

**Project Report**

**On**

**Automated Visitor Counter With 7 Segment Display**

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## **SYNOPSIS**

In Today's world there is a continuous need for automatic appliances. The object of this project is to make a controller based model to count number of persons visiting particular room and accordingly light up the down automatically there we can use sensor and can know present number of persons. Wastage of electricity is one of the main problems which we are facing now a day. To avoid all such situations, we have designed this project called "Digital Visitor counter using 8051 Microcontroller (AT89C51)". This project has one modules, first one is known as "Digital Visitor counter.

Main concept behind this project is known as "Visitor Counting" which measures the number of persons entering in any room like seminar hall, conference room, classroom. This function is implemented using a pair of Infrared sensors. LED display placed outside the room displays this value of person count. This person count will be incremented if somebody enters inside the room and at that time lights are turned on. In this way Relay does the operation of "Digital Visitor counter". Since this project uses 2 infrared sensors, it can be used as Bidirectional person counter as well.

## **LIST OF ABBREVIATIONS**

TCON	Timer/Counter Control Register
ICSP	In-circuit Serial Programming
IDE	Integrated Development Environment
USB	Universal Serial Bus.
SPI	Serial Peripheral Interface
MISO	Master in Slave Out
MOSI	Master Out Slave In
SCK	Serial Clock
SS	Slave Select
SDA	Serial Data Access
SCL	Serial Clock
CS	Chip Select Line
Rx	Receiver
Tx	Transaction
Vin	Voltage (0 - 5 V)
Gnd	Ground
HF	High Frequency
Hz	HERTZ
EMI	Electromagnetic Induction
SEVEN SEGMENT DISPLAY	Liquid Crystal Display
PCB	Printed Circuit Board
TTL	Transistor Logic
UART	Universal Asynchronous Receiver/Transmitter
CPU	Central Processing Unit
RAM	Random Access Memory

ROM	Read Only Memory
DPTR	Data Pointer
ALE	Address Latch Enable
R/W	Read/Write
RST	Reset
ID	Identification
ASCII	American Standard Code for Information Interchange

## **DECLARATION**

“We hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text”.

## **CHAPTER-1**

### **PROJECT INTRODUCTION**

# **CHAPTER-1**

## **PROJECT INTRODUCTION**

### **1.1 Introduction**

Electricity is one of the most important resource in this century. Many times we need to monitor the Electricity is one of the most important resources in this century. Many times we need to monitor the person/people visiting some place like Auditorium. To provide solution for this we are going to implement a project called “Digital Visitor Counter”. This project has a “Visitor counter”. Main concept behind this project is to measure and display the number of persons entering in any room like seminar hall, conference room. SEVEN SEGMENT DISPLAY display placed outside the room displays number of person inside the room. This project can be used to count and display the number of visitors entering inside any conference room or seminar hall. That means counter will be incremented if person enters the room. We should conserve the electricity. Main concept behind this project is to measure and display the number of persons entering in any room like seminar hall, conference room. And when number of persons inside the room is zero, power supply inside the room can be cut using a relay interface. This will help to save electricity. LED display placed outside the room displays number of person inside the room.

### **1.2 Problem Statement**

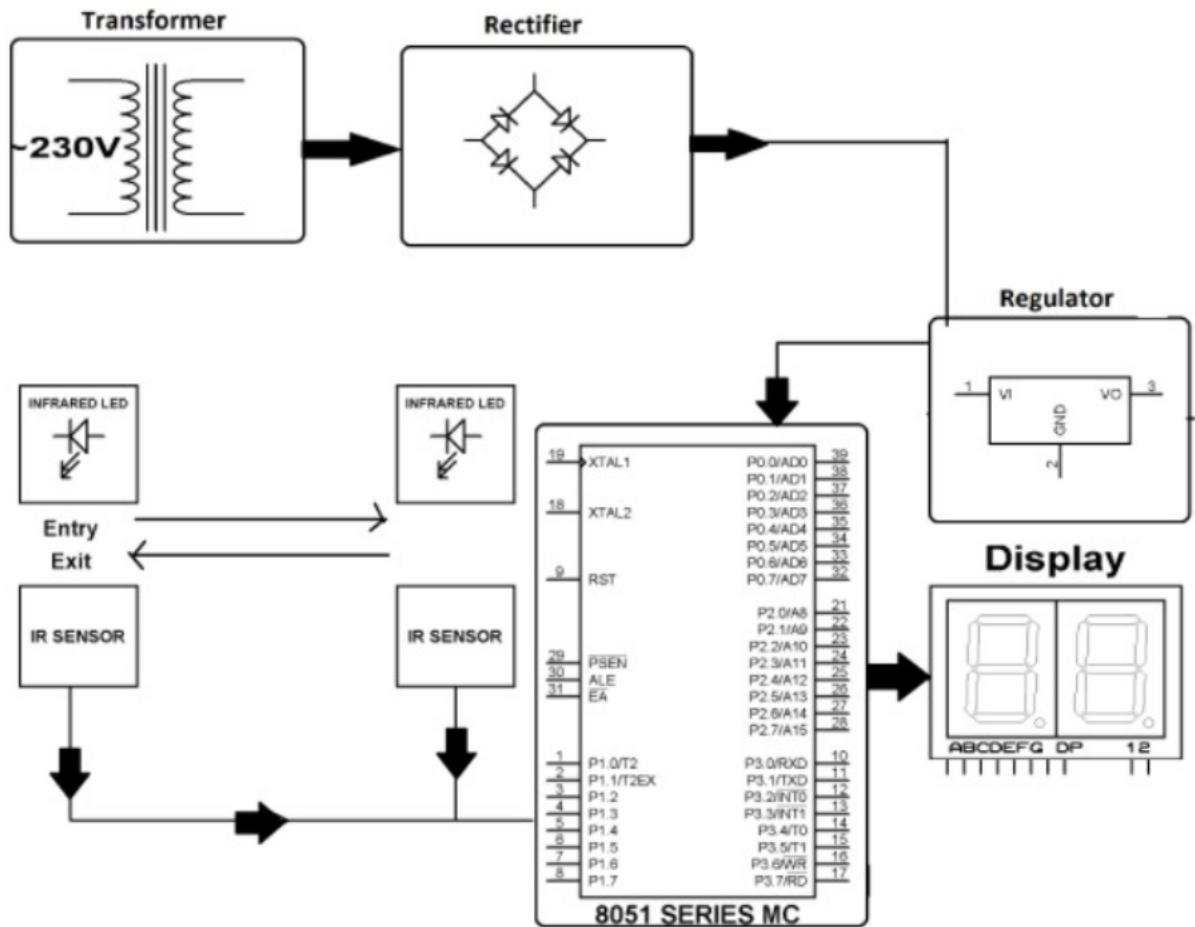
Digital visitor counter is a reliable circuit that takes over the task of counting number of persons/ visitors in the room passing through a single door and also turns ON led light. The total number of persons inside the room is displayed on Seven Segment LED display.

### **1.3 Motivation and Challenges**

Nowadays without electricity we cannot imagine our daily life because electricity has become a necessity for all, without which day-to-day life chores & daily activities become stand still. Due to the depletion of non-renewable resources, conservation of energy has become mandatory and by doing so we can reduce electricity bills as well. We know that energies like wind energy, solar energy and hydro energy are called renewable energy sources which are renewable in nature. Therefore, utilization of these resources for power supply is the best possible way of producing, conserving and renewing energy, which is advantageous as it is pollution free, affordable, and free from environmental impacts. Nowadays without electricity we cannot imagine our daily life because electricity has become a necessity for all, without which day-to-day life chores & daily

activities become stand still. Due to the depletion of non-renewable resources, conservation of energy has become mandatory and by doing so we can reduce electricity bills as well. We know that energies like wind energy, solar energy and hydro energy are called renewable energy sources which are renewable in nature. Therefore, utilization of these resources for power supply is the best possible way of producing, conserving and renewing energy, which is advantageous as it is pollution free, affordable, and free from environmental impacts.

**Block Diagram:**



## 1.4 Working of Project

The system is designed for optimum energy usage and is very beneficial in case if we want to count the number of people going to attend a particular event or any function thereby helps in collecting data by counting the number of people. This is done by simply incrementing the counter. The system uses InfraRed Sensor pairs in order to fulfil this purpose and thus saves a large amount of energy. Each pair consists of 2 sensor pairs placed at a certain distance from one another in the opposite direction. The IR transmitter is used to transmit IR rays straight to the receiver which receives the input and feeds this to an 8051 Microcontroller. As soon as a person enters the area where the system is placed, it is detected by the IR sensor module and this info is fed to the microcontroller. The microcontroller process this input received. At this time the system also counts the number of people present and increments a counter on each arrival, this count is displayed on a 7 segment display.

The basic block diagram of “Digital visitor counter” is shown in the figure. Mainly this block diagram consists of the following essential blocks.

1. Power Supply
2. Entry sensor
3. Micro controller 8051
4. Comparator circuit

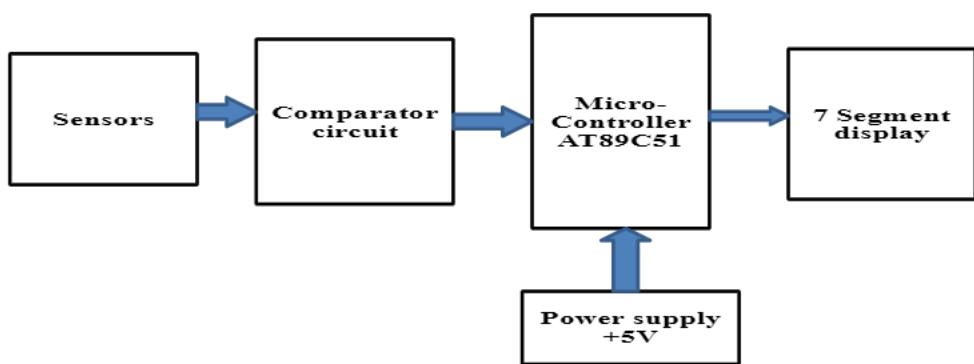


Fig.1.1 Block Diagram of Project

This project is divided in four parts: sensors, controller, counter display and gate. The sensor would observe an interruption and provide an input to the controller which would run the counter increment depending on entering of the person. And counting is displayed on a 7 Segment LED through the controller. When any one enters in the room, IR sensor will get interrupted by the object then other sensor will network because we have added a delay for a while he outputs of IR Sensor Modules are directly connected to Comparator circuit to Micro controller digital pin number 9. LED is connected to pin number 21 to 27 PORT 3(AD1 to AD7) .Each transistors of LED segment is connected to pin 1, 2&3.

## 1.5 Circuit Diagram

This Project “**Digital visitor counter**” is a reliable circuit that takes over the task of counting number of persons/ visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one.

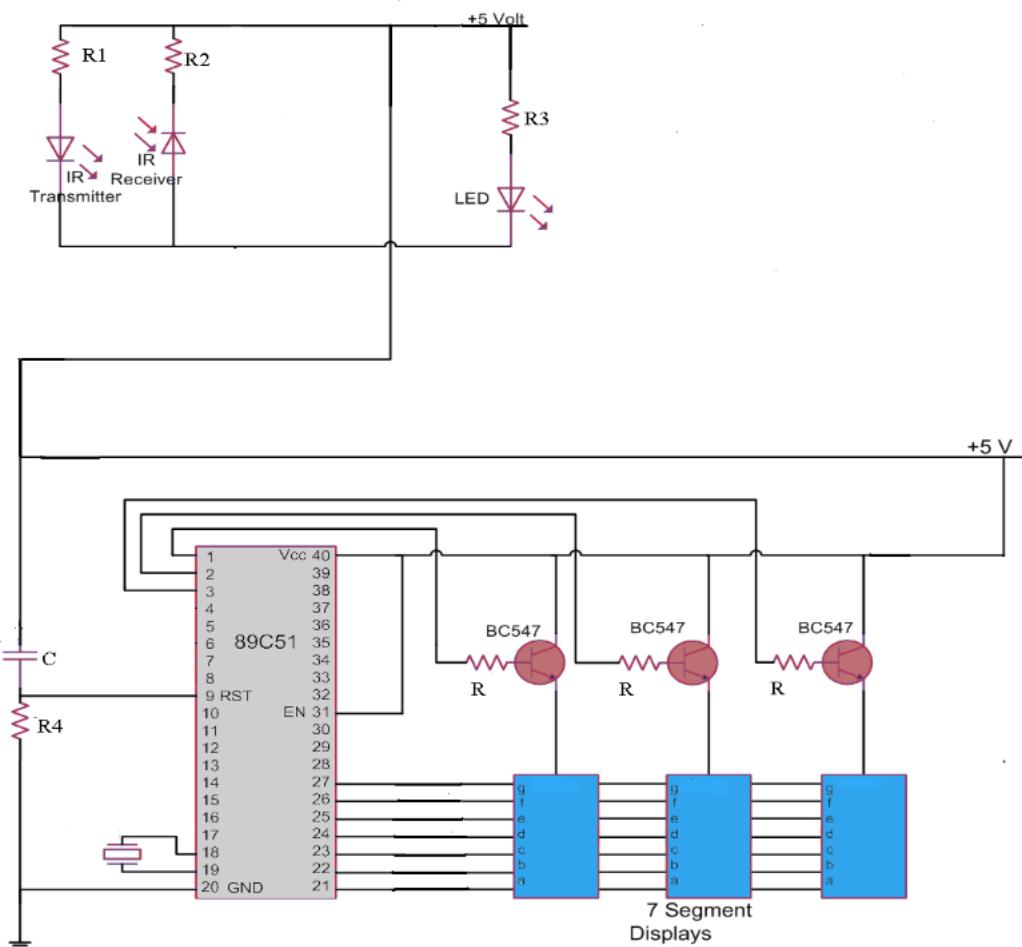


Fig.1.2 Circuit Schematic of Project

The sensor would observe an interruption and provide an input to the controller which would run the counter increment depending on entering of the person. And counting is displayed on a 7 Segment LED through the controller. When any one enters in the room, IR sensor will get interrupted by the object then other sensor will network because we have added a delay for a while he outputs of IR Sensor Modules are directly connected to Micro-controller digital pin number 9(RST).Crystal Oscillator is connected to pin number 18 &19. LED is connected to pin number 21 to 27.

The total number of persons entering the room is displayed on the 7 segment LED displays. The Micro-controller does the above job. It receives the signals from the sensors, and this signal is operated under the control of software which is stored Micro-controller. Micro-controller continuously monitor the Infrared Receivers, when any object passes through the IR Receiver's

then the IR Rays falling on the receiver are obstructed, this obstruction is sensed by the Microcontroller on the board

## **1.6 Project Objective:**

This project is not limited to a specific application or a specific operating environment, but it can be easily implemented wherever such an application is needed. This circuit uses a microcontroller which ensures the flexibility of the circuit, due to which this circuit can easily be integrated or assembled with other modules or circuits where ever required. All the components required are readily available in the market and the circuit is easy to build. The significant feature of this project is that it detects the entry of visitors from a single door itself.

The aim of this project is to count the objects (persons) entering the room and also switch the led light accordingly. If we consider an office or a conference hall or any other room, we need to turn on the lights whenever anybody enters the room. This is true even in the day time at some places like conference halls or offices where a good brightness levels are desired. The problem is, when the first person is entering a room.

## **1.7 COMPONENTS USED**

- Micro controller 8051
- Power supply (5v)
- IR Sensor module
- 7 Segment LED display

- Connecting Wires

Here Micro-controller is used for controlling whole the process of the visitor counter project. The outputs of comparators are connected to digital pin number 9 of Micro-controller. Micro-controller read these signals and sends commands to 7 segment LED display.

## **1.8 Organization of the thesis**

This thesis has been organized into seven chapters. Chapter 1 introduces with our project and explains the background review. Chapter 2 explains the power supply used in this project. Chapter 3 explains Micro-controller, Chapter 4 and explains IR Modules. Chapter 5 explains LED and USB serial communication approach. Chapter 6 explains the results and project outputs. Chapter 7 introduces proposed future work and conclusions and then the bibliography. At last in appendix codes are shown related to the project

## **CHAPTER-2**

### **POWER SUPPLY**

## CHAPTER-2

### POWER SUPPLY

#### 2.1 Parts of Power

By still use PCB and other equipment as before. To use transformer 1-2A. IC-78xx to Hold Heatsink. For example, circuit that use IC-78xx series in fixed voltage supply for digital circuits. I am built this dc regular circuit, is the first project. Because at that interesting about digital circuits, need a constant 5V 1A fixed power supply. Using ic-7805 is very suitable for this job. Because it is easy to use, easy to buy, as popular applications, and it is also cheap. For working principle, I would have permitted to tell simply. When the home electric source ACV, 110V or 230V or a 220V, depending on your country, through the transformer, the voltage remains 12VAC. Then through the diode for rectifier power supply to the DC Volt, And a filter circuit with Capacitors. This is a voltage is about 12Vdc. It does not work through IC-7812, before our hero, for to control a stable 12V voltage with can prevent also a short circuit. Just now I have a small circuit great ready to use it.

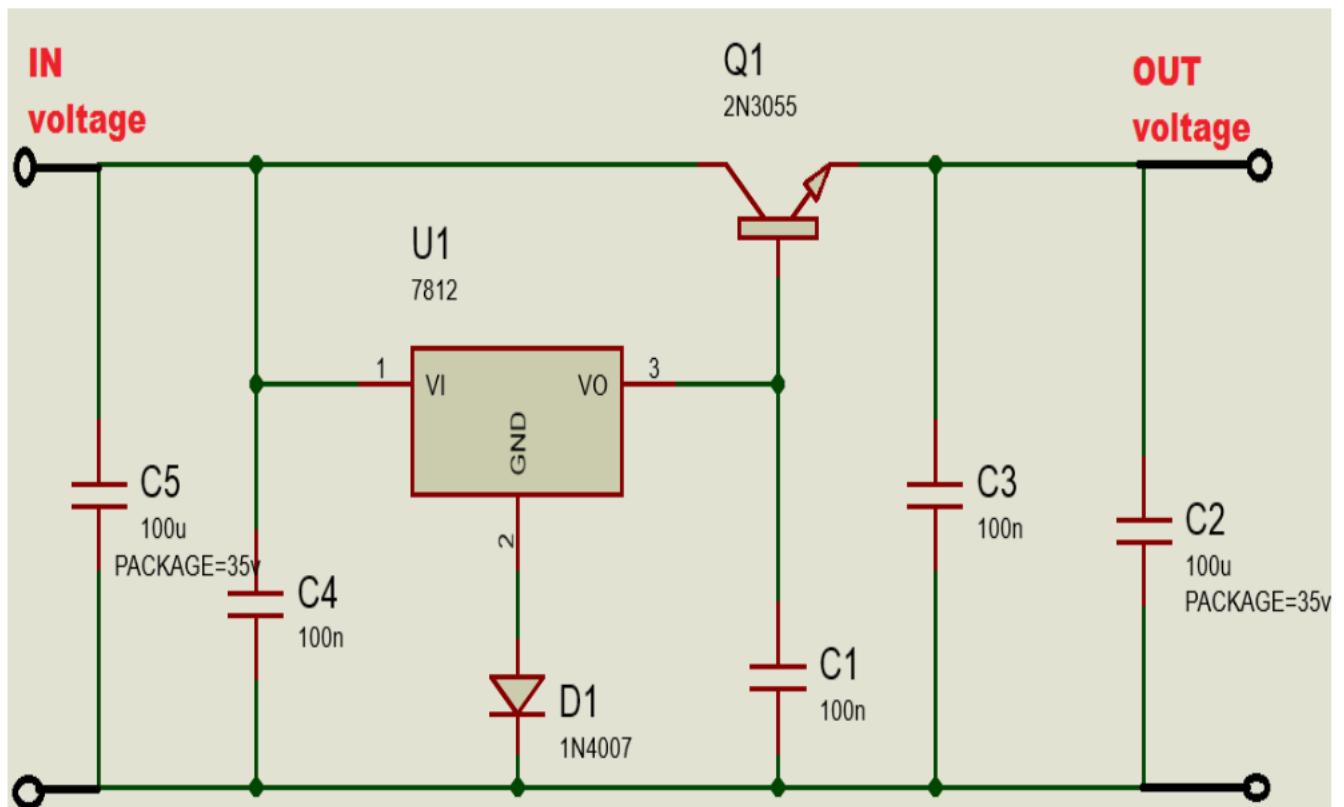


Figure 2.1: Internal Architecture

Here this circuit diagram is for +12V regulated (fixed voltage) DC power supply. This power supply circuit diagram is ideal for an average current requirement of 1Amp. This circuit is based on IC LM7812. It is a 3-terminal (+ve) voltage regulator IC. It has short circuit protection, thermal overload protection. LM7812 IC is from LM78XX series. The LM78XX series IC is positive voltage regulator IC for different voltage requirements, for example LM7805 IC is made for 5 volt fixed output voltage. There is LM79XX IC series for negative voltage.

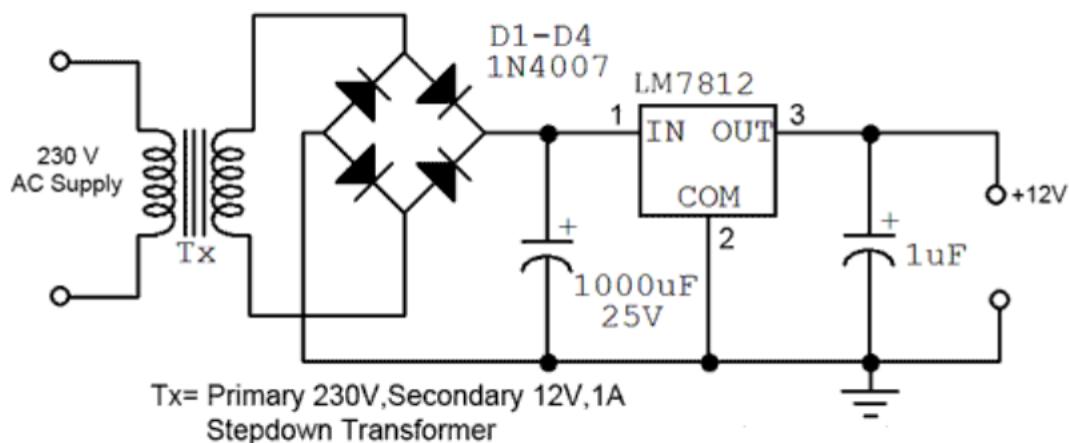


Figure 2.2: Internal Circuit

## 2.2 IC 7812:

7812 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7812 provides +12V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

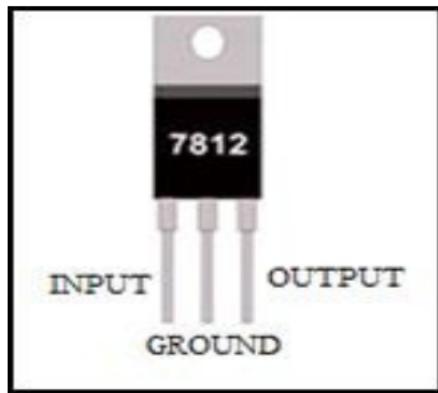


Figure 2.3: 7805 IC

### 2.3 Pin Explanation

The RS7812 can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each employs internal current limiting, thermal shut-down safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Table 2.1: Pin Description of 7805.

Pin No	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 12V (9.8V-12.2V)	Output



**CHAPTER-3**

**THE MICRO-CONTROLLER**

# **CHAPTER-3**

## **THE MICRO-CONTROLLER**

### **3.1 General**

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of neither Ferroelectric RAM, nor flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computer or other general purpose applications consisting of various discrete chips.

### **3.2 The History**

The first microprocessor was the 4-bit Intel 4004 released in 1971, with the Intel 8008 and other more capable microprocessors becoming available over the next several years. However, both processors required external chips to implement a working system, raising total system cost, and making it impossible to economically computerize appliances. The Smithsonian Institution credits TI engineers Gary Boone and Michael Cochran with the successful creation of the first microcontroller in 1971. The result of their work was the TMS 1000, which became commercially available in 1974. It combined read-only memory, read/write memory, processor and clock on one chip and was targeted at embedded systems. Partly in response to the existence of the single-chip TMS 1000, Intel developed a computer system on a chip optimized for control applications, the Intel 8048, with commercial parts first shipping in 1977. It combined RAM and ROM on the same chip. This chip would find its way into over one billion PC keyboards, and other numerous applications. At that time Intel's President, Luke J. Valenter, stated that the microcontroller was one of the most successful in the company's history, and expanded the division's budget over 25%. Most microcontrollers at this time had concurrent variants. One had an erasable EPROM program memory, with a transparent quartz window in the lid of the package to allow it to be erased by exposure to ultraviolet light, often used for prototyping. The other was either a mask programmed ROM from the manufacturer for large series, or a PROM variant which was only programmable once; sometimes this was signified with the designation OTP, standing for "one-time programmable". The PROM was of identical type of memory as the EPROM, but because there was no way to expose it to ultraviolet light, it could not be erased. The erasable

versions required ceramic packages with quartz windows, making them significantly more expensive than the OTP versions, which could be made in lower-cost opaque plastic packages. For the erasable variants, quartz was required, instead of less expensive glass, for its transparency to ultraviolet—glass is largely opaque to UV—but the main cost differentiator was the ceramic package itself. In 1993, the introduction of EEPROM memory allowed microcontrollers (beginning with the Microchip) to be electrically erased quickly without an expensive package as required for EPROM, allowing both rapid prototyping, and In System Programming. (EEPROM technology had been available prior to this time, but the earlier EEPROM was more expensive and less durable, making it unsuitable for low-cost mass-produced microcontrollers.) The same year, Atmel introduced the first microcontroller using Flash memory, a special type of EEPROM. Other companies rapidly followed suit, with both memory types. Cost has plummeted over time, with the cheapest 8-bit microcontrollers being available for under 0.25 USD in quantity (thousands) in 2009, and some 32-bit microcontrollers around US\$1 for similar quantities. Nowadays microcontrollers are cheap and readily available for hobbyists, with large online communities around certain processors. In the future, MRAM could potentially be used in microcontrollers as it has infinite endurance and its incremental semiconductor wafer process cost is relatively low.

### **3.3 Embedded design:**

A microcontroller can be considered a self-contained system with a processor, memory and peripherals and can be used as an embedded system. The majority of microcontrollers in use today are embedded in other machinery, such as automobiles, telephones, appliances, and peripherals for computer systems. While some embedded systems are very sophisticated, many have minimal requirements for memory and program length, with no operating system, and low software complexity. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom liquid-crystal displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of personal computer, and may lack human interaction devices of any kind.

#### **3.3.1 Interrupts:**

Microcontrollers must provide real time (predictable, though not necessarily fast) response to events in the embedded system they are controlling. When certain events occur, an interrupt system can signal the processor to suspend processing the current instruction sequence and to begin an interrupt service routine (ISR, or "interrupt handler") which will perform any processing

required based on the source of the interrupt, before returning to the original instruction sequence. Possible interrupt sources are device dependent, and often include events such as an internal timer overflow, completing an analog to digital conversion, a logic level change on an input such as from a button being pressed, and data received on a communication link. Where power consumption is important as in battery devices, interrupts may also wake a microcontroller from a low-power sleep state where the processor is halted until required to do something by a peripheral event.

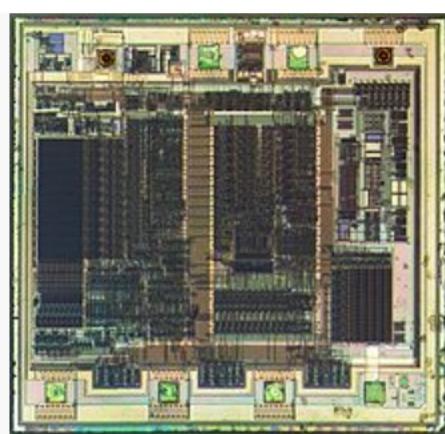
**Programs:** Typically microcontroller programs must fit in the available on-chip memory, since it would be costly to provide a system with external, expandable memory. Compilers and assemblers are used to convert both high-level and assembly language codes into a compact machine code for storage in the microcontroller's memory. Depending on the device, the program memory may be permanent, read-only memory that can only be programmed at the factory, or it may be field-alterable flasher erasable read-only memory. Manufacturers have often produced special versions of their microcontrollers in order to help the hardware and software development of the target system. Originally these included EPROM versions that have a "window" on the top of the device through which program memory can be erased by ultraviolet light, ready for reprogramming after a programming ("burn") and test cycle. Since 1998, EPROM versions are rare and have been replaced by EEPROM and flash, which are easier to use (can be erased electronically) and cheaper to manufacture. Other versions may be available where the ROM is accessed as an external device rather than as internal memory, however these are becoming rare due to the widespread availability of cheap microcontroller programmers. The use of field-programmable devices on a microcontroller may allow field update of the firmware or permit late factory revisions to products that have been assembled but not yet shipped. Programmable memory also reduces the lead time required for deployment of a new product. Where hundreds of thousands of identical devices are required, using parts programmed at the time of manufacture can be economical. These "mask programmed" parts have the program laid down in the same way as the logic of the chip, at the same time. A customizable microcontroller incorporates a block of digital logic that can be personalized for additional processing capability, peripherals and interfaces that are adapted to the requirements of the application. One example is the AT91CAP from Atmel.

### **3.3.2 Other microcontroller features:**

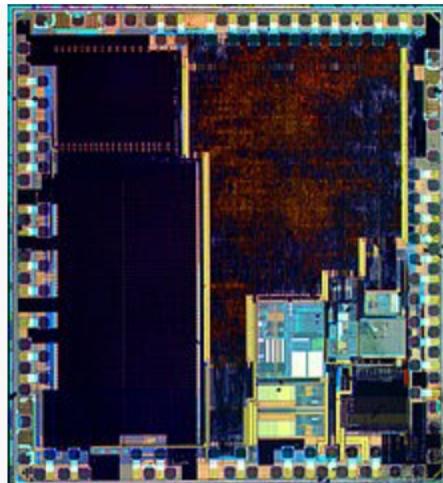
Microcontrollers usually contain from several to dozens of general purpose input/output pins (GPIO). GPIO pins are software configurable to either an input or an output state. When GPIO pins are configured to an input state, they are often used to read sensors or external signals. Configured

to the output state, GPIO pins can drive external devices such as LEDs or motors, often indirectly, through external power electronics. Many embedded systems need to read sensors that produce analog signals. This is the purpose of the analog-to-digital converter (ADC). Since processors are built to interpret and process digital data, i.e. 1s and 0s, they are not able to do anything with the analog signals that may be sent to it by a device. So the analog to digital converter is used to convert the incoming data into a form that the processor can recognize. A less common feature on some microcontrollers is a digital-to-analog converter (DAC) that allows the processor to output analog signals or voltage levels. In addition to the converters, many embedded microprocessors include a variety of timers as well. One of the most common types of timers is the Programmable Interval Timer (PIT). A PIT may either count down from some value to zero, or up to the capacity of the count register, overflowing to zero. Once it reaches zero, it sends an interrupt to the processor indicating that it has finished counting. This is useful for devices such as thermostats, which periodically test the temperature around them to see if they need to turn the air conditioner on, the heater on, etc. A dedicated Pulse Width Modulation (PWM) block makes it possible for the CPU to control power converter, resistive loads, motors, etc., without using lots of CPU resources in tight timer loops. Universal Asynchronous Receiver/Transmitter (UART) block makes it possible to receive and transmit data over a serial line with very little load on the CPU. Dedicated on-chip hardware also often includes capabilities to communicate with other devices (chips) in digital formats such as Inter-Integrated Circuit , Serial Peripheral Interface (SPI), Universal Serial Bus (USB), and Ethernet.

### 3.3.3 Higher Integration:



Die of a PIC12C508 8-bit, fully static, EEPROM/EPROM/ROM-based CMOS microcontroller manufactured by Microchip Technology using a 1200nanometre process.



Die of a STM32F100C4T6B ARM Cortex-M3 microcontroller with 16kilobytes flash memory, 24 MHZ Central Processing Unit (CPU), motor control and Consumer Electronics Control (CEC) functions. Manufactured by STMicroelectronics. Micro-controllers may not implement an external address or data bus as they integrate RAM and non-volatile memory on the same chip as the CPU. Using fewer pins, the chip can be placed in a much smaller, cheaper package. Integrating the memory and other peripherals on a single chip and testing them as a unit increases the cost of that chip, but often results in decreased net cost of the embedded system as a whole. Even if the cost of a CPU that has integrated peripherals is slightly more than the cost of a CPU and external peripherals, having fewer chips typically allows a smaller and cheaper circuit board, and reduces the labor required to assemble and test the circuit board, in addition to tending to decrease the defect rate for the finished assembly. Central processing unit - ranging from small and simple 4-bit processors to complex 32-bit or 64-bit processors. Volatile memory (RAM) for data storage. ROM, EPROM, EEPROM or Flash memory for program and operating parameter storage discrete input and output bits, allowing control or detection of the logic state of an individual package pin serial input/output such as serial ports (UARTs) other serial communication interface like I2C, Serial Peripheral Interface and Controller Area Network for system interconnect peripherals such as timers, event counters, PWM generators, and watchdog clock generator - often an oscillator for a quartz timing crystal, resonator or RC circuit many include analog-to-digital converters, some include digital-to-analog converters in-circuit programming and in-circuit debugging support. This integration drastically reduces the number of chips and the amount of wiring and circuit board space that would be needed to produce equivalent systems using separate chips. Furthermore, on low pin count devices in particular, each pin may interface to several internal peripherals, with the pin function selected by software. This allows a part to be used in a wider variety of applications than if pins had dedicated functions. Micro-controllers have proved to

be highly popular in embedded systems since their introduction in the 1970s. Some microcontrollers use a Harvard architecture separate memory buses for instructions and data, allowing accesses to take place concurrently. Where a Harvard architecture is used, instruction words for the processor may be a different bit size than the length of internal memory and registers; for example: 12-bit instructions used with 8-bit data registers. The decision of which peripheral to integrate is often difficult. The microcontroller vendors often trade operating frequencies and system design flexibility against time-to-market requirements from their customers and overall lower system cost. Manufacturers have to balance the need to minimize the chip size against additional functionality. Microcontroller architectures vary widely. Some designs include general-purpose microprocessor cores, with one or more ROM, RAM, or I/O functions integrated onto the package. Other designs are purpose built for control applications. A micro-controller instruction set usually has many instructions intended for bit manipulation (bit-wise operations) to make control programs more compact. For example, a general purpose processor might require several instructions to test a bit in a register and branch if the bit is set, where a micro-controller could have a single instruction to provide that commonly required function. Microcontrollers typically do not have a math coprocessor, so floating point arithmetic is performed by software.

### **3.3.4 Programming environments:**

Microcontrollers were originally programmed only in assembly language, but various high-level programming language, such as C, Python and JavaScript, are now also in common use to target microcontrollers and embedded system. These languages are either designed specially for the purpose, or versions of general purpose languages such as the C programming language. Compilers for general purpose languages will typically have some restrictions as well as enhancements to better support the unique characteristics of microcontrollers. Some microcontrollers have environments to aid developing certain types of applications. Microcontroller vendors often make tools freely available to make it easier to adopt their hardware.

Many microcontrollers are so quirky that they effectively require their own non-standard dialects of C, such as SDCC for the 8051, which prevent using standard tools (such as code libraries or static analysis tools) even for code unrelated to hardware features. Interpreters are often used to hide such low level quirks. Interpreter firmware is also available for some microcontrollers. For example, basic on the early microcontrollers Intel 8052, basic and forth on the Zilog Z8 as well as some modern devices. Typically these interpreters support interactive programming. Simulators are available for some microcontrollers. These allow a developer to analyze what the behavior of the

microcontroller and their program should be if they were using the actual part. A simulator will show the internal processor state and also that of the outputs, as well as allowing input signals to be generated. While on the one hand most simulators will be limited from being unable to simulate much other hardware in a system, they can exercise conditions that may otherwise be hard to reproduce at will in the physical implementation, and can be the quickest way to debug and analyze problems. Recent microcontrollers are often integrated with on-chip debug circuitry that when accessed by an in-circuit emulator via JTAG, allow debugging of the firmware with a debugger. A real-time ICE may allow viewing and/or manipulating of internal states while running. A tracing ICE can record executed program and MCU states before/after a trigger point.

### 3.3 Arduino Description

Arduino is a single-board open source microcontroller designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The Arduino Uno SMD is a version of the [Arduino Uno](#), but uses a surface mount version of the Atmega328P instead of the through-hole version. This version was made in response to a shortage in supply of the through-hole Atmega328P. The board is based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get

started.

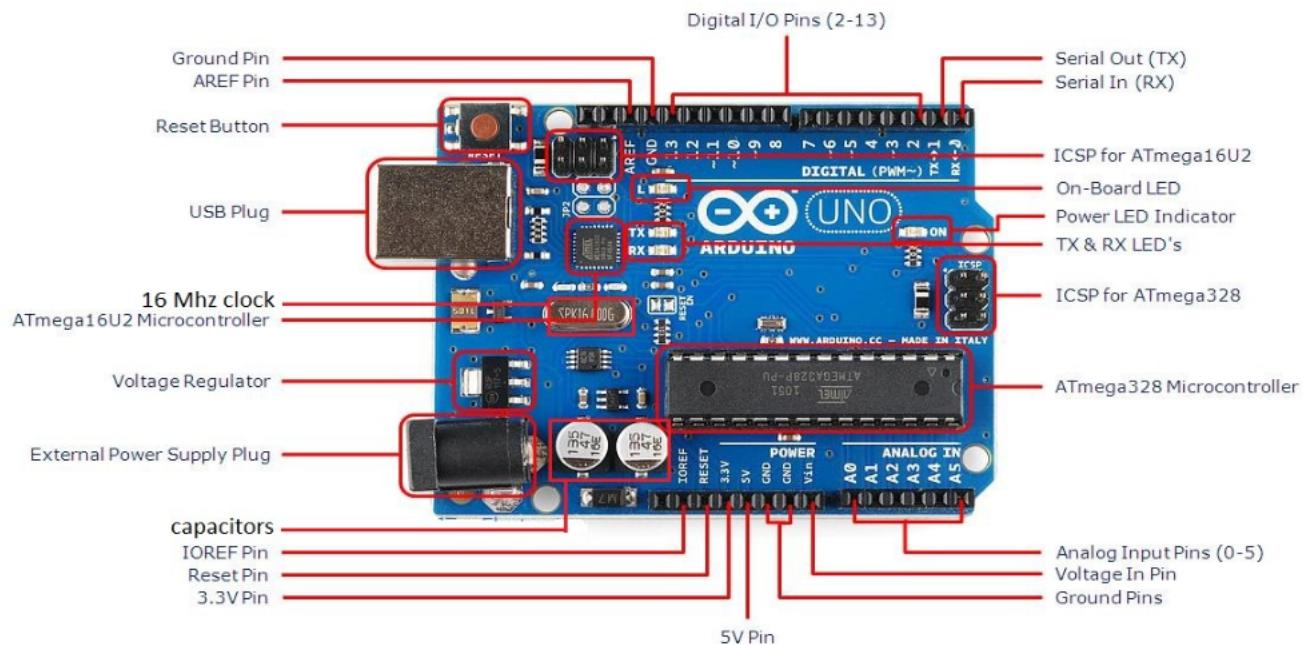


Figure 3.1: Arduino Description

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the [index of Arduino boards](#).

### 3.3.1 Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either

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

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or another regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

3V3. A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND. Ground pins.

### 3.3.2 Memory

Since the emergence of microcontrollers, many different memory technologies have been used. Almost all microcontrollers have at least two different kinds of memory, a non-volatile memory for storing firmware and a read-write memory for temporary data.

### 3.3.3 Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using `pinMode()`, `digitalWrite()`, and `digitalRead()` functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

### 3.3.4 External Interrupts

2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the `attachInterrupt()` function for details.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the `analogWrite()` function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the `SPI` library.

LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of their range using the AREF pin and the `analogReference()` function. Additionally, some pins have specialized functionality:

I2C: A4 (SDA) and A5 (SCL). Support I2C (TWI) communication using the `Wire` library.

There are a couple of other pins on the board:

AREF. Reference voltage (0 to 5V only) for the analog inputs. Used with `analogReference()`.

Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

See also the mapping between Arduino pins and ATmega328 ports.

### 3.3.5 Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes

a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

### 3.3.6 ATmega328 Microcontroller

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz .The Atmega328 is a very popular microcontroller chip produced by Atmel. It is an 8-bit microcontroller that has 32K of flash memory, 1K of EEPROM, and 2K of internal SRAM.The Atmega328 is one of the microcontroller chips that are used with the popular Arduino boards. The Arduino board comes with either 1 of 2 microcontroller chips, the Atmega168 or the Atmega328. Of these 2, the Atmega328 is the upgraded, more advanced chip. Unlike the Atmega168 which has 16K of flash program memory and 512 bytes of internal SRAM, the Atmega328 has 32K of flash program memory and 2K of Internal SRAM.

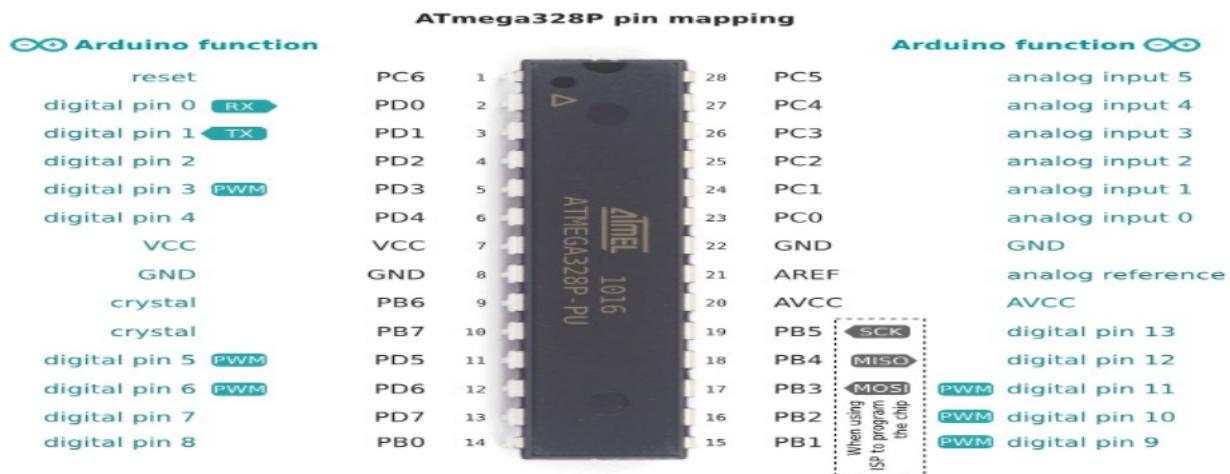


Figure 3.2: Pin Mapping For Arduino

### 3.3.7 Block Diagram

The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers

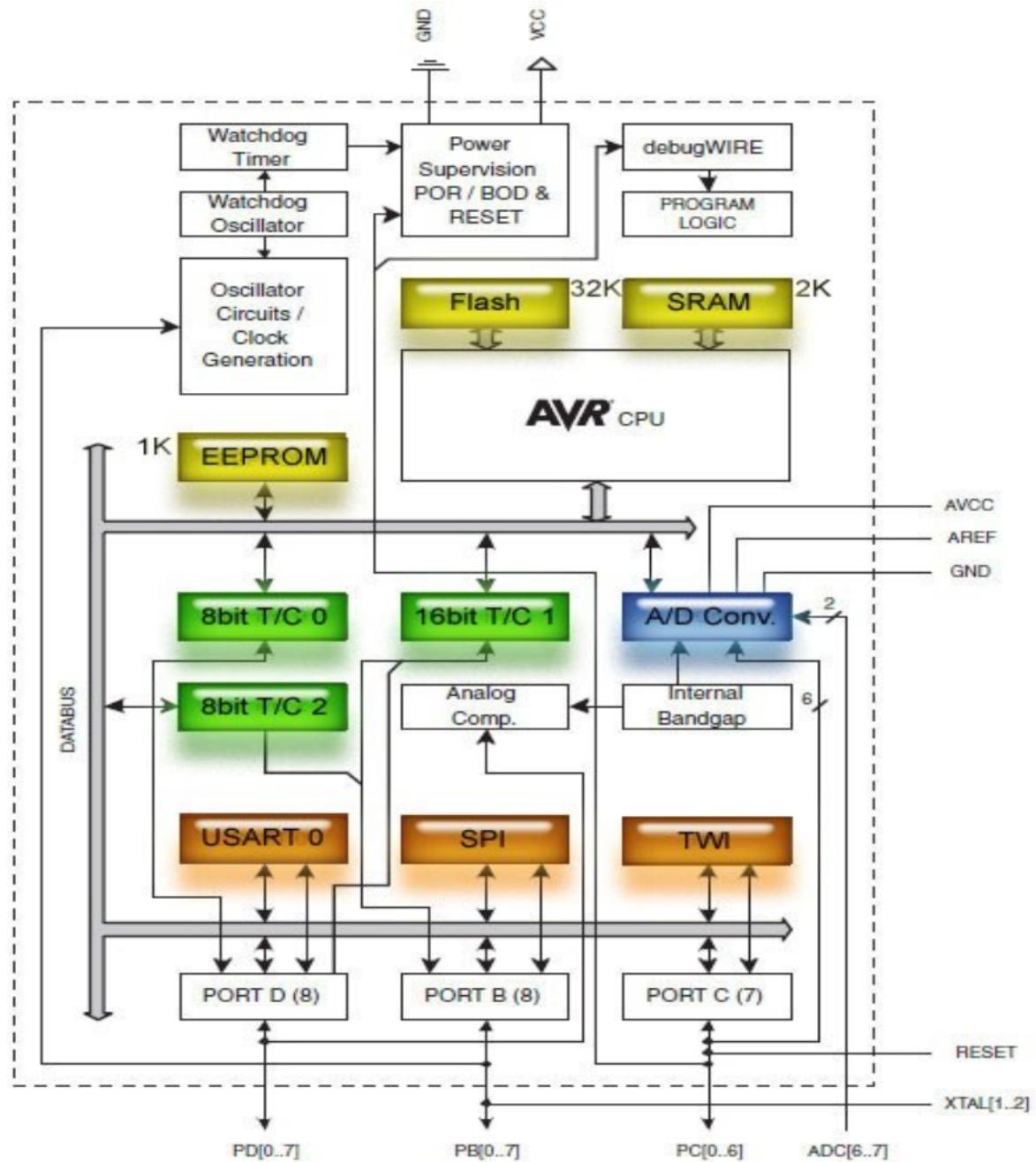
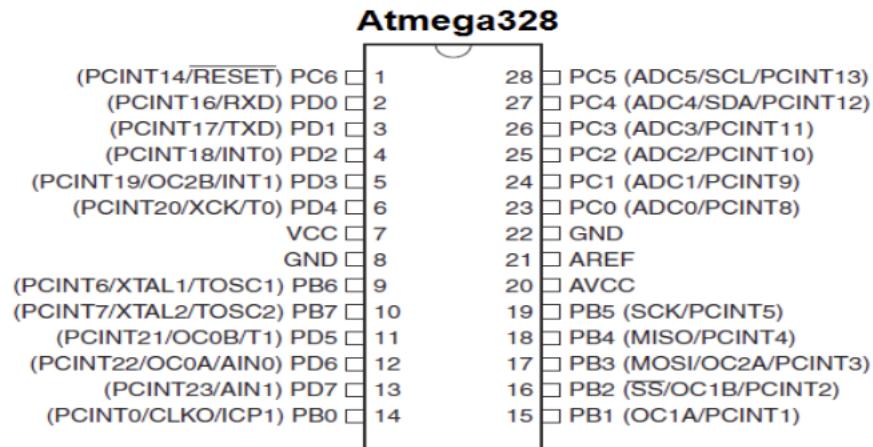


Figure 3.3: The Above Explains The Blocks Of ATmeg328

### 3.3.8 Pin Description

It has 14 digital I/O pins, of which 6 can be used as PWM outputs and 6 analog input pins. These I/O pins account for 20 of the pins. As stated before, 20 of the pins function as I/O ports. This means they can function as an input to the circuit or as output. Whether they are input or output is set in the software. 14 of the pins are digital pins, of which 6 can function to give PWM output. 6 of the pins are for analog input/output. Two of the pins are for the crystal oscillator. This is to provide a clock pulse for the Atmega chip. A clock pulse is needed for synchronization so that communication can occur in synchrony between the Atmega chip and a device that it is connected to. The chip needs power so 2 of the pins, Vcc and GND, provide it power so that it can operate. The Atmega328 is a low-power chip, so it only needs between 1.8-5.5V of power to operate.



**Figure 3.4: The Pin Mapping Of ATmeg328**

Table 3.1 Pin Description of ATmega 328

Pin Number	Description	Function
1	PC6	Reset
2	PD0	Digital Pin (RX)
3	PD1	Digital Pin (TX)
4	PD2	Digital Pin
5	PD3	Digital Pin (PWM)
6	PD4	Digital Pin
7	Vcc	Positive Voltage (Power)
8	GND	Ground
9	XTAL 1	Crystal Oscillator
10	XTAL 2	Crystal Oscillator
11	PD5	Digital Pin (PWM)
12	PD6	Digital Pin (PWM)
13	PD7	Digital Pin
14	PB0	Digital Pin

15	PB1	Digital Pin (PWM)
16	PB2	Digital Pin (PWM)
17	PB3	Digital Pin (PWM)
18	PB4	Digital Pin
19	PB5	Digital Pin
20	AVCC	Positive voltage for ADC (power)
21	AREF	Reference Voltage
22	GND	Ground
23	PC0	Analog Input
24	PC1	Analog Input
25	PC2	Analog Input
26	PC3	Analog Input
27	PC4	Analog Input
28	PC5	Analog Input

**CHAPTER-4**  
**IR MODULES**

## CHAPTER-4

# IR MODULES

### 4.1 Introduction

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

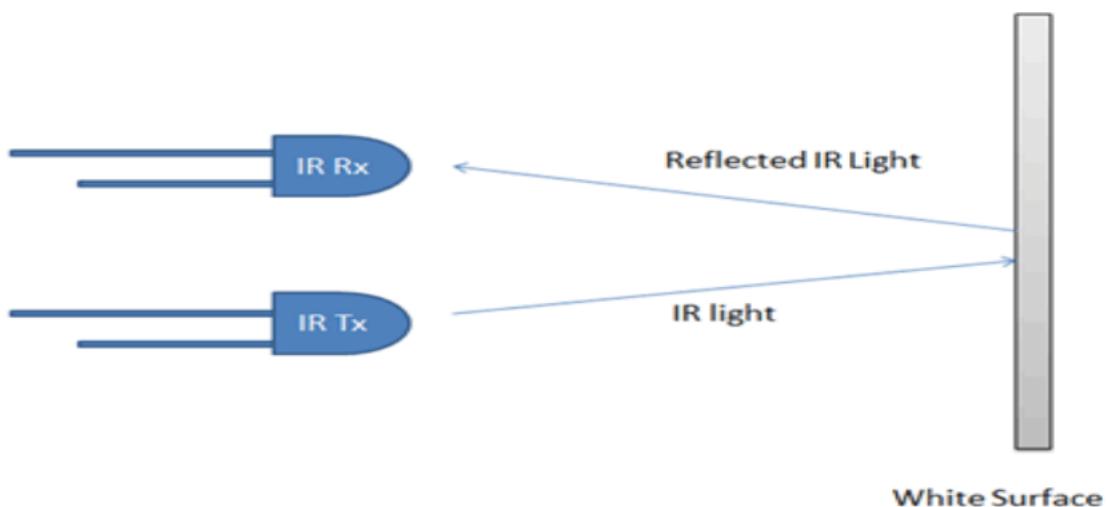


Figure 4.1: IR Transmitter And Receiver Working Principle

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. In the electromagnetic spectrum, the infrared portion is divided into three regions: near infrared region, mid infrared region and far infrared region. The wavelengths of these regions and their applications are shown below.

Near infrared region — 700 nm to 1400 nm — IR sensors, fiber optic

Mid infrared region — 1400 nm to 3000 nm — Heat sensing

Far infrared region — 3000 nm to 1 mm — Thermal imaging

## 4.2 IR Circuit Description

We have used two IR sensor modules which contain IR diodes, potentiometer, comparator(op-amp) and LED's. Potentiometer is used for setting reference voltage at comparators one terminal and IR sensors sense the object or person and provide a change in voltage at comparators second terminal. Then comparator compares both voltages and generates a digital signal at output. Here in this circuit we have used two comparators for two sensors LM358 is used as a comparator. LM358 has inbuilt two low noise op-amp.

In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit. Here an operational (op-amp) of LM 339 is used as comparator circuit

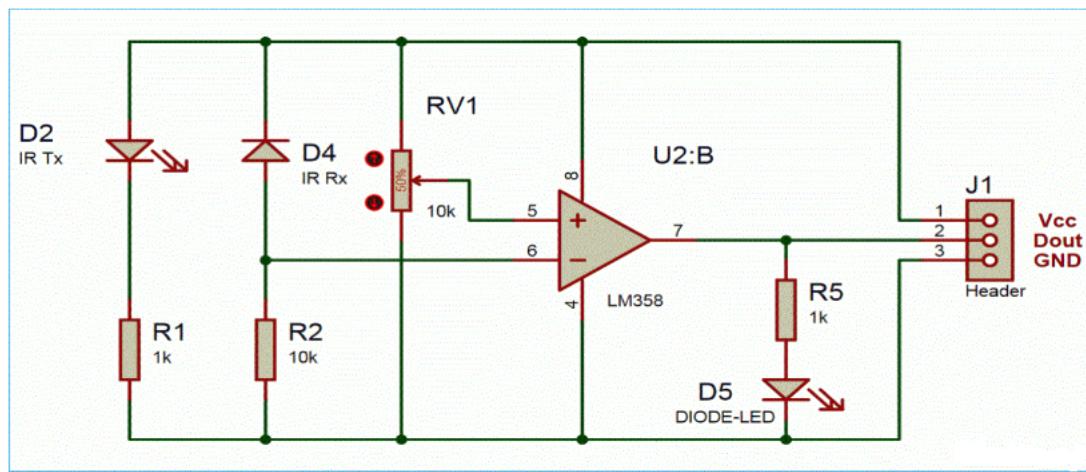


Figure 4.2: Circuit Schematic Of IR Module.

When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and the LED starts glowing. Resistor R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram. Read more about IR sensors.

#### 4.2.1 LM358

The LM358 op-amps are used in transducer amplifiers, dc gain blocks and all the conventional op-amp circuits which now can be more easily implemented in single power supply systems. For example, the LM358 op-amp can be directly operated off of the standard +5V power supply voltage which is used as a part of digital systems and will easily provide the required interface electronics without needing the extra  $\pm 15\text{V}$  power supplies.

It comes in an 8-pin DIP package is shown in below.

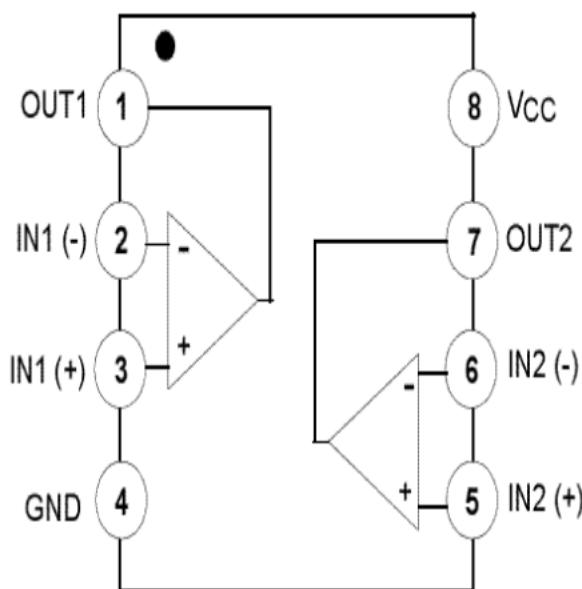


Figure 4.3: Packing Of LM358 IC

#### Pin Description:

- Pin 1 and 7 are outputs of comparator
- Pin 2 and 6 are inverting inputs
- Pin 3 and 5 are non-inverting inputs
- Pin 4 is ground (GND)
- Pin 8 is VCC+

#### Features:

- Internally frequency compensated for unity gain
- Large dc voltage gain: 100 DB

- Wide bandwidth
- Wide power supply range: single supply: 3V to 32V
- Very low supply current drain essentially independent of supply voltage
- Low input offset voltage: 2 mV
- Input common-mode voltage range includes ground
- Differential input voltage ranges equal to the power supply voltage
- Power drain suitable for battery operation

### **Advantages:**

- Two internally compensated op amps
- Eliminates need for dual supplies
- Allows direct sensing near GND and VOUT also goes to GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

#### **4.2.2 Working Of LM358:**

The inverting input of the comparator LM358 i.e., pin 2 is given to the fixed voltage i.e., in the ratio 47k:10k and the non-inverting input of the comparator is pulled down and is given to sensing terminal. When the resistance between the positive supply and the non-inverting input is high then resulting is the non-inverting input less than the inverting input making comparator output as logic low at pin1. And when the resistance falls making available a voltage to the non-inverting input higher than inverting input, so that the output of comparator is logic high.

### **4.3 IR LED**

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminum gallium arsenide. They, along with IR receivers, are commonly used as sensors.

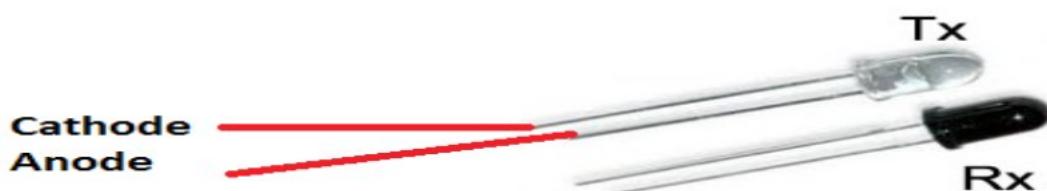


Figure 4.4 IR Transmitter And Receiver LED's

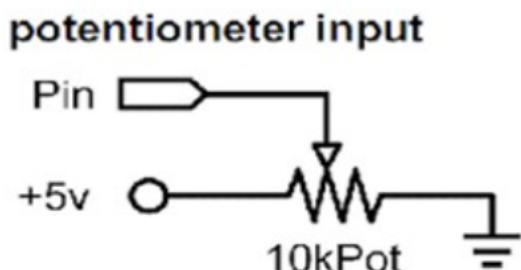
The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED. To overcome this problem, the camera on a cellphone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit.

#### 4.4 10k Potentiometer

Potentiometer (Pot) is another class of variable resistors and is used as an adjustable voltage divider. It consists of a fixed resistance track having connections at both ends and a sliding contact, called wiper, which moves along this track by turning the spindle. If only one of the connections and wiper are used, it behaves as a variable resistor or rheostat. In case wiper is not used, it will offer fixed resistance across the two connections. They are specified by their fixed value resistance.



(a)



(b)

Figure 4.5: Show 10k Potentiometer (a) And Its Circuit Schematic (b)

#### 4.5 IR Sensor Applications

IR sensors are used in various Sensor based projects and also in various electronic devices

- Radiation Thermometers
- Flame Monitors
- Moisture Analyzers
- Gas Analyzers
- Dispersive

- Non dispersive
- IR Imaging Device

## 4.6 Introduction to Relay Module

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like SPST, SPDT, DPDT etc., which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off. Get inner details about structure of a relay switch.

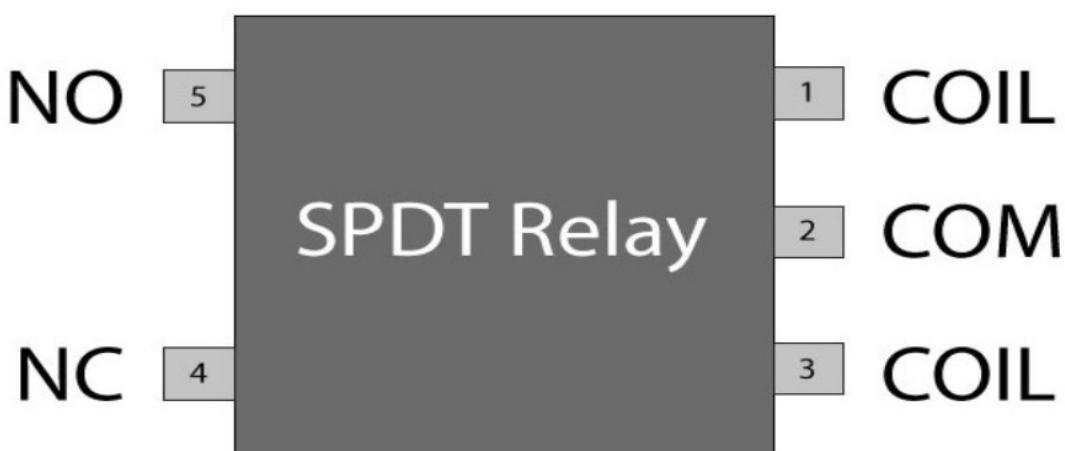


Figure 4.6 SPDT Relay IC

As soon as the coil current is off, the movable armature will be returned by a force back to its initial position. This force will be almost equal to half the strength of the magnetic force. This force is mainly provided by two factors. They are the spring and also gravity

## 4.7 Relay Working

The working of a relay can be better understood by explaining the following diagram given below. The diagram shows an inner section diagram of a relay. An iron core is surrounded by a control coil. As shown, the power source is given to the electromagnet through a control switch and through contacts to the load. When current starts flowing through the control coil, the electromagnet starts energizing and thus intensifies the magnetic field. Thus the upper contact arm starts to be attracted to the lower fixed arm and thus closes the contacts causing a short circuit for the power to the load. On the other hand, if the relay was already de-energized when the contacts were closed, then the contact move oppositely and make an open circuit

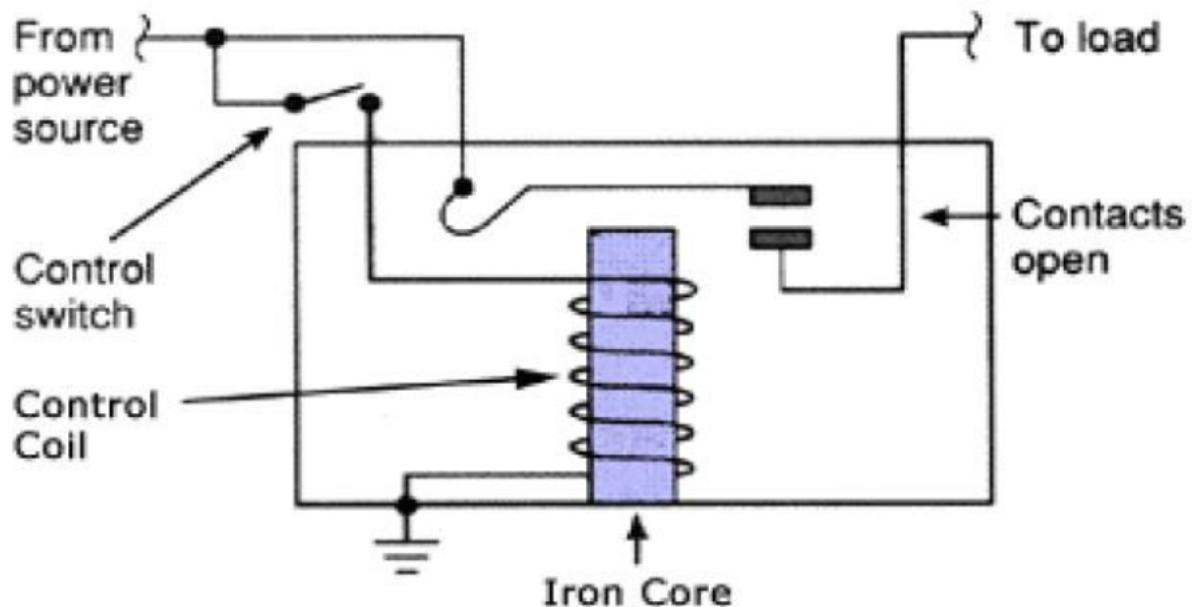


Figure 4.7: Inner Section Diagram of a Relay

Relays are mainly made for two basic operations. One is low voltage application and the other is high voltage. For low voltage applications, more preference will be given to reduce the noise of the whole circuit. For high voltage applications, they are mainly designed to reduce a phenomenon called arcing. Two terminals are used to give the input DC voltage also known as the operating voltage of the relay. Relays are available in different operating voltages like 6V, 12V, 24V

etc. The rest of the three terminals are used to connect the high voltage AC circuit. The terminals are called Common, Normally Open (NO) and Normally Closed (NC).

#### 4.7.1 Relay Basics

The basics for all the relays are the same. Take a look at a 4 – pin relay shown below. There are two colors shown. The green color represents the control circuit and the red color represents the load circuit. A small control coil is connected onto the control circuit. A switch is connected to the load. This switch is controlled by the coil in the control circuit. Now let us take the different steps that occur in a relay.

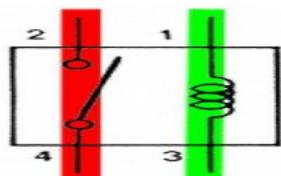


Figure 4.7.1: Relay Operation

#### 4.7.2 Energized Relay (ON)

As shown in the circuit, the current flowing through the coils represented by pins 1 and 3 causes a magnetic field to be aroused. This magnetic field causes the closing of the pins 2 and 4. Thus the switch plays an important role in the relay working. As it is a part of the load circuit, it is used to control an electrical circuit that is connected to it. Thus, when the relay is energized the current flow will be through the pins 2 and 4.

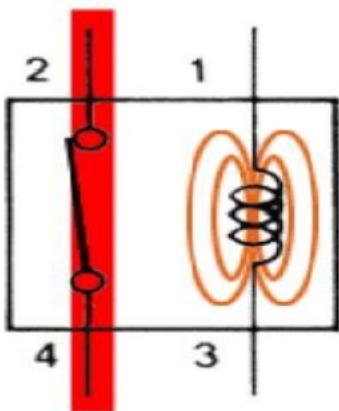


Figure 4.7.2: Energized Relay (ON)

#### 4.7.3 De-Energized Relay (OFF)

As soon as the current flow stops through pins 1 and 3, the switch opens and thus the open circuit prevents the current flow through pins 2 and 4. Thus the relay becomes de-energized and thus in off position.

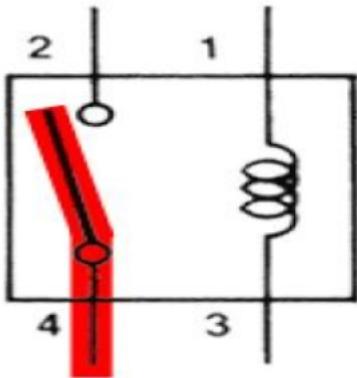


Figure 4.7.3: De-Energized Relay (OFF)

In simple, when a voltage is applied to pin 1, the electromagnet activates, causing a magnetic field to be developed, which goes on to close the pins 2 and 4 causing a closed circuit. When there is no voltage on pin 1, there will be no electromagnetic force and thus no magnetic field. Thus the switches remain open.

#### 4.7.4 Pole and Throw

Relays have the exact working of a switch. So, the same concept is also applied. A relay is said to switch one or more poles. Each pole has contacts that can be thrown in mainly three ways. They are

Normally Open Contact (NO) – NO contact is also called a make contact. It closes the circuit when the relay is activated. It disconnects the circuit when the relay is inactive.

Normally Closed Contact (NC) – NC contact is also known as break contact. This is opposite to the NO contact. When the relay is activated, the circuit disconnects. When the relay is deactivated, the circuit connects.

Change-over (CO) / Double-throw (DT) Contacts – This type of contacts is used to control two types of circuits.

They are used to control a NO contact and also a NC contact with a common terminal. According to their type they are called by the names break before make and make before break contacts.

Single Pole Single Throw (SPST) – This type of relay has a total of four terminals. Out of these two terminals can be connected or disconnected. The other two terminals are needed for the coil.

Single Pole Double Throw (SPDT) – This type of a relay has a total of five terminals. Out of these two are the coil terminals. A common terminal is also included which connects to either of two others.

Double Pole Single Throw (DPST) – This relay has a total of six terminals. These terminals are further divided into two pairs. Thus they can act as two SPST's which are actuated by a single coil. Double Pole Double Throw (DPDT) – This is the biggest of all. It has mainly eight relay terminals. Out of these two rows are designed to be change over terminals. They are designed to act as two SPDT relays which are actuated by a single coil.

## 5.5 Introduction to USB

Universal Serial Bus (USB) is a set of interface specifications for high speed wired communication between electronics systems peripherals and devices with or without PC/computer.

The USB was originally developed in 1995 by many of the industry leading companies like Intel, Compaq, Microsoft, Digital, IBM, and Northern Telecom.

The major goal of USB was to define an external expansion bus to add peripherals to a PC in easy and simple manner. The new external expansion architecture, highlights,

- PC host controller hardware and software
- Robust connectors and cable assemblies
- Peripheral friendly master-slave protocols
- Expandable through multi-port hubs.

USB offers users simple connectivity. It eliminates the mix of different connectors for different devices like printers, keyboards, mice, and other peripherals. That means USB-bus allows many peripherals to be connected using a single standardized interface socket. Another main advantage is that, in USB environment, DIP-switches are not necessary for setting peripheral addresses and IRQs. It supports all kinds of data, from slow mouse inputs to digitized audio and compressed videos also allows hot swapping. The "hot-swapping" means that the devices can be plugged and unplugged without rebooting the computer or turning off the device. That means, when plugged in, everything configures automatically. So the user needs not worry about terminations, terms such as IRQs and port addresses, or rebooting the computer. Once the user is finished, they can simply unplug the cable out, the host will detect its absence and automatically unload the driver. This makes the USB a plug-and-play interface between a computer and add-on devices.

## 5.6 Serial Communication

Arduino use the USB port to simulate a serial port so we have to use a USB cable to connect the Arduino USB port to computer USB port.

Serial communication on pins TX/RX uses TTL logic levels (5V or 3.3V depending on the board). Don't connect these pins directly to an RS232 serial port; they operate at +/- 12V and can damage your Arduino board.

Serial is used for communication between the Arduino board and a computer or other devices. All Arduino boards have at least one serial port (also known as a UART or USART): Serial. It communicates on digital pins 0 (RX) and 1 (TX) as well as with the computer via USB

This board converts a USB connection into 5 volt TX and RX that you can connect straight to the Arduino Mini or other microcontrollers, allowing them to talk to the computer. It is based on the FT232RL chip from FTDI (drivers are included with the Arduino software).

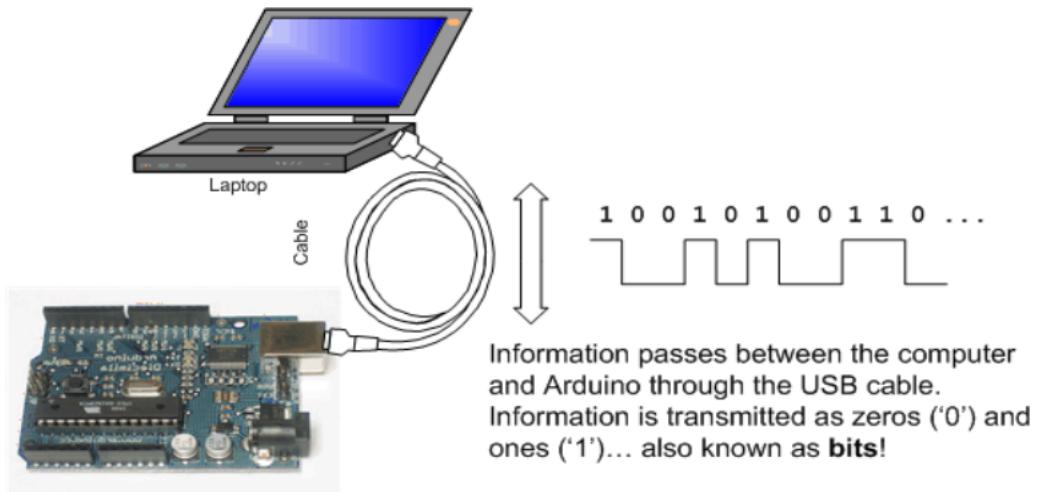


Figure 5.5: Serial Communication Between Board and Laptop

Thus, if you use these functions, you cannot also use pins 0 and 1 for digital input or output. You can use the Arduino environment's built-in serial monitor to communicate with an Arduino board. Click the serial monitor button in the toolbar and select the same baud rate used in the call to begin ()�.

Serial communication works on 1s and 0s. Also known as binary, the Arduino sends these 1s and 0s (bits) one by one, or Serially. These bits are sent in the form of Highs (1) and Lows (0). These bits' form together and turn into bytes. A byte is composed of 8 bits.

Similarly:

100 = 4,  
1000 = 8,  
10000 = 16,  
100000 = 32,  
1000000 = 64  
10000000 = 128.

## 5.7 Arduino Function for Communication

In this project we use only the following function for communication

**Write ()**: -Writes binary data to the serial port. This data is sent as a byte or series of bytes; to send the characters representing the digits of a number use the `print()` function instead.

**Print ()**: -Prints data to the serial port as human-readable ASCII text. This command can take many forms. Numbers are printed using an ASCII character for each digit. Floats are similarly printed as ASCII digits, defaulting to two decimal places. Bytes are sent as a single character

**read ()**: -Reads incoming serial data. `read()` inherits from the `Stream` utility class.

## **Chapter 6**

### **EXPERIMENTAL RESULTS**

## Chapter 6

### EXPERIMENTAL RESULTS

This chapter contains the results conducted and discusses the obtained results. The proposed approach has been evaluated on the results in the below.

#### 6.1 Memory Use Age by Arduino

Sketch uses 3,238 bytes (10%) of program storage space. Maximum is 32,256 bytes.

Global variables use 121 bytes (5%) of dynamic memory, leaving 1,927 bytes for local variables. Maximum is 2,048 bytes.



The screenshot shows the Arduino IDE interface. The top bar is red with the text "sketch\_aug26a | Arduino". Below it is a toolbar with icons for file operations. The main area is a code editor with the following content:

```

File Edit Sketch Tools Help
sketch_aug26a §
sketch_aug26a.ino

lcd.begin(16,2);
lcd.print("WELCOME EVERYONE");
lcd.setCursor(0,1);
lcd.print("ROOM IS EMPTY");
delay(2000);
pinMode(in, INPUT);
pinMode(out, INPUT);
pinMode(re1,OUTPUT);
pinMode(re2,OUTPUT);
pinMode(re3,OUTPUT);
pinMode(re4,OUTPUT);
lcd.clear();
lcd.print("Person In Room:");
lcd.setCursor(0,1);
lcd.print(count);

}

void loop()
{
    if(digitalRead(in))
        IN();
    if(digitalRead(out))
        OUT();

    if(count<=0)
    {
}

```

At the bottom of the code editor, there is a message: "Done compiling."

Below the code editor, the status bar displays memory usage statistics:

Sketch uses 3,238 bytes (10%) of program storage space. Maximum is 32,256 bytes.  
 Global variables use 121 bytes (5%) of dynamic memory, leaving 1,927 bytes for local variables. Maximum is 2,048 bytes.

Figure 6.1: Figure Showing the Memory Usage in Arduino

The program is stored in DRAM in the Arduino by taking 32385 bytes of the total memory space that is 10% of 32256 bytes for the execution of the program. The program is store until

another program is dumped into the board. The program can be rested by pressing the reset button on the board

The notes on this page are for all boards except the Due, which has a different architecture

There are three pools of memory in the microcontroller used on AVR-based Arduino boards:

- Flash memory (program space), is where the Arduino sketch is stored.
- SRAM (static random access memory) is where the sketch creates and manipulates variables when it runs.
- EEPROM is memory space that programmers can use to store long-term information.
- Flash memory and EEPROM memory are non-volatile (the information persists after the power is turned off). SRAM is volatile and will be lost when the power is cycled.
- The ATmega328 chip found on the Uno has the following amounts of memory:

### **6.3 Person Entering into Room Incremented and Displayed**

Here all the four relays are high and number of persons are increased and the appliance can be **ON** The connected appliance are switched on. The appliances get **OFF** if persons leave the Room shown below

Figure 6.2: Assuming A Person Entering into Room as an Obstacle to The IR Module

### **6.4 Person Leaving into Room Incremented and Displayed**

Here the relay and the appliances gets turn off by decrementing the number of persons in the room automatically by sensing from IR modules.

Figure 6.3 Assuming A Person Leaving from Room as an Obstacle to The IR Module

The maximum number of person entering and leaving from the room is limited by 32767 and maximum number of appliance controlled is 4

## **Chapter 7**

### **CONCLUSION AND PROPOSED FUTURE SCOPE**

## **Chapter 7**

# **CONCLUSION AND PROPOSED FUTURE SCOPE**

### **7.1 CONCLUSION**

The theme of the project when merged with certain established technologies can be quite effective in number of countries like Germany, Japan and France etc., which control the train. The project is useful in developing countries and this project has a bright future. This project helps us to control the light, fan, and home appliance automatically and counts the number of persons entering and leaving the room by modifying this circuit and using four relays we can achieve a task of opening and closing the door and can be implemented to every high voltage controllable appliance which has to automated by sensing.

### **7.2 Future Development**

We can send this data to a remote location using mobile or internet. Voice alarm system can be added to indicate that room is full and persons can't enter inside. We can increase the maximum number of persons that can be counted by implementing the EEPROM in Arduino. We can add a Bluetooth module for communication This can be basic for home automation system Making android app and connecting and operation can be done Using for INTERNET OF THINGS(IOT) The board may be extended and module can be upgraded. By using this circuit and proper power supply we can implement various applications such as fans, tube lights, etc. By modifying this circuit and using two relays we can achieve a task of opening and closing the door.



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