner not get proper message. Y ogendra S Dohare and Tanmoy Maity design surveillance and safety system for underground coal mines based on Low Power WSN. In this system a low power, cost-effective, and Zigbee protocol based wireless sensor network that provides an intelligent surveillance and safety system for underground coal mines. The system consists of wireless connection of several nodes. This network can be easily placed in underground mines and it provides an effectively surveillance and safety system for underground coal miners. Especially, it provides the real-time data communication between miners and surface control room through highly secure, reliable wireless sensor nodes [5]. This system is placed in mine so problem is created when miner are not in range of the system. This system only monitor environmental condition of underground mine but not monitor the health condition of miner.

1.3 PROPOSED SYSTEM:



In this system we are designed to monitor and control the process occurred in coal mine. The main aim of our system is used to get the accurate value of the sensors output by using Raspberry Pi. The hazardous gas is sensed by using the sensor and the variation in temperature level also found by using the temperature sensor. If the hazardous gas value increase above the threshold value then the controller enables the buzzer to give alert to the workers. Simultaneously the motor switch turned on automatically to remove the excess gas present in the mine. The automatic control of the switch is done by relay. Relay are used to control the motor, fan, temperature sensor and gas sensor. All the data are transferred by wi-fi to html and the direction of the robot also controlled html page.

1.4 WORKING:

In the system the working components here we are adding are IOT module, micro controller and the input sensors such as fire sensor, water sensor, smoke sensor and the output components such as buzzer, water pump, LCD display.

When the fire is detected by the fire sensor, the buzzer sounds, LCD wil be displayed, and the water pump turns on. When the water is detected by the water sensor the buzzer sounds then LCD will be displayed as detected. When the methane gas is detected by the gas sensor the buzzer sounds then the LCD also will be displayed as on for gas.

Finally, the information will be shown in IOT server that can be accessed in any time and in any location.

CHAPTER 2

EMBEDDED SYSTEM

2.1 INTRODUCTION:

An embedded system is a system which is going to do a predefined specified task is the embedded system and is even defined as combination of both software and hardware. A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "Embedded" reflects the fact that they are an integral part of the system. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious. All embedded systems are including computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer.

The very simplest embedded systems are capable of performing only a single function or set of functions to meet a single predetermined purpose. In more complex systems an application program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded system. The ability to have programs means that the same embedded system can be used for a variety of different purposes. In some cases, a microprocessor may be designed in such a way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes. The applications software on such processors is sometimes referred to as firmware.

The simplest devices consist of a single microprocessor (often called a "chip”), which may itself be packaged with other chips in a hybrid system or Application Specific Integrated Circuit (ASIC). Its input comes from a detector or sensor and its output goes to a switch or activator which (for example) may start or stop the operation of a machine or, by operating a valve, may control the flow of fuel to an engine.

2.2 DEFINATION OF AN EMBEDDED SYSTEM:

Embedded system is defined as, for a particular/specific application implementing the software code to interact directly with that particular hardware what we built. Software is used for providing features and flexibility, Hardware = {Processors, ASICs, Memory…} is used for Performance (& sometimes security).

There are many definitions of embedded system but all of these can be combined into a single concept. An embedded system is a special purpose computer system that is used for particular task.

As the embedded system is the combination of both software and hardware.

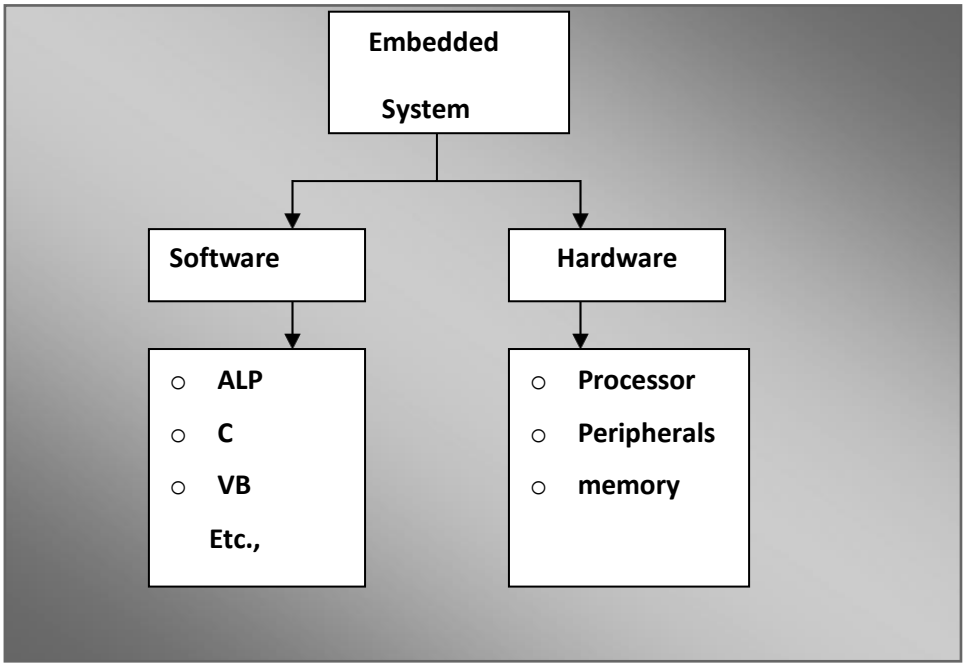


Figure 1.1 Block diagram of Embedded System

Software deals with the languages like ALP, C, and VB etc., and Hardware deals with Processors, Peripherals, and Memory.

Memory: It is used to store data or address.

Peripherals: These are the external devices connected

Processor: It is an IC which is used to perform some task

2.3 FEATURES OF EMBEDDED SYSTEMS:

The versatility of the embedded computer system lends itself to utility in all kinds of enterprises,

from the simplification of deliverable products to a reduction in costs in their development and manufacture. Complex systems with rich functionality employ special operating systems that take into account major characteristics of embedded systems. Embedded operating systems have minimized footprint and may follow real-time operating system specifics. The special computers system is usually less powerful than general-purpose systems, although some expectations do exist where embedded systems are very powerful and complicated. Usually a low power consumption CPU with a limited amount of memory is used in embedded systems. Many embedded systems use very small operating systems; most of these provide very limited operating system capabilities.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance.

Some embedded systems are mass-produced, benefiting from scale. Some embedded systems have to operate in extreme environment conditions such as very high temperature & humidity. For high volume systems such as portable music players or mobile phones, minimizing cost is usually the primary design consideration. Engineers typically select hardware that is just “good enough” to implement the necessary functions.

For low volume or prototype embedded systems, general purpose computers may be adapted by limiting the programs or by replacing the operating system with a real-time operating system.

2.4 APPLICATIONS OF EMBEDDED SYSTEMS:

Some of the most common embedded systems used in everyday life are

Small embedded controllers: 8-bit CPUs dominate simple or no operating system (e.g., thermostats).

Control systems: Often use DSP chip for control computations (e.g., automotive engine control).

Distributed embedded control: Mixture of large and small nodes on a real-time Embedded network (e.g., cars, elevators, factory automation).

System on chip: SIC design tailored to application area (e.g., consumer electronics, set-top boxes).

Network equipment: Emphasis on data movement/packet flow (e.g., network switches; telephone switches).

Critical systems: Safety and mission critical computing (e.g., pacemakers, automatic trains).

Signal processing: Often use DSP chips for vision, audio, or other signal Processing (e.g., face recognition).

Robotics: Uses various types of embedded computing (especially Vision and control) (e.g., autonomous vehicles).

Computer peripherals: Disk drives, keyboards, laser printers, etc.

Wireless systems: Wireless network-connected "sensor networks" and "Motes" to gather and report information.

Embedded PCs: Palmtop and small form factor PCs embedded into Equipment.

Office Telephones, computers, security systems, fax machines, microwave, copier, laser printer, color printer, paging.

Auto Trip computer, engine control, air bag, ABS, instrumentation, security system, transmission control, entertainment, climate control, cellular phone, keyless entry.

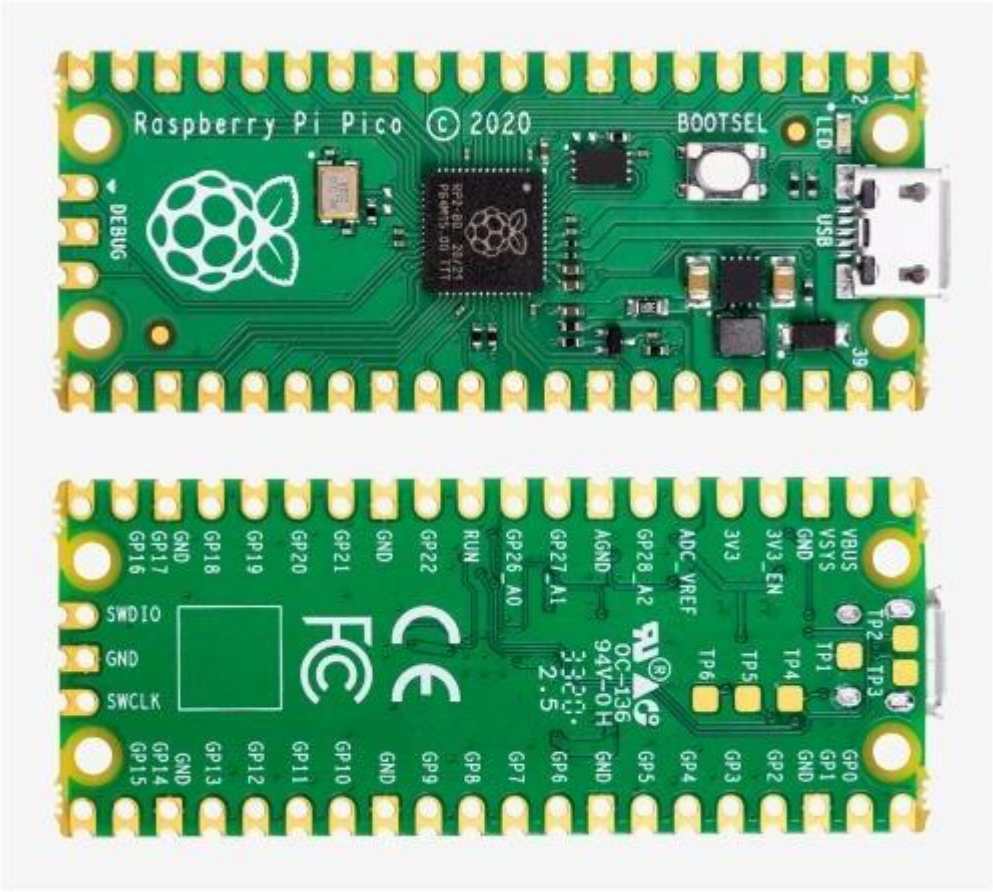
CHAPTER 3

HARDWARE DESCRIPTION

3.1 RASPBERRY PI PICO:

Pico provides minimal (yet flexible) external circuitry to support the RP2040 chip: flash (Winbond W25Q16JV), crystal, power supplies and decoupling, and USB connector. The majority of the RP2040 microcontroller pins are brought to the user IO pins on the left and right edge of the board. Four RP2040 IO are used for internal functions - driving an LED, onboard Switched Mode Power Supply (SMPS) power control and sensing the system voltages. Pico has been designed to use either soldered 0.1" pin-headers (it is one 0.1" pitch wider than a standard 40-pin DIP package) or can be used as a surface mountable 'module', as the user IO pins are also castellated. There are SMT pads underneath the USB connector and BOOTSEL button, which allow these signals to be accessed if used as a reflowsoldered SMT module

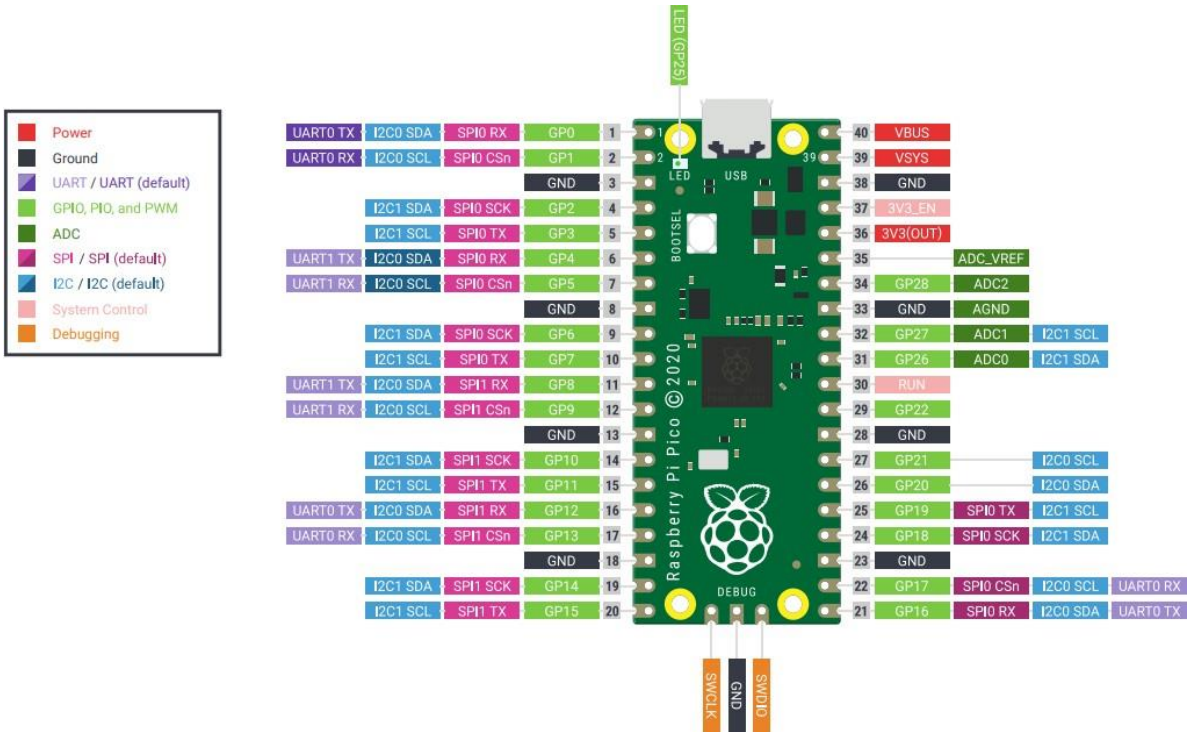
Figure 2.3 RASPBERRY PI PICO Development Board

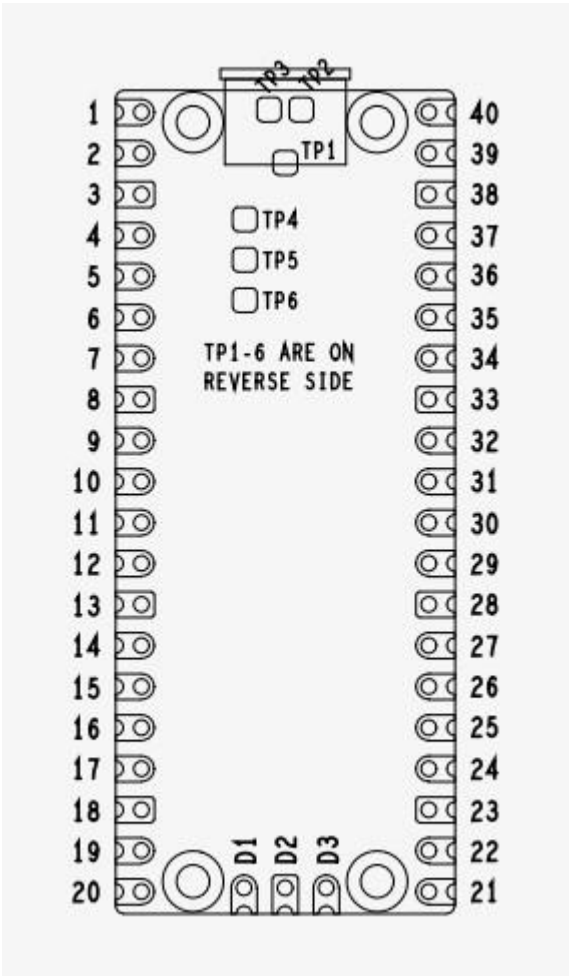


Pico uses an on-board buck-boost SMPS which is able to generate the required 3.3 volts (to power RP2040 and external circuitry) from a wide range of input voltages (~1.8 to 5.5V). This allows significant flexibility in powering the unit from various sources such as a single Lithium-Ion cell, or 3 AA cells in series. Battery chargers can also be very easily integrated with the Pico powerchain. Reprogramming the Pico Flash can be done using USB (simply drag and drop a file onto the Pico which appears as a mass storage device), or the standard Serial Wire Debug (SWD) port can reset the system and load and run code without any button presses. The SWD port can also be used to interactively debug code running on the RP2040.

3.1.1 Pin Diagram:

The Pico pinout has been designed to directly bring out as much of the RP2040 GPIO and internal circuitry function as possible, while also providing a suitable number of ground pins to reduce EMI (Electro Magnetic Interference) and signal crosstalk. This is important in general but especially for RP2040 which is built on a modern 40nm silicon process and hence the digital IO edge rates are very fast.


Power
Ground
UART / UART (default)
GPIO, PIO, and PWM
ADC
SPI / SPI (default)
I2C / I2C (default)
System Control
Debugging
LED (GP25)
LED
USB
BOOTSEL
DEBUG
SWCLK
GND
SWDIO
Raspberry Pi Pico © 2020
UART0 TX I2C0 SDA SPI0 RX GP0 1
UART0 RX I2C0 SCL SPI0 CSn GP1 2
GND 3
I2C1 SDA SPI0 SCK GP2 4
I2C1 SCL SPI0 TX GP3 5
UART1 TX I2C0 SDA SPI0 RX GP4 6
UART1 RX I2C0 SCL SPI0 CSn GP5 7
GND 8
I2C1 SDA SPI0 SCK GP6 9
I2C1 SCL SPI0 TX GP7 10
UART1 TX I2C0 SDA SPI1 RX GP8 11
UART1 RX I2C0 SCL SPI1 CSn GP9 12
GND 13
I2C1 SDA SPI1 SCK GP10 14
I2C1 SCL SPI1 TX GP11 15
UART0 TX I2C0 SDA SPI1 RX GP12 16
UART0 RX I2C0 SCL SPI1 CSn GP13 17
GND 18
I2C1 SDA SPI1 SCK GP14 19
I2C1 SCL SPI1 TX GP15 20
40 VBUS
39 VSYS
38 GND
37 3V3_EN
36 3V3(OUT)
35 ADC_VREF
34 GP28 ADC2
33 GND AGND
32 GP27 ADC1 I2C1 SCL
31 GP26 ADC0 I2C1 SDA
30 RUN
29 GP22
28 GND
27 GP21 I2C0 SCL
26 GP20 I2C0 SDA
25 GP19 SPI0 TX I2C1 SCL
24 GP18 SPI0 SCK I2C1 SDA
23 GND
22 GP17 SPI0 CSn I2C0 SCL UART0 RX
21 GP16 SPI0 RX I2C0 SDA UART0 TX


TP3
TP2
TP1
TP4
TP5
TP6
TP1-6 ARE ON
REVERSE SIDE
D1
D2
D3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21

3.1.2 PICO Technical Specification

Raspberry Pi Pico is a low-cost, high-performance microcontroller board with flexible digital interfaces. Key features include:

- RP2040 microcontroller chip designed by Raspberry Pi in the United Kingdom
- Dual-core Arm Cortex M0+ processor, flexible clock running up to 133 MHz
- 264KB of SRAM, and 2MB of on-board Flash memory
- Castellated module allows soldering direct to carrier boards
- USB 1.1 with device and host support
- Low-power sleep and dormant modes
- Drag-and-drop programming using mass storage over USB
- 26 × multi-function GPIO pins
- 2 × SPI, 2 × I2C, 2 × UART, 3 × 12-bit ADC, 16 × controllable PWM channels
- Accurate clock and timer on-chip
- Temperature sensor
- Accelerated floating-point libraries on-chip
- 8 × Programmable I/O (PIO) state machines for custom peripheral support

3.1.3 GPIO PIN CONFIGURATION

GPIO29 IP Used in ADC mode (ADC3) to measure VSYS/3

GPIO25 OP Connected to user LED

GPIO24 IP VBUS sense - high if VBUS is present, else low

GPIO23 OP Controls the on-board SMPS Power Save pin (Section 4.4) Apart from GPIO and ground pins, there are 7 other pins on the main 40-pin interface: PIN40 VBUS

PIN39 VSYS

PIN37 3V3_EN

PIN36 3V3

PIN35 ADC_VREF

PIN33 AGND

PIN30 RUN VBUS is the micro-USB input voltage, connected to micro-USB port pin 1. This is nominally 5V (or 0V if the USB is not connected or not powered). VSYS is the main system input voltage, which can vary in the allowed range 1.8V to 5.5V, and is used by the on-board

SMPS to generate the 3.3V for the RP2040 and its GPIO. 3V3_EN connects to the on-board SMPS enable pin, and is pulled high (to VSYS) via a 100K resistor. To disable the 3.3V (which also de-powers the RP2040), short this pin low. 3V3 is the main 3.3V supply to RP2040 and its I/O, generated by the on-board SMPS. This pin can be used to power external circuitry (maximum output current will depend on RP2040 load and VSYS voltage, it is recommended to keep the load on this pin less than 300mA). ADC_VREF is the ADC power supply (and reference) voltage, and is generated on Pico by filtering the 3.3V supply. This pin can be used with an external reference if better ADC performance is required. AGND is the ground reference for GPIO26-29, there is a separate analog ground plane running under these signals and terminating at this pin. If the ADC is not used or ADC performance is not critical, this pin can be connected to digital ground. RUN is the RP2040 enable pin, and has an internal (on-chip) pull-up resistor to 3.3V of about ~50K Ohms. To reset RP2040, short this pin low. Finally, there are also 6 Test Points (TP1-TP6) which can be accessed if required, for example if using as a surface mount module. These are: TP1 Ground (close coupled ground for differential USB signals) TP2 USB DM TP3 USB DP TP4 GPIO23/SMPS PS pin (do not use) TP5 GPIO25/LED (not recommended to be used) TP6 BOOTSEL TP1, TP2 and TP3 can be used to access the USB signals instead of using the micro-USB port. TP6 can be used to drive the system into mass-storage USB programming mode (by shorting it low at power-up). Note that TP4 is not intended to be used externally, and TP5 is not really recommended to be used as it will only swing from 0V to the LED forward voltage (and hence can only really be used as an output with special care).

3.2 REGULATED POWER SUPPLY:

3.2.1 Introduction:

Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

A power supply may include a power distribution system as well as primary or secondary sources of energy such as

- Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics.

- Batteries.
- Chemical fuel cells and other forms of energy storage systems.
- Solar power.
- Generators or alternators.

3.2.2 Block Diagram:

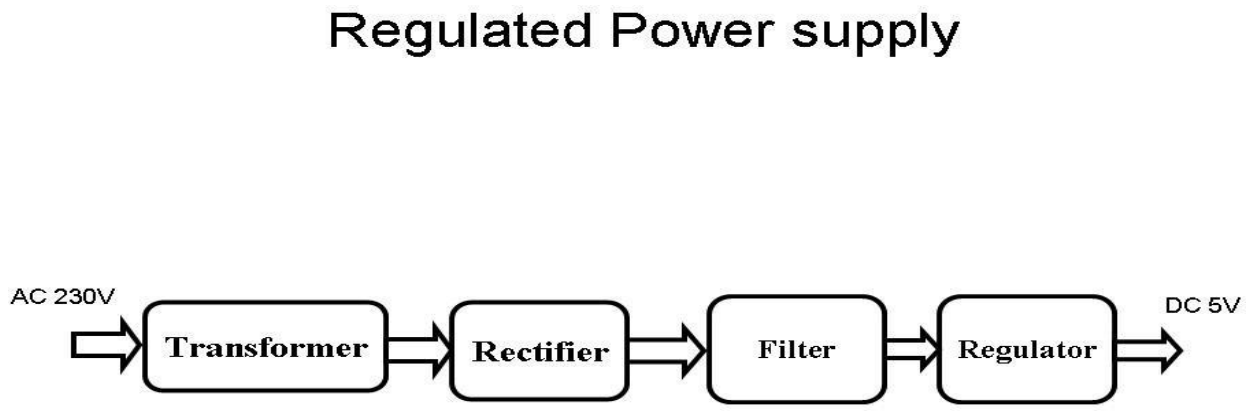


Fig 3.2.2 Regulated Power Supply

The basic circuit diagram of a regulated power supply (DC O/P) with led connected as load is shown in fig: 3.3.3.

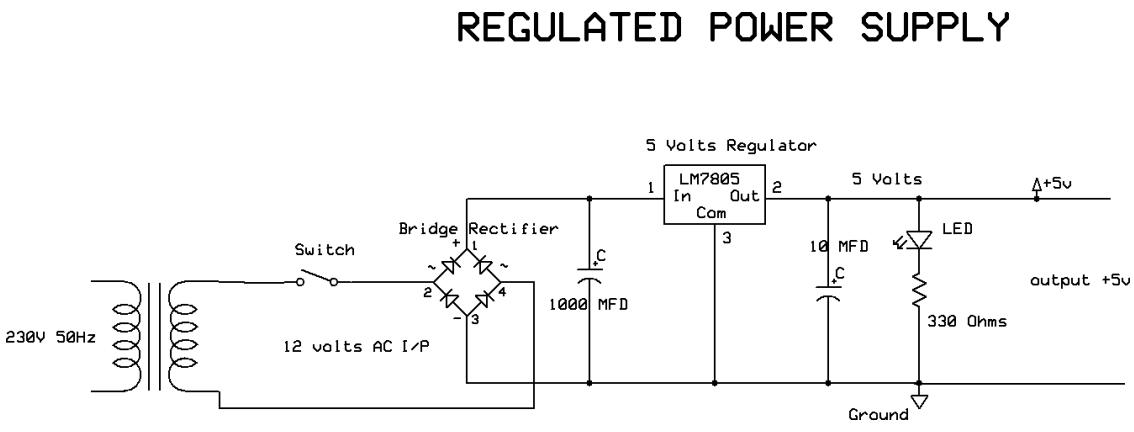


Fig 3.2.3 Circuit diagram of Regulated Power Supply with Led connection

The components mainly used in above figure are

- 230V AC MAINS
- TRANSFORMER
- BRIDGE RECTIFIER(DIODES)
- CAPACITOR
- VOLTAGE REGULATOR(IC 7805)
- RESISTOR
- LED(LIGHT EMITTING DIODE)

The detailed explanation of each and every component mentioned above is as follows:

Transformation: The process of transforming energy from one device to another is called transformation. For transforming energy we use transformers.

3.2.4 Transformers:

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors without changing its frequency. A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core, and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from the primary circuit through the transformer to the load. This field is made up from lines of force and has the same shape as a bar magnet.

If the current is increased, the lines of force move outwards from the coil. If the current is reduced, the lines of force move inwards.

If another coil is placed adjacent to the first coil then, as the field moves out or in, the moving lines of force will "cut" the turns of the second coil. As it does this, a voltage is induced in the second coil. With the 50 Hz AC mains supply, this will happen 50 times a second. This is called MUTUAL INDUCTION and forms the basis of the transformer.

The input coil is called the PRIMARY WINDING; the output coil is the SECONDARY WINDING. Fig: 323.4 shows step-down transformer.

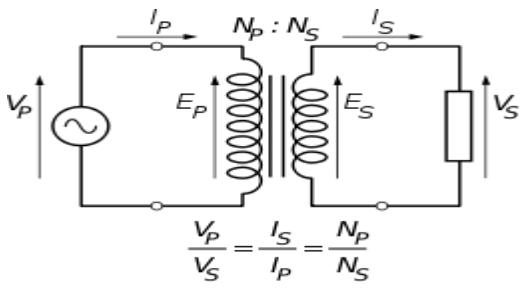


Fig 3.2.4: Step-Down Transformer

The voltage induced in the secondary is determined by the TURNS RATIO.

$$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of primary turns}}{\text{number of secondary turns}}$$

For example, if the secondary has half the primary turns; the secondary will have half the primary voltage.

Another example is if the primary has 5000 turns and the secondary has 500 turns, then the turn's ratio is 10:1.

If the primary voltage is 240 volts then the secondary voltage will be x 10 smaller = 24 volts. Assuming a perfect transformer, the power provided by the primary must equal the power taken by a load on the secondary. If a 24-watt lamp is connected across a 24 volt secondary, then the primary must supply 24 watts.

To aid magnetic coupling between primary and secondary, the coils are wound on a metal CORE. Since the primary would induce power, called EDDY CURRENTS, into this core, the core is LAMINATED. This means that it is made up from metal sheets insulated from each other. Transformers to work at higher frequencies have an iron dust core or no core at all.

Note that the transformer only works on AC, which has a constantly changing current and moving field. DC has a steady current and therefore a steady field and there would be no induction.

Some transformers have an electrostatic screen between primary and secondary. This is to prevent some types of interference being fed from the equipment down into the mains supply, or in the other direction. Transformers are sometimes used for IMPEDANCE MATCHING.

We can use the transformers as step up or step down.

Step Up transformer:

In case of step up transformer, primary windings are every less compared to secondary winding.Because of having more turns secondary winding accepts more energy, and it releases more voltage at the output side.

Step down transformer:

Incase of step down transformer, Primary winding induces more flux than the secondary winding, and secondary winding is having less number of turns because of that it accepts less number of flux, and releases less amount of voltage.

Rectification:

The process of converting an alternating current to a pulsating direct current is called as rectification. For rectification purpose we use rectifiers.

3.2.5 Rectifiers:

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers have many uses including as components of power supplies and as detectors of radio signals. Rectifiers may be made of solid-state diodes, vacuum tube diodes, mercury arc valves, and other components.

A device that it can perform the opposite function (converting DC to AC) is known as an inverter.

When only one diode is used to rectify AC (by blocking the negative or positive portion of the waveform), the difference between the term diode and the term rectifier is merely one of usage, i.e., the term rectifier describes a diode that is being used to convert AC to DC. Almost all rectifiers comprise a number of diodes in a specific arrangement for more efficiently converting AC to DC than is possible with only one diode. Before the development of silicon semiconductor rectifiers, vacuum tube diodes and copper (I) oxide or selenium rectifier stacks were used.

Bridge full wave rectifier:

The Bridge rectifier circuit is shown in fig: 3.3.7, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance R_L and hence the load current flows through R_L.

For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes D2 and D4 will be in series with the load resistance R_L and hence the current flows through R_L in the same direction as in the previous half cycle. Thus a bi-directional wave is converted into a unidirectional wave.

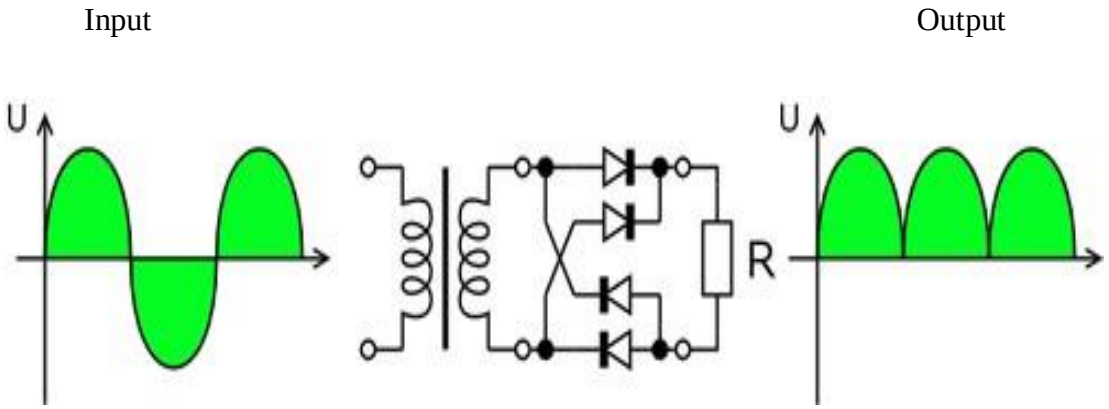


Fig 3.2.5: Bridge rectifier: a full-wave rectifier using 4 diodes

DB107:

Now -a -days Bridge rectifier is available in IC with a number of DB107. In our project we are using an IC in place of bridge rectifier. The picture of DB 107 is shown in fig: 3.3.8.

3.2.6 Features:

- Good for automation insertion
- Surge overload rating - 30 amperes peak
- Ideal for printed circuit board
- Reliable low cost construction utilizing molded
- Glass passivated device
- Polarity symbols molded on body
- Mounting position: Any
- Weight: 1.0 gram

Fig 3.2.6: DB107

Filtration:

The process of converting a pulsating direct current to a pure direct current using filters is called as filtration.

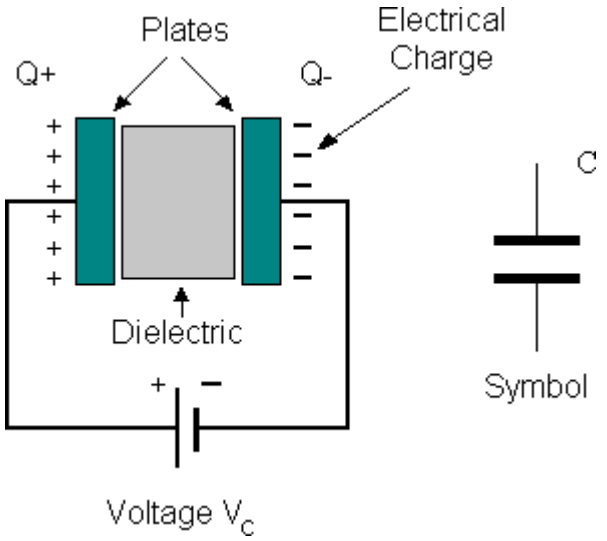
3.2.7 Filters:

Electronic filters are electronic circuits, which perform signal-processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones.

Introduction to Capacitors:

The Capacitor or sometimes referred to as a Condenser is a passive device, and one which stores energy in the form of an electrostatic field which produces a potential (static voltage) across its plates. In its basic form a capacitor consists of two parallel conductive plates that are not connected but are electrically separated either by air or by an insulating material called the Dielectric. When a voltage is applied to these plates, a current flows charging up the plates with electrons giving one plate a positive charge and the other plate an equal and opposite

negative charge this flow of electrons to the plates is known as the Charging Current and continues to flow until the voltage across the plates (and hence the capacitor) is equal to the applied voltage Vcc. At this point the capacitor is said to be fully charged and this is illustrated below. The construction of capacitor and an electrolytic capacitor are shown in figures 3.2.7and 32.8. respectively.



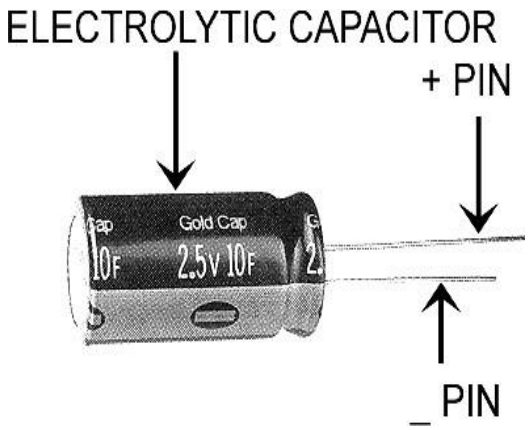


Fig 3.2.7:Construction Of a Capacitor **Fig 3.2.8:Electrolytic Capaticor**

Units of Capacitance:

Microfarad (μF) 1μF = 1/1,000,000 = 0.000001 = 10^{-6} F

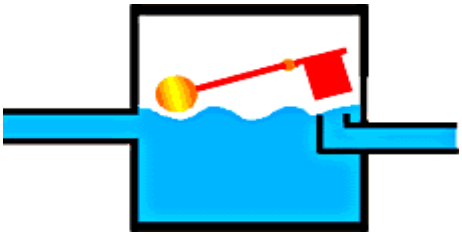
Nanofarad (nF) 1nF = 1/1,000,000,000 = 0.000000001 = 10^{-9} F

Pico farad (pF) 1pF = 1/1,000,000,000,000 = 0.000000000001 = 10^{-12} F

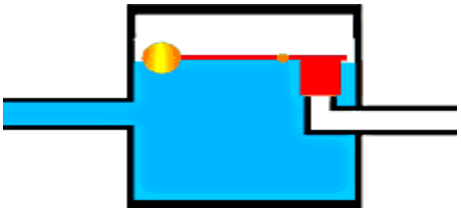
Operation of Capacitor:

Think of water flowing through a pipe. If we imagine a capacitor as being a storage tank with an inlet and an outlet pipe, it is possible to show approximately how an electronic capacitor works.

First, let's consider the case of a "coupling capacitor" where the capacitor is used to connect a signal from one part of a circuit to another but without allowing any direct current to flow.



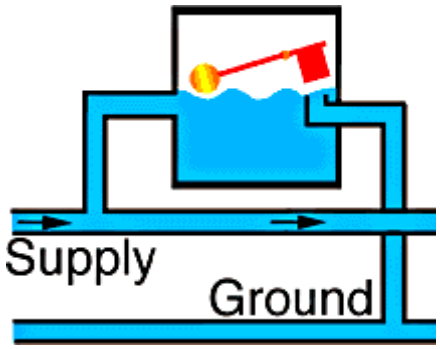
If the current flow is alternating between zero and a maximum, our "storage tank" capacitor will allow the current waves to pass through.



However, if there is a steady current, only the initial short burst will flow until the "floating ball valve" closes and stops further flow.

So a coupling capacitor allows "alternating current" to pass through because the ball valve doesn't get a chance to close as the waves go up and down. However, a steady current quickly fills the tank so that all flow stops.

A capacitor will pass alternating current but (apart from an initial surge) it will not pass d.c.



Where a capacitor is used to decouple a circuit, the effect is to "smooth out ripples". Any ripples, waves or pulses of current are passed to ground while d.c. Flows smoothly.

Regulation:

The process of converting a varying voltage to a constant regulated voltage is called as regulation. For the process of regulation we use voltage regulators.

Voltage Regulator:

A voltage regulator (also called a ‘regulator’) with only three terminals appears to be a simple device, but it is in fact a very complex integrated circuit. It converts a varying input voltage into

a constant 'regulated' output voltage. Voltage Regulators are available in a variety of outputs like 5V, 6V, 9V, 12V and 15V. The LM78XX series of voltage regulators are designed for positive input. For applications requiring negative input, the LM79XX series is used. Using a pair of 'voltage-divider' resistors can increase the output voltage of a regulator circuit.

It is not possible to obtain a voltage lower than the stated rating. You cannot use a 12V regulator to make a 5V power supply. Voltage regulators are very robust. These can withstand over-current draw due to short circuits and also over-heating. In both cases, the regulator will cut off before any damage occurs. The only way to destroy a regulator is to apply reverse voltage to its input. Reverse polarity destroys the regulator almost instantly. Fig: 3.2.9 shows voltage regulator.

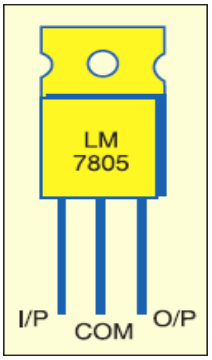


Fig 3.2.9: Voltage Regulator

Resistors:

A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current passing through it in accordance with Ohm's law:

$$V = IR$$

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor. Resistors can be made to control the flow of current, to work as Voltage dividers, to dissipate

power and it can shape electrical waves when used in combination of other components. Basic unit is ohms.

Theory of operation:

Ohm's law:

The behavior of an ideal resistor is dictated by the relationship specified in Ohm's law:

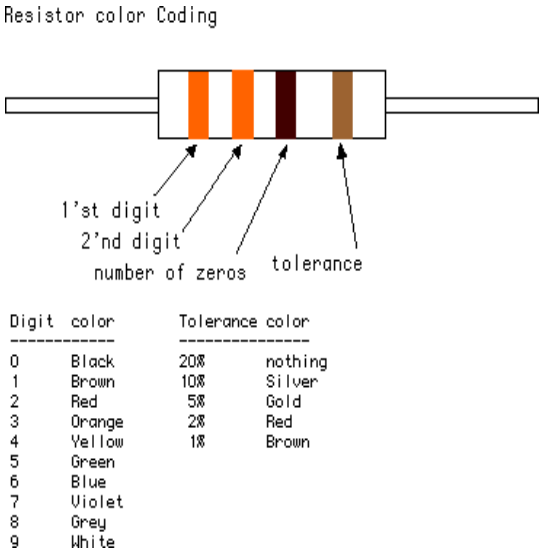
V = IR

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I) through it where the constant of proportionality is the resistance (R).**Power dissipation:**

The power dissipated by a resistor (or the equivalent resistance of a resistor network) is calculated using the following:

$$P = I^2R = IV = \frac{V^2}{R}$$

Fig 3.2.10: Resistor



Digit	color	Tolerance	color
0	Black	20%	nothing
1	Brown	10%	Silver
2	Red	5%	Gold
3	Orange	2%	Red
4	Yellow	1%	Brown
5	Green		
6	Blue		
7	Violet		
8	Grey		
9	White		

Fig 3.2.11: Color Bands In Resistor

3.3 IOT MODULE:

The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn. It can be used with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or it can be used as a self-sufficient MCU by running an RTOS-based SDK. The module has a full TCP/IP stack and provides the ability for data processing, reads and controls of GPIOs.

ESP8266 Specifications

This is based on the ESP-12 module, which we discuss below.

ESP8266	DESCRIPTION
Core	1
Arquitecture	32 bits
Clock	Xtensa LX106 80-160MHz
WiFi	IEEE802.11 b/g/n support for WPA and WPA2
Bluetooth	No
RAM	160KB - 64KB Instruction - 96KB Data
Flash	Extern QSPI - 512KB A 4MB
GPIO	16
DAC	0
ADC	1
Interfaces	SPI-I2C-UART-I2S

ESP8266 Functions

ESP8266 has many applications when it comes to the IoT. Here are just some of the functions the chip is used for:

- **Networking:** The module's Wi-Fi antenna enables embedded devices to connect to routers and transmit data
- **Data Processing:** Includes processing basic inputs from analog and digital sensors for far more complex calculations with an RTOS or Non-OS SDK

- **P2P Connectivity:** Create direct communication between ESPs and other devices using IoT P2P connectivity
- **Web Server:** Access pages written in HTML or development languages.

ESP8266 Applications

The ESP8266 modules are commonly found in the following IoT devices:

- Smart security devices, including surveillance cameras and smart locks
- Smart energy devices, including HVACs and thermostats
- Smart industrial devices, including Programmable Logic Controllers (PLCs)
- Smart medical devices, including wearable health monitors

Chip versus Modules versus Development Boards

As discussed above, the ESP8266 is just the name of the chip. There are essentially three formats you can buy this in:

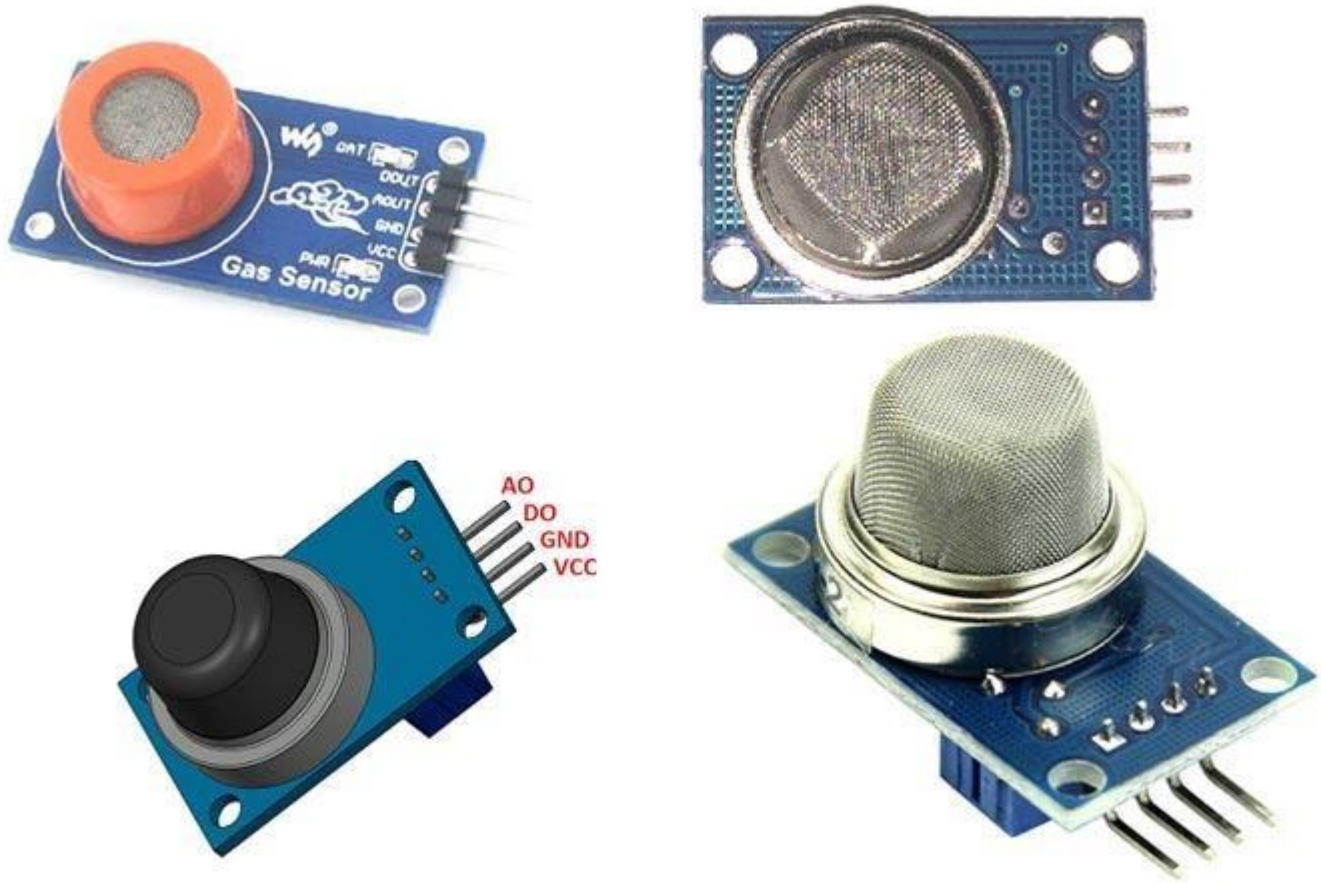
- **ESP8266 Chip:** This is the basic chip manufactured by Espressif, which comes unshielded and needs to be soldered onto a module. This is unsuitable for most users, apart from perhaps volume device manufacturers that can factor this into the production process under the unit cost of a module.
- **ESP8266 Modules:** These are the surface-mountable modules that contain the chip, which are ready to be mounted onto an MCU, produced by Espressif, Ai-Thinker and certain other manufacturers. They are usually shielded and pre-approved by the FCC for use. This means they're a good option for device manufacturers looking to scale production.
- **ESP8266 Development Boards:** These are the complete IoT MCU development boards that have the modules preinstalled. They're used for developers and manufacturers to create prototypes during the design stage, before they start production. Development boards are produced by several different manufacturers and the specifications differ between models. Some core specifications to be aware of when assessing ESP8266 IoT development board options include:
    - GPIO pins
    - ADC pins
    - Wi-Fi antennas
    - LEDs
    - Shielding*
    - Flash Memory

*Many international markets require shielded Wi-Fi devices, as Wi-Fi produces considerable Radio Frequency Interference (RFI), and shielding minimizes this interference. This should, therefore, be a key consideration for all developers and embedded-device manufacturers.

3.4 GAS SENSOR:

A Typical human nose has 400 types of scent receptors enabling us to smell about 1 trillion different odours. But still many of us do not have the capacity to identify the type or concentration of gas present in our atmosphere. This is where Sensors comes in, there are many types of sensors to measure different parameters and a **Gas sensor** is one which comes handy in applications where we have to detect the variation in the concentration of toxic gases in order to maintain the system safe and avoid/caution any unexpected threats. There are various gas sensors to detect gases like oxygen, Carbon Dioxide, Nitrogen, methane etc. They can also be commonly found in devices that are used to detect the leakage of the harmful gases, monitor the air quality in industries and offices etc.

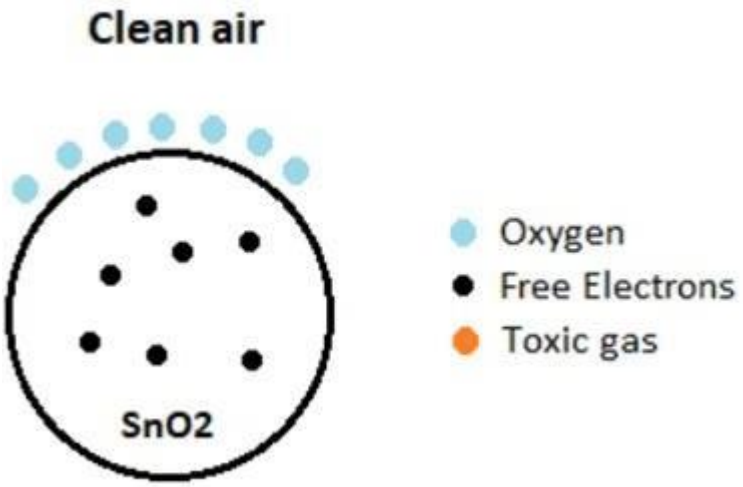
In this article, we will learn more about **gas sensors**, their construction, types, working and how they can be used to measure the required type and concentration of Gas in our atmosphere. There are many types of Gas sensors but the **MQ type gas sensors** are commonly used and widely popular so will focus more on these types of sensors for this article.



Different Types of Gas Sensors

The ability of a Gas sensor to detect gases depends on the **chemiresister** to conduct current. The most commonly used chemiresistor is Tin Dioxide (SnO2) which is an n-type semiconductor that has free electrons (also called as donor). Normally the atmosphere will contain more oxygen than combustible gases. The oxygen particles attract the free electrons present in SnO2 which pushes them to the surface of the SnO2. As there are **no free electrons** available output current will be zero. The below gif shown the oxygen molecules (blue color) attracting the free

electrons (black color) inside the SnO2 and preventing it from having free electrons to conduct current.



When the sensor is placed in the toxic or combustible gases environment, this reducing gas (orange color) reacts with the adsorbed oxygen particles and breaks the chemical bond between oxygen and free electrons thus **releasing the free electrons**. As the free electrons are back to its initial position they can now conduct current, this conduction will be proportional the amount of free electrons available in SnO2, if the gas is highly toxic more free electrons will be available.

Applications of Gas Sensors

- Used in industries to monitor the concentration of the toxic gases.
- Used in households to detect an emergency incidents.
- Used at oil rig locations to monitor the concentration of the gases those are released.
- Used at hotels to avoid customers from smoking.
- Used in air quality check at offices.
- Used in air conditioners to monitor the CO2 levels.
- Used in detecting fire.
- Used to check concentration of gases in mines.
- Breath analyzer.

3.5 WATER SENSOR:

brick is designed for water detection, which can be widely used in sensing the rainfall, water level, even the liquate leakage. The brick is mainly comprised of three parts: An Electronic brick connector, a 1 MΩ resistor, and several lines of bare conducting wires.This sensor works by having a series of exposed traces connected to ground and interlaced between the grounded traces are the sens traces. The sensor traces have a weak pull-up resistor of 1 MΩ. The resistor will pull the sensor trace value high until a drop of water shorts the sensor trace to the grounded trace. Believe it or not this circuit will work with the digital I/O pins of your Raspberry pi PICO or you can use it with the analog pins to detect the amount of water induced contact between the grounded and sensor traces. This item can judge the water level through with a series of exposed parallel wires stitch to measure the water droplet/water size.This High Sensitivity Water Sensor can easily change the water size to analog signal, and output analog value can directly be used in the program function, then to achieve the function of water level alarm.This item have low power consumption, and high sensitivity, which are the biggest characteristics of this module.The High Sensitivity Water Sensor can be compatible with Raspberry pi PICO UNO,Raspberry pi PICO mega2560,Raspberry pi PICO ADK etc.

Features :

- Working voltage: 5V
- Working Current: <20ma
- Interface: Analog
- Width of detection: 40mm×16mm
- Working Temperature: 10°C~30°C
- Weight: 3g
- Size: 65mm×20mm×8mm
- Raspberry pi PICO compatible interface
- Low power consumption

- High sensitivity
- Output voltage signal: 0~4.2V

Pin definition :

- "S" stand for signal input
- "+" stand for power supply
- "-" stand for GND

Applications :

- Rainfall detecting
- Liquid leakage
- Tank overflow detector

3.6 FIRE SENSOR:

Introduction:

This module is sensitive to the flame and radiation. It also can detect ordinary light source in the range of of a wavelength 760nm-1100 nm. The detection distance is up to 100 cm. The Flame sensor can output digital or analog signal. It can be used as a flame alarm or in fire fighting robots. Future Electronics Egypt Ltd. (Raspberry pi PICO Egypt).

Description:

• Detects a flame or a light source of a wavelength in the range of 760nm-1100 nm

• Detection distance: 20cm (4.8V) ~ 100cm (1V) • Detection angle about 60 degrees, it is sensitive to the flame spectrum.

• Comparator chip LM393 makes module readings stable.

• Adjustable detection range.

• Operating voltage 3.3V-5V

• Digital and Analog Output DO digital switch outputs (0 and 1) AO analog voltage output

• Power indicator and digital switch output indicator Interface Description (4-wire)

VCC -- 3.3V-5V voltage

GND -- GND

DO -- board digital output interface (0 and 1)

AO -- board analog output interface.

3.7 BUZZER:

Basically, the sound source of a piezoelectric sound component is a piezoelectric diaphragm. A piezoelectric diaphragm consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal plate (brass or stainless steel, etc.). A piezoelectric ceramic plate is attached to a metal plate with adhesives. Applying D.C. voltage between electrodes of a piezoelectric diaphragm causes mechanical distortion due to the piezoelectric effect. For a misshaped piezoelectric element, the distortion of the piezoelectric element expands in a radial direction. And the piezoelectric diaphragm bends toward the direction. The metal plate bonded to the piezoelectric element does not expand. Conversely, when the piezoelectric element shrinks, the piezoelectric diaphragm bends in the direction Thus, when AC voltage is applied across electrodes, the bending is repeated, producing sound waves in the air.

To interface a buzzer the standard transistor interfacing circuit is used. Note that if a different power supply is used for the buzzer, the 0V rails of each power supply must be connected to provide a common reference.

If a battery is used as the power supply, it is worth remembering that piezo sounders draw much less current than buzzers. Buzzers also just have one 'tone', whereas a piezo sounder is able to create sounds of many different tones.

To switch on buzzer -high 1

To switch off buzzer -low 1

Notice (Handling) In Using Self Drive Method:

1) When the piezoelectric buzzer is set to produce intermittent sounds, sound may be heard continuously even when the self drive circuit is turned ON / OFF at the "X" point shown in Fig. 9. This is because of the failure of turning off the feedback voltage.

2) Build a circuit of the piezoelectric sounder exactly as per the recommended circuit shown in the catalog. Life of the transistor and circuit constants is designed to ensure stable oscillation of the piezoelectric sounder.

3) Design switching which ensures direct power switching.

4) The self drive circuit is already contained in the piezoelectric buzzer. So there is no need to prepare another circuit to drive the piezoelectric buzzer.

5) Rated voltage (3.0 to 20Vdc) must be maintained. Products which can operate with voltage higher than 20Vdc are also available.

6) Do not place resistors in series with the power source, as this may cause abnormal oscillation. If a resistor is essential to adjust sound pressure, place a capacitor (about 1μF) in parallel with the piezo buzzer.

7) Do not close the sound emitting hole on the front side of casing.

8) Carefully install the piezo buzzer so that no obstacle is placed within 15mm from the sound release hole on the front side of the casing.

Figure of buzzer:

3.8 WATER PUMP:

The water pump can be defined as a pump which uses the principles like mechanical as well as hydraulic throughout a piping system and to make sufficient force for its future use. They have been approximately in one structure otherwise another because of early civilization. At present these pumps are utilized within a wide range of housing, farming, municipal, and manufacturing applications.

PRINCIPLE:

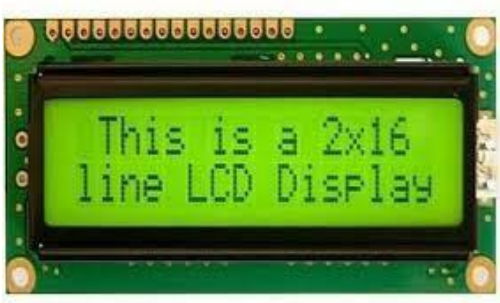
The working principle of a water pump mainly depends upon the positive displacement principle as well as kinetic energy to push the water. These pumps use AC power otherwise DC power for energizing the motor of the water pump whereas others can be energized other kinds of drivers like gasoline engines otherwise diesel.

The water pump is a portable device and can be applied in several household applications. These pumps are used for pumping the huge amount of water from one place to another. The main purpose of a water pump is versatile. A quality pump which can be selected carefully may be perfect for draining water from a low flooded region, refilling the swimming pool, and bathtub, circulating pesticides otherwise fertilizers.

The collection of water pumps are very large, therefore, while selecting a strong and consistent one, one should think about the requirement.

3.9 Liquid Crystal Displays (LCD) – Working

We always use devices made up of Liquid Crystal Displays (LCDs) like computers, digital watches and also DVD and CD players. They have become very common and have taken a giant leap in the screen industry by clearly replacing the use of Cathode Ray Tubes (CRT). CRT draws more power than LCD and are also bigger and heavier. All of us have seen an LCD, but no one knows the exact working of it. Let us take a look at the working of an LCD.



Specification

Gross Weight (kg)	0.1000
Manufacturer	East Rising
Continuity Supply	We promise the long-term continuity supply for this product no less than 10 years since 2015.
Part Number	ERM2004SYG-2
Display Format	20x4 Character
Interface	6800 4-bit Parallel, 6800 8-bit Parallel
IC or Equivalent	AIP31066, HD44780, KS0066, SPLC780, ST7066
Appearance	Black on Yellow Green
Diagonal Size	No
Connection	Pin Header
Outline Dimension	98.00(W)x60.0(H)x14.0(T)mm
Visual Area	76.00x25.20mm
Active Area	70.40(W)x20.80(H)mm

Character Size	2.95x4.75mm
Dot (Pixel) Size	0.55x0.55mm
Dot (Pixel) Pitch	0.60x0.60mm
IC Package	COB
Display Type	STN-LCD Yellow Green
Touch Panel Optional	No
Sunlight Readable	Yes
Response Time (Typ)	No
Contrast Ratio (Typ)	No
Colors	No
Viewing Direction	6:00
Viewing Angle Range	No
Brightness (Typ)	No
Backlight Color	White Color
Backlight Current (Typ)	75mA
Power Supply (Typ)	3.3V, 5V
Supply Current for LCM(Max)	2000uA
Operating Temperature	-20℃~70℃
Storage Temperature	-30℃~80℃
Series Number	ERM2004-2

CHAPTER 4

SOFTWARE DESCRIPTION

4.1 INTRODUCTION TO EMBEDDED C:

KEIL Software makes industrial-strength software development tools and C compilers that help software developers write compact, efficient embedded processor code.

For over two decades Keil Software has delivered the industry's most reliable embedded software development tools and compilers for writing efficient and compact code to run on the most popular embedded processors. Used by tens of thousands of customers including General Motors, Whirlpool, Qualcomm, John Deere and many others, combined with world-class support have helped serious embedded software programmers to create hundreds of breakthrough new solutions.

4.2 SYSTEM CONSTITUENT:

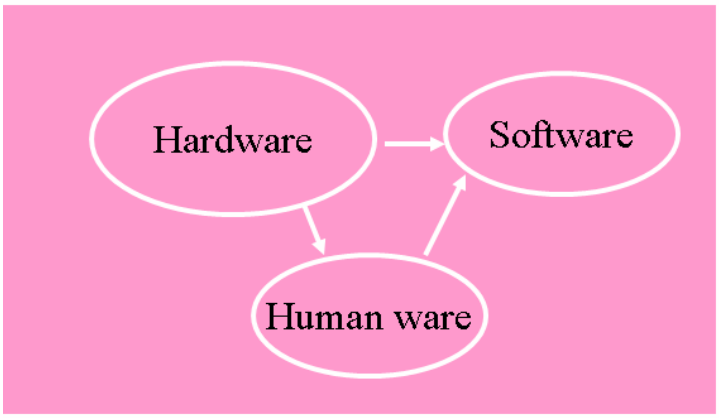


Fig.4. 1 Block diagram of system constituent

Embedded C Compiler:

- KEIL C - full featured and portable
- Reliable - mature, field-proven technology
- Multiple C optimization levels
- An optimizing assembler
- Full linker, with overlaying of local variables to minimize RAM usage
- Comprehensive C library with all source code provided
- Includes support for 24-bit and 32-bit IEEE floating point and 32-bit long.

- Mixed C and assembler programming
- Unlimited number of source files
- Listings showing generated assembler
- Compatible - integrates into the MPLAB IDE, MPLAB ICD and most 3rd-party development tools
- Runs on multiple platforms: Windows, Linux, UNIX, Mac OS X, Solaris

4.2.1 Operating systems:

To run any software, we need operating system. Embedded systems do not require a complete operating system, which may make the system bulky, but only the basic functionalities of the operating system in a real time environment – RTOS. Off-the-shelf operating systems for these systems began to appear in the late 1970's, and today several dozen viable options are available. Embedded operating systems are available in variety of flavors: Windows NT, LINUX, Windows CE 3.0, PalmOS, QNX, ROMDOS, JBED, RT kernel, Tiny BIOS, Turbo task, Nucleus plus/Tasking, Diamond, and Thread etc. Out of these, a few major players have emerged, such as VxWorks, PSOS, and nucleus, windows CE, ThreadX and Linux. 'Inferno' and 'Chai' are the two popular environments that are used to develop application stems.

The Essence:

An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost-conscious market.

CHAPTER 5:

ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Automatically will get the data through cell phones
- INTIMATION TIME WILL BE VERY LESS
- Low cost product.
- Ease to operate
- Easy portable
- Time saver
- COAL Miners will be IN SAFETY & happy for having this product

DISADVANTAGES:

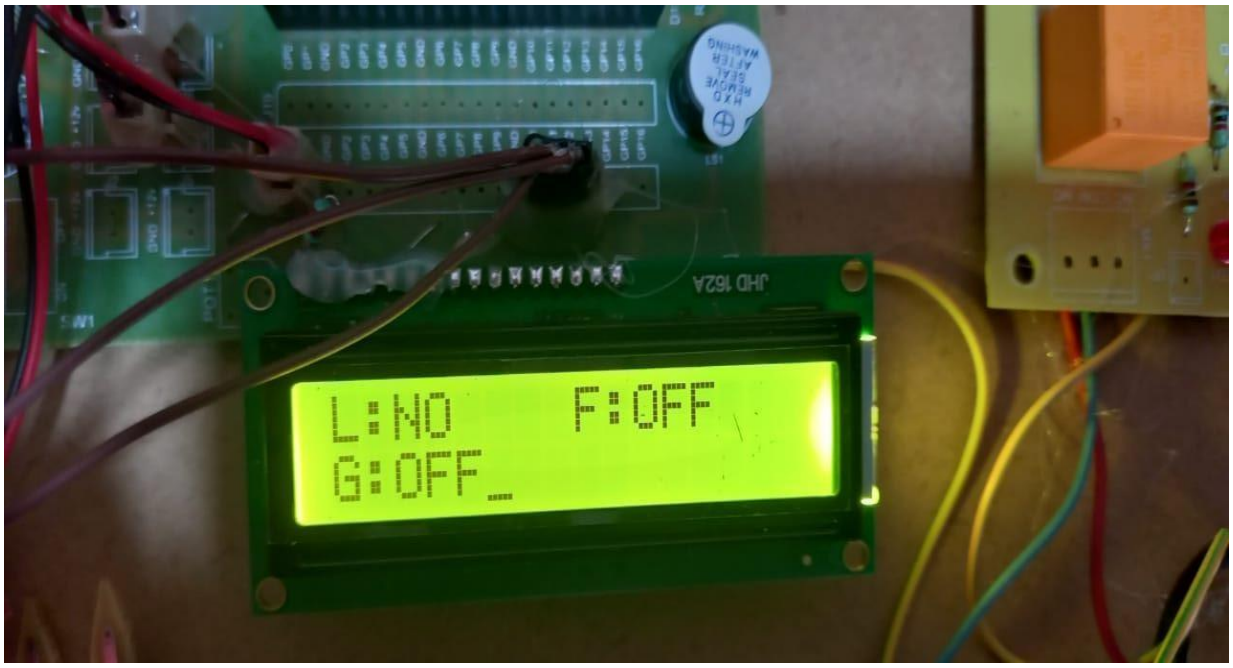
- Incase of emergency manual call points not available for communication.
- No specific incident report available like fire or water or gas.
- Delay will occurs compare to automatic incident report system.
- Different actions needed for different incidents.

APPLICATIONS:

- For Underground Mine System

CHAPTER 6

RESULT ANALYSIS



Page 1 of 1

S.No	Level	Fire	Gas	Date
1	NO-Water	OFF	OFF	2022-11-10 14:27:19
2	NO-Water	OFF	OFF	2022-11-10 14:26:39
3	NO-Water	OFF	OFF	2022-11-10 14:26:00
4	NO-Water	OFF	OFF	2022-11-10 14:22:27
5	NO-Water	OFF	OFF	2022-11-10 14:21:47
6	NO-Water	OFF	OFF	2022-11-10 14:21:07
7	NO-Water	OFF	OFF	2022-11-10 14:20:27
8	NO-Water	OFF	OFF	2022-11-10 14:19:48
9	NO-Water	OFF	OFF	2022-11-10 14:19:09
10	NO-Water	ON	OFF	2022-11-10 14:18:36
11	NO-Water	OFF	OFF	2022-11-10 14:18:10
12	NO-Water	OFF	OFF	2022-11-10 14:17:29
13	Water-Detected	OFF	OFF	2022-11-10 14:17:10
14	Water-Detected	OFF	OFF	2022-11-10 14:16:48
15	NO-Water	OFF	OFF	2022-11-10 14:16:12
16	Water-Detected	OFF	ON	2022-11-08 12:29:45
17	Water-Detected	ON	OFF	2022-11-08 12:29:26
18	Water-Detected	OFF	OFF	2022-11-08 12:29:07
19	NO-Water	OFF	OFF	2022-11-08 12:28:27

- By this project we have achieved the IOT based coal mine safety monitoring and alerting system with the features like detecting the methane gas with the help of gas sensor, fire detection with the help of fire sensor then automatically water pump will turn on and water will be detected with the help of water sensor. Finally, this information will be shown in the server.

CONCLUSION

Whenever the parameters exceeds the preset limit i.e. when temperature is more than 50.0C , gas concentration is more than 50 and humidity is more than 250 then the designed system will show alert message on lcd display and buzzer will sound. Also, IOT gives this information to distant person hence it helps to prevent dangerous hazard.

Future Scope:

In future we will add the modern technology which is faster than the present technology. We can add smart helmet as the future scope. So, that the security system can improve in the view of coal mines.

REFERENCES

[1].Yongping Wu and Guo Feng, “The study on coal mine monitoring using the Bluetooth wireless transmission system” , 2014 IEEE Workshop on Electronics, Computer and Applications, pp. 1016-1018, 2014.

[2]. Xiaolong Feng, Jiansheng Qian, Zhenzhen Sun, Xing Wang, "Wireless Mobile Monitoring System for Tram Rail Transport in Underground Coal Mine Based on WMN," cason, pp.452-455, 2010 International Conference on Computational Aspects of Social Networks, 2010.

[3]. Yi-ming Tian, You-rui Huang, Yi-qing Huang, "Intelligent Information Processing of WSN Based on Vague Sets Theory and Applied in Control of Coal Mine Monitoring,"cccm, vol. 2, pp.649-652, 2008 ISECS International Colloquium on Computing, Communication, Control, and Management, 2008.

[4]. Jingjiang Song ,Yingli Zhu and Fuzhou DongK, “automatic monitoring system for coal mine safety based on wireless sensor network”, IEEE Radio Science and Wireless Technology Conference, pp.933-936, 2011.

[5]. Yogendra S Dohare and Tanmoy Maity, “surveillance and safety system for underground coal mines based on Low Power WSN”, IEEE, pp.116-119, 2014.

[6]. Valdo Henriques and Reza Malekian, “ Mine safety system using wireless sensor network”, IEEE, pp. 1-12, 2016.

[7]. Huping Xu, Feng Li, Yancheng Ma, A ZigBeebased miner Localization System’, IEEE, 2012. 8

Shuo pang, Ricardo Trujillo, Indoor Localization Using Ultrasonic Time Difference of Arrival’, IEEE, 2013.

[8]. Yongping Wu, Guo Feng, Zhang Meng, The Study on Coal Mine Using the Bluetooth Wireless Transmission’,IEEE, 2014.

[9]. Yuping Zhang, Yinghui Zhang, Chen Li2, Research of Short Distance Wireless Communication Technology in the Mine Underground’,IEEE, 2014.

[10]. Manash Jyoti Deka, Jetendra Joshi, Nishchay

Sinha, Aman Tyagi, Apoorv Kushal Avijit Jain,

Indoor and Outdoor Position Identification Using RFID', IEEE, 2016.

[11]. Mengda Wang, Bing Xue, Wei Wang, Junjie

Yang, The Design of multi-User Indoor UWB Localization System',IEEE, 2017.

[12]. Nisha Dube1, Prof. K.S.Ingle 2 PG Student, Dept. of ECE "Intelligent Mining: A Monitoring and Security System for Coal Mine

Workers",International Journal of Advanced Research in Electrical, Electronics and

Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 1,

January 2016.

Cite this article as :

Prof. A. H. Ansari, Karishma Shaikh, Pooja Kadu, Nikam Rishikesh, "IOT Based Coal Mine Safety Monitoring and Alerting System", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099,

Print ISSN : 2395-1990, Volume 8 Issue 3, pp. 404-410,

May-June 2021. Available at

doi : https://doi.org/10.32628/IJSRSET2183188

Journal URL : https://ijsrset.com/IJSRSET2183188