NEW HORIZON
COLLEGE OF ENGINEERING

AUTONOMOUS COLLEGE Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade

AUTOMATIC CAR PARKING SYSTEM

A MINI PROJECT

REPORT

Submitted by

Arnab Sangam

Abhishek Singh Rathore

Dhamini.S

Apoorva.R

Chandana.N

In partial fulfilment for the award of

the degree of

Bachelor of Engineering

In

ELECTRONICS AND COMMUNICATION ENGINEERING

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Certificate

This is to certify that the mini project work titled

AUTOMATIC CAR PARKING SYSTEM

Submitted in partial fulfilment of the degree of Bachelor of Engineering

in Electronic and Communication Engineering

Submitted by

Arnab Sangam(1NH18EC013)

Abhishek Singh Rathore(1NH18EC136)

Dhamini.S(1NH18EC029)

Apoorva.R(1NH18EC009)

Chandana.N(1NH17EC917)

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1._____ _____

2._____ _____

ABSTRACT

This project has shown the concept of an automatic car parking system. Everything in the modern world is going automatic, we have built a system which can automatically sense the entry and exit of car through the gate and then display the number of car through the gate and then display the number of cars in the parking slot. This automated car parking system reduced the time taken to check the space for the vehicles by displaying the available spaces for parking on a LCD displayer by using infra red sensors installed at the entrance and exit. This project is developed using 89c52 microcontroller.

Keywords: automatic car parking system, LCD displayer, microcontroller, infrared sensors.

ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

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Arnab Sangam(1NH18EC013)

Abhishek Singh Rathore(1NH18CVOO3)

Dhamini.S(1NH18EC029)

Apoorva.R(1NH18EC009)

Chandana.N(1NH17EC017)

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CHAPTER 01

INTRODUCTION

A major problem faced by many drivers in a larger car park is to find an unoccupied parking space easily as we know cars on the increases every year. On the other hand, it is more difficult to find the parking space during peak time and holidays because this is the time people want to release their stress and to spend time with family. Gone are the days when we were seeing only a few numbers of vehicles on road. Out of them, the number of cars can be equated to almost to a very small number. But with increasing urbanization and population, in the last few decades, there has been a considerable and enormous rise in the number of vehicles.

Conventionally, car parking systems do not have any intelligent monitoring system. Parking lots are monitored by human beings. All vehicles enter into the parking and waste time searching for a parking slot. Sometimes it creates a blockage.

The condition becomes worse when there are multiple parking lanes and each lane has multiple parking slots. Many parking models have been developed in last few decades but the models still cannot solve the parking problems.

As many multifunctional cities are suffering from lack of available parking spots, it was necessary to create an automated car parking system that can counter such a daily basis problem to make life easier.

There are many advantages that a automatic car parking system provides. Those are:

1. This project can be used for the parking system in any residential, showrooms, shopping mall, multiplex., universities etc.
2. Quick and efficient method.
3. It is highly feasible for extremely small sites that are unable to accommodate a conventional ramped parking structure.
4. There is no need for driving while looking for an available space.

CHAPTER 02

LITERATURE SURVEY

Many cities worldwide are looking forward to becoming smart. One of the most popular use cases in smart cities is the implementation of smart parking solutions, as they allow people to optimize time, reduce fuel consumption, and carbon dioxide emissions. Automatic parking solutions have a defined architecture with particular components (sensors, communication protocols, and software solutions). Although there are only three components that compose a Automatic parking solution, it is important to mention that each component has many types that can be used in the deployment of these solutions.

Automatic parking is popular among smart cities, as described in articles of the industry . These papers highlight that smart parking reduces congestion, increases revenue, has a pricing systemthat is adjusted based on the demand for availability on-peak hours, and reinforces traffic laws byusing cameras to detect violators among others. Parking space search is one of the most important

activities in a city, reaching up to 31% of ground usage in big cities On average, a vehicle is moving 10% of the time, and the rest of the time it remains stopped either temporarily or permanently.

In cities with high vehicular congestion, finding an available parking spot can be a waste of time and resources. The authors found that, in areas such as Los Angeles, vehicles looking for parkingspots produced over 730 tons of carbon dioxide and burnt 47,000 gallons of gas. The inconveniencecreated by the need for finding a parking slot causes some drivers to park in unauthorized zones, plusincreasing vehicular congestion and carbon dioxide emissions. For instance, if drivers had access to adatabase containing information about parking spots in real-time, there would be more opportunitiesfor selecting an appropriate route to a desired parking slot.

Moreover, the authorsperform an extensive review of several works that implement smart parking solutions. They have considered a 16-year period for the analysis. Authors have classifiedliterature based on the categorization of functionalities getting three majors: Information Collection(overview of sensing techniques), System Deployment (software system exploitation) and ServiceDissemination (relationship between information and social features). Although they have extensively

classified selected papers according to specific features and categories, they could have complementedtheir study by identifying a trend of usage for future use. The time threshold is very extensive andconsidered obsolete technology

- **Anthony Mwabaze-** represents Intelligent Parking System based onwireless sensor network technology. using (CCTVs) which will be used as a sensing node to identify vacant parking space. The captured image will be processed through the AVR Microcontroller and the processed data will be transmitted via ZigBee to a central computer to store and update the occupancy status of available parking space vacancies in the database.
- **Shitaln B. Dhote-** proposed the concept of micro controller-based carparking system in which micro controller senses the moment of cars andopen the gate is vacancy available. And security is provided by using RFID module through RFID card and displays the information to LCD. IR sensor identify entry and exit of car.

CHAPTER 03

PROPOSED METHODOLOGY

Blockdiagram

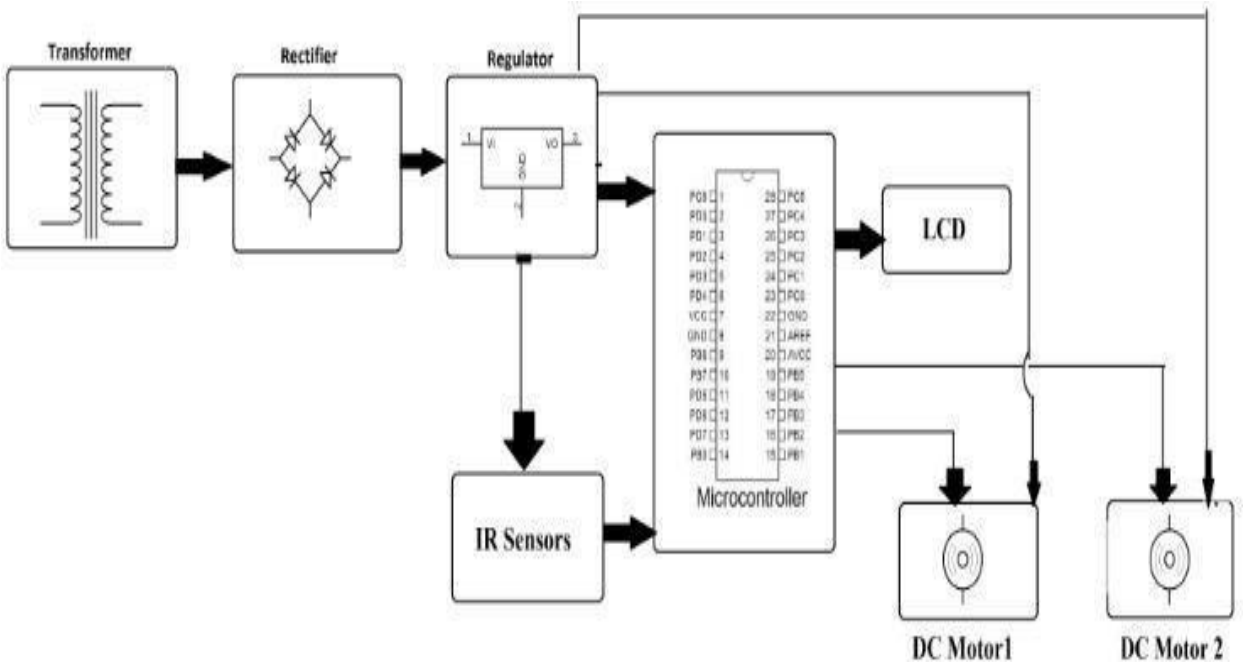


Fig1- block diagram

Components

Microcontroller

8051 Microcontroller is available in a variety of packages like 40 pin DIP or 44 lead PLCC and TQFP. The pin orientation of an 8051 Microcontroller may change with the package but the Pin Configuration is same. This basic circuit of 8051 microcontroller is the minimal interface required for it to work. The basic circuit includes a Reset Circuit, the oscillator circuit and power supply. Let us discuss a little bit deeper about this basic circuit of 8051 Microcontroller.

LCD

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIY and circuits. The 16×2 translates

o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

IR Sensors

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real-time.

DC Motors

In a series wound DC motor, reversing either the field winding leads or the rotor winding leads will reverse the direction of the motor. However, simply reversing the leads from the power supply will have no effect on the direction of rotation since it is equivalent to reversing the current through both the individual windings - in effect a double reversal. In other words the motor will turn in the same direction even though the current through the series windings is reversed. This means that the motor can run on alternating current as well as direct current since the direction of rotation is independent of the direction of the current through the series windings

Rectifier

A Bridge rectifier is an Alternating Current to Direct Current convertor that rectifies mains AC input to DC output. Bridge Rectifiers are widely used in power supplies that provide necessary DC voltage for the electronic components or devices. They can be constructed with four or more diodes or any other controlled solid state switches.

Transformer

The **working principle of a transformer** is very simple. Mutual induction between two or more windings allows for electrical energy to be transferred between circuits.

A [Automatic Car Parking System]

Circuit Diagram

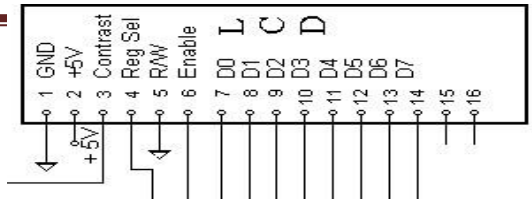


Fig2- circuit diagram

Explanation

- The reverse indicator light supply is given to the 7805 regulator to give 5v to the rest of the circuit. The diode D6 is used to eliminate the reverse current and wrong supply polarity.
- When the car is driving in reverse the car battery will provide DC supply the reverse light indicator at the back of the car when this supply came to the reverse light indicator the circuit will have the power supply will regulate the DC voltage to 5V and give to the IR Sensors through the transistor with 20 KHz modulating frequency of the LM567 available at Pin5. The resistor R1 will resists the IR senor current. At this point the pin8 of is high which will enable the5 timer operating in astable multivibrator mode. The output of the timer is enabled which can be assured by the LED (blinking) and also buzzer will beeps at determined rate given by the resistors R6, R7 and capacitor C7. The timer output also is given to the lamp through a transistor. The lamp will blink as a warning signal because of the PWM signal generated by the timer, transistor will work as a switch and resistor R10 will limit the current. This condition is maintained until the

  20 KHz signal is received by the pin3 of the diagram.
- The above condition is when there is no obstacle in the path of the car while taking reverse. If there is a obstacle the IR beam will radiate back to the IR sensor and the 20KHz modulated signal is given to the pin3 of through photo transistor, at this point the pin8 of the is turned to low and also gets locked to detect the 20Khz signal. By this the is turned low and disabled by this the led will remain lighting and buzzer makes the continuous sound to alert the driver.

- This section describes how to generate +5V & +12 V Power Supply.

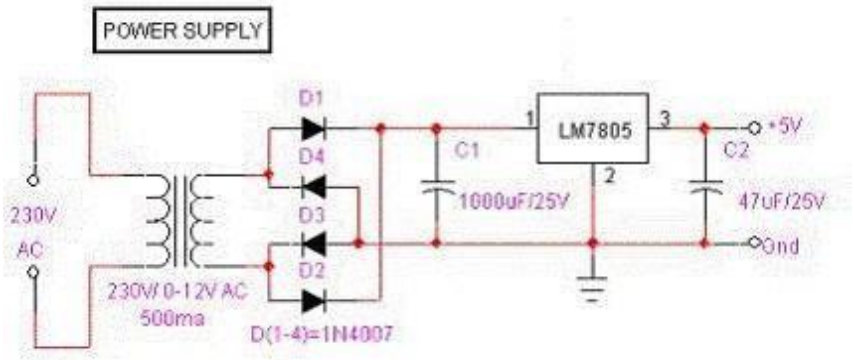


Fig.3.2 Power supply Module

Transformer:

A 0-12V/1A transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection.

Types of Transformer:

1. Core type Transformer
2. Shell type Transformer
3. Berry type Transformer

2) Voltage Regulator (LM7805):

These voltage regulators are monolithic integrated circuits designed as fixed–voltage regulators for a wide variety of applications including local, on–card regulation. These regulators employ internal current limiting, thermal shutdown, and safe–area compensation. With adequate heat sinking they can deliver output currents in excess of 1.0 A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

Transformer selection: we require 12V for min input for IC 7805

= Drop across IC 7805 + Required Output voltage

= 3 V+ 5V

= 8 V

So at Input of 7805 we required 8 V with margin

Consider drop across diode 0.7V so 2 diode conducts drop is 1.4 V

= 1.4 V +8 V

= 9.4 V

So at secondary we required 10 V

3) Rectifier:

The secondary is connected to the Rectifier to convert 12V AC to 12V DC voltage. Full wave rectification converts both polarities of the input waveforms to DC and is more efficient .However, in a circuit with a non-center tapped transformer, four rectifiers are required instead of the one needed for half wave rectification. This is due to each output polarity requiring two rectifiers each, forexample, one for when AC terminal ‘X’ is positive and one for when AC terminal ‘Y’ is positive. The other DC output requires exactly the same, resulting in four individual junctions. Four rectifiers arranged this way are called a bridge rectifier.

A full wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output by reversing the negative (or positive) portions of the alternating current waveform .The positive (negative) portions thus combine with the reversed negative (positive) portions to produce an entirely positive (negative) voltage/current waveform. For single phase AC is center tapped,and then two diodes back to back (i.e. anode to anode or cathode to cathode) form a full wave rectifier.

Rectifier designing 1N4007 diodes are used to build circuit of full wave bridge rectifier.

- Surge overloads rating - 50 amperes peak
- Ideal for printed circuit board
- Reliable low cost construction utilizing molded plastic technique results in inexpensive product
- Mounting Position: Any

For diode design:-

PIV = Vm

Vm = E0 max + 2 Vf

= 10.7 + 1.4 V

= 12.1 V I0

= Il/2

= 116.2 mA/ 2

= 58.1 mA

Peak repetitive current

Ifm = [Il (t1+t2)]/t2

T2 = time for 90° - time for θ1

= 5ms - 3.4ms

=1.2ms

Ifm = 116.2mA (8.6 ms+1.2ms) /1.2ms

= 833mA

From above specification diode 1N4007 is selected

4) Filter:

Filter capacitor is used in order to remove ripples from the pulsating DC and convert it to unregulated DC. A capacitor is an electrical device that can store energy in the electric field between a pair of closely spaced conductors (called 'plates'). When voltage is applied to the capacitor, electric charges of equal

magnitude, but opposite polarity, build up on the plate. Capacitors are used in electrical circuits as energy storage devices. They can also be used to differentiate between high frequency and low frequency signals and this makes them useful in electronic filters. These small deviations from the ideal behavior of the device can become significant when it is operating under certain conditions, i.e. high frequency, high current, or temperature extremes.

PIV =100V

I = 1A

For filter capacitor design:- C=

(I1 * t1)/Vr

Vr= ripple voltage

Il = load current

T1= time during which the capacitor being discharge by load current

Vr = ripple voltage 10% of output voltage

Vr = 1.0 V

Frequency 50 HZ

T1 = 1/50 = 20 ms

T for 360° = 20ms

For 180°= 10ms

For 60°= 20ms * (60°/360)

= 3.4ms

For bridge :-

T1 = [time for 90° + time for θ1]

= 5ms + 3.4ms

= 8.4ms

I1 = load current supplied to various IC

I1 = current required for LCD + o/p current of AT89s51 +

o/p current of max232 + current required for LM35 +

+ current required for Light sensor

= 3mA + 40mA + 8mA + 0.060mA + 22mA + 40mA

= 113.06Ma

C = I1 * T1/ Vr

= 113.06 * 8.4 * 10^-6 / 1

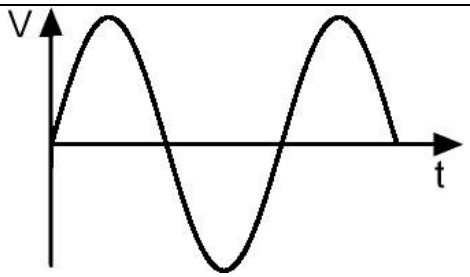
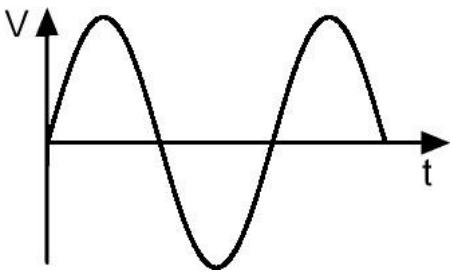
= 949.704 μF

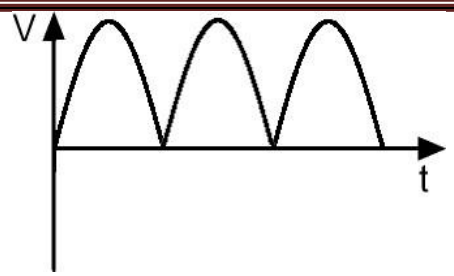
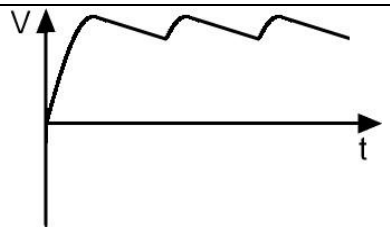
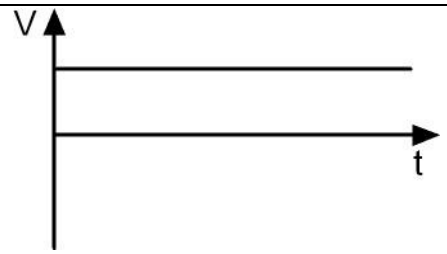
Thus this 949.704 µF value can be approximated to 1000 µF. Thus we will use 1000 µF capacitorbefore IC 7805, which is used for improving Frequency Response.

Fixed voltage regulator IC 7805 produces +5V regulated output voltage with respect to the ground.

- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection Internal Short Circuit Current Limiting
- Output Transistor Safe–Area Compensation
- Output Voltage Offered in 2% and 4% Tolerance
- Transistor Packages

Waveforms for Power supply module

	We get 230 volts A.C. supply from the power grid (Electricity board). The voltage amplitude is of 230 volts and the frequency is 50 Hz.
	By using a Step down tranformer we are lowering the 230 volt AC supply to a lower value (e.g., 15 V) using a transformer. This lower voltage is still AC. The voltage amplitude is reduced but the frequency is same, which is 50 Hz

	Then rectification is done by a set of 4 diodes (Bridge rectifier), this rectifier transforms this AC voltage into pulsating voltage. The negative half cycles of transformer output are converted to positive half cycles.
	The next step is filtering, which is done by an electrolytic capacitor of 100microF, this filter capacitor transforms this pulsating voltage into almost DC. This is having ripples.
	The voltage obtained after the capacitor oscillates a little bit (this oscillation is called ripple), so a voltage regulating stage is necessary, done by a voltage regulator IC. After this stage the output is true DC voltage

IC 555 astable mode design calculations:

Since ADC0808 requires a clock, IC 555 is used in astable mode to generate pulses of 500kHz.

In astable mode output frequency is obtained as, f = 1.44 / (RA+2RB)C

Here we have chosen C=0.001 microF,

RA=15kOhms,hence

RB=11.4kOhm. Since resistor of value 11.4kOhm is not available we have used a potentiometer of 10k along with a constant resistor of 4.7k and adjusted the pot to a value of 6.7 kOhm.

Working

System demonstrates a fully automated car parking system. For this purpose we use IR sensors along with motors, LCD display and microcontroller for controlling the system working.

Our system consists of an LCD display that is used to demonstrate as a parking gate entrance display. The display displays empty slots to new car arriving at gate of parking area. If no parking space is available the system does not open the gate and displays parking full.

If slot is empty system allows car to enter the lot and displays empty slots where user can park. To detect vehicle slot occupancy the system uses IR sensors. Also system uses IR sensors to detect vehicles arriving at parking gates,to open the gates automatically on vehicle arrival. The microcontroller is used to facilitate the working of the entire system.

Flow Chart

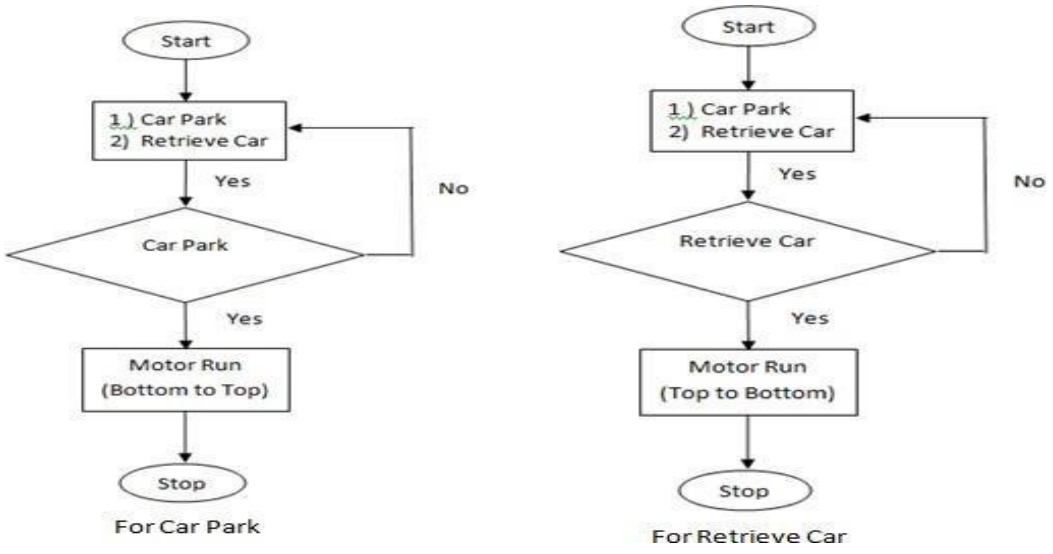


Fig3- flow chart

A [Automatic Car Parking System]

- Microcontroller

- LCD

- DC motor

- IR sensor

- Transformer

- Rectifier

Block diagram of microcontroller


External
Interrupt
Counter
Input
Interrupts
4k
128
Timer1

Fig3- block diagram of microcontroller

Central Processor Unit (CPU)

As we know that the CPU is the brain of any pessing device of the microcotroller. It monitors and controls all operations that are perfomed on the Microcontroller units. The User has no control over the work of the CPU directly . It reads program written in ROM memory and executes them and do the expected task of that application

Interrupts

Interrupt is a subroutine call that interrupts of the microcontrollers main operations or work and causes it to execute any other program, which is more important at the time of operation. The feature of Interrupt is very useful as it helps in case of emergency operations. An Interrupts gives us a mechanism to put on hold the ongoing operations.

Memory

Microcontroller requires a program which is a collection of instructions. This program tells microcontroller to do specific tasks. These programs require a memory on which these can be saved and read by Microcontroller to perform specific operations of a particular task. The memory which is used to store the is known as code memory or Program memory of applications. It is known as ROM memory of microcontroller also requires a memory to store data or operands temporarily of the micro controller. The data memory of the 8051 is used to store data temporarily for operation is known RAM memory. 8051 microcontroller has 4K of code memory or program memory, that has 4KB ROM and also 128 bytes of data memory of RAM.

BUS

Basically Bus is a collection of wires which work as a communication channel or medium for transfer of Data. These buses consists of 8, 16 or more wires of the microcontroller. Thus, these can carry 8 bits,16 bits simultaneously. Hire two types of buses that are shown in below

- Address Bus
- Data Bus

Address Bus: Microcontroller 8051 has a 16 bit address bus for transferring the data. It is used to address memory locations and to transfer the address from CPU to Memory of the microcontroller. It has four addressing modes that are

- Immediate addressing modes.

- Bank address (or) Register addressing mode.
- Direct Addressing mode.
- Register indirect addressing mode.

Data Bus: Microcontroller 8051 has 8 bits of the data bus, which is used to carry data of particular applications.

Oscillator

we know that the microcontroller is a device, therefore it requires clock pulses for its operation of microcontroller applications. microcontroller 8051 has an on-chip oscillator which works as a clock source for Central Processing Unit of the microcontroller. The output pulses of oscillator are stable. it enables synchronized work of all parts of the 8051 .

Input-Output Port

microcontroller is used systems to control the operation of machines in the microcontroller. Therefore, to connect it to other machines, devices or peripherals we require I/O interfacing ports in the microcontroller interface. Microcontroller has 4 input, output ports to connect it to the other

Timers-Counters

8051 microcontroller has two 16 bit timers and counters. These counters are again divided into a 8 bit register. The timers are used for measurement of intervals to determine the pulse width of pulses.

Pin diagram

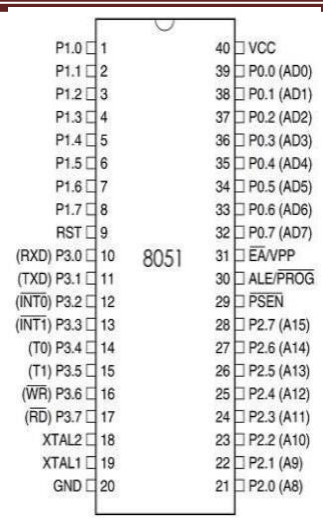


Fig4- pin diagram of microcontroller

Since it is a 40 – pin DIP IC, each side contains 20 Pins. We have also seen that there other packages of 8051 like the 44 – Lead PLCC and the 44 – Lead TQFP. The following image shows the 8051 Microcontroller Pin Diagram for these packages specifically

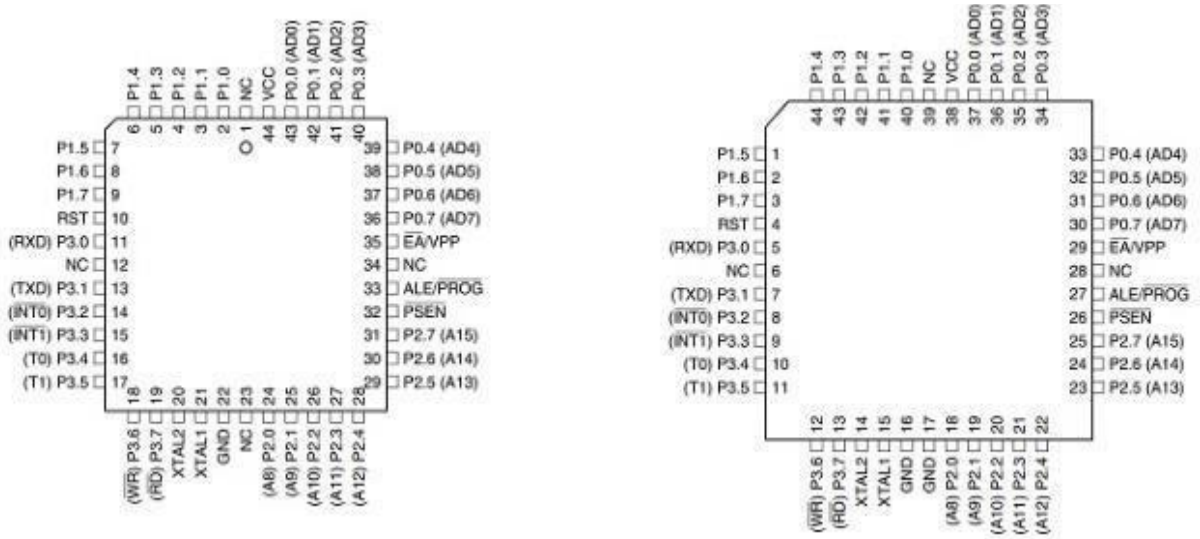


Fig5- structure of microcontroller

Pin diagram description-

Pins 1 – 8: Pins 1 to 8 are the PORT 1 Pins of 8051. PORT 1 Pins consists of 8 – bit bidirectional Input / Output Port with internal pull – up resistors. In older 8051 Microcontrollers, PORT 1 doesn't serve any additional purpose but just 8 – bit I/O PORT.

Pin 9: Pin 9 is the Reset Input Pin. It is an active HIGH Pin i.e. if the RST Pin is HIGH for a minimum of two machine cycles, the microcontroller will be reset. During this time, the oscillator must be running.***Pins 10 – 17 :*** Pins 10 to 17 form the PORT 3 pins of the 8051 Microcontroller. PORT 3 also acts as a bidirectional Input / Output PORT with internal pull-ups. Additionally, all the PORT 3 Pins have special functions. The following table gives the details of the additional functions of PORT 3 Pins.

Pins 18 & 19: Pins 18 and 19 i.e. XTAL 2 and XTAL 1 are the pins for connecting external oscillator..
Pin 20 : Pin 20 is the Ground Pin of the 8051 Microcontroller. It represents 0V and is connected

to the negative terminal of the Power Supply.

Pins 21 – 28 : These are the PORT 2 Pins of the 8051 Microcontroller. PORT 2 is also a Bidirectional Port i.e. all the PORT 2 pins act as Input or Output. Additionally, when external memory is interfaced, PORT 2 pins act as the higher order address byte. PORT 2 Pins have internal pull-ups.

Pin 29 : Pin 29 is the Program Store Enable Pin (PSEN). Using this pins, external Program Memory can be read.

Pin 30 : Pin 30 is the Address Latch Enable Pin. Using this Pins, external address can be separated from data

Pin 31 : Pin 31 is the External Access Enable Pin i.e. allows external Program Memory. Code from external program memory can be fetched only if this pin is LOW. For normal operations, this pins is pulled HIGH.

Pins 32 – 39 : Pins 32 to 39 are PORT 0 Pins. They are also bidirectional Input / Output Pins but without any internal pull-ups. Hence, we need external pull-ups in order to use PORT 0 pins as I/O PORT.

Pin 40 : Pin 40 is the power supply pin to which the supply voltage is given (+5V).

Microcontroller basic diagram

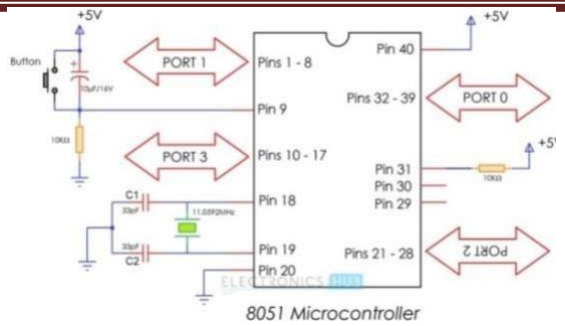


Fig6-basic diagram

This basic circuit of 8051 microcontroller is the minimal interface required for it to work. The basic circuit includes a Reset Circuit. Let us discuss a little bit deeper about this basic circuit of 8051 Microcontroller.

First is the power supply. Pins 40 and 20 of the 8051 Microcontroller are connected to +5V and GND respectively.

A logic HIGH on Reset Pin for a minimum of two machine cycle will reset the 8051 Microcontroller. The reset circuit of the 8051 Microcontroller consists of a capacitor, a resistor and a push button and this type of reset circuit provides a Manual Reset Option. If you remove the push button, then the reset circuit becomes a Power-On Reset Circuit.

The next part of the basic circuit of the 8051 Microcontroller is the Oscillator Circuit or the Clock Circuit. A Quartz Crystal Oscillator is connected across pins i.e. Pins 19 and 18. The capacitors C1 and C2 can be selected in the range of 20pF to 40pF.

As mentioned in the 8051 Microcontroller Pin Description, PORTS 1, 2 and 3, all have internal pull – ups and hence can be directly used as Bidirectional I/O Ports. But, we need to add external Pull – ups for PORT 0 Pins in order to use it as an I/O Port.

a 1KΩ Resistor Pack of 8 Resistors is used as a Pull – up for the PORT 0 of the 8051 Microcontroller.

Application of microcontroller

- Light sensing and controlling devices
- Temperature sensing and controlling devices
- Fire detections and safety devices
- Automobile applications

- Defense applications

LCD

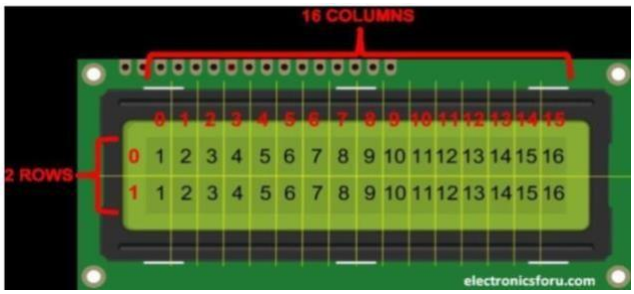


Fig7- LCD

Block diagram of lcd

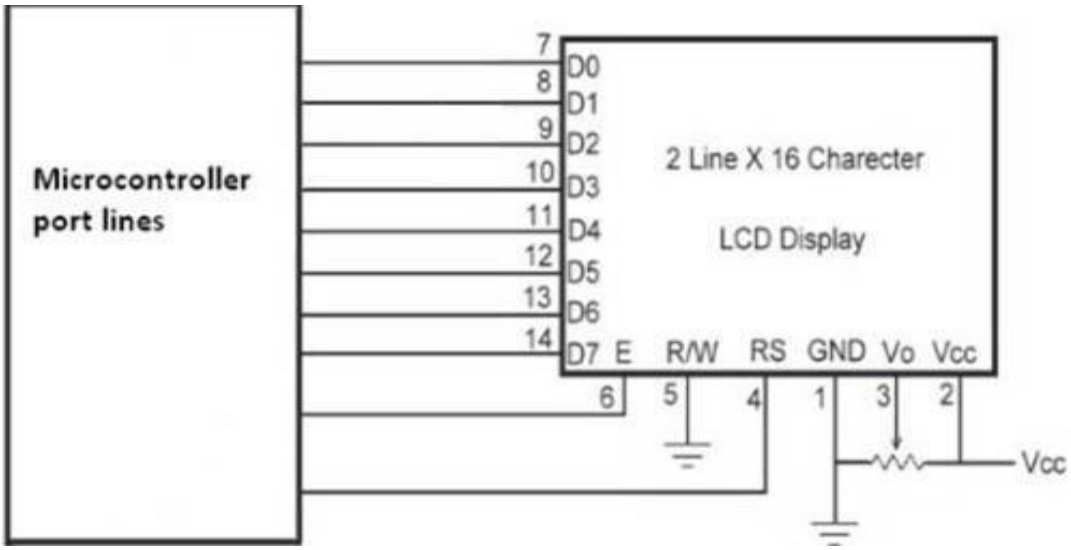


Fig8-block diagram

LCD is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diodeand gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

Circuit Diagram of LCD

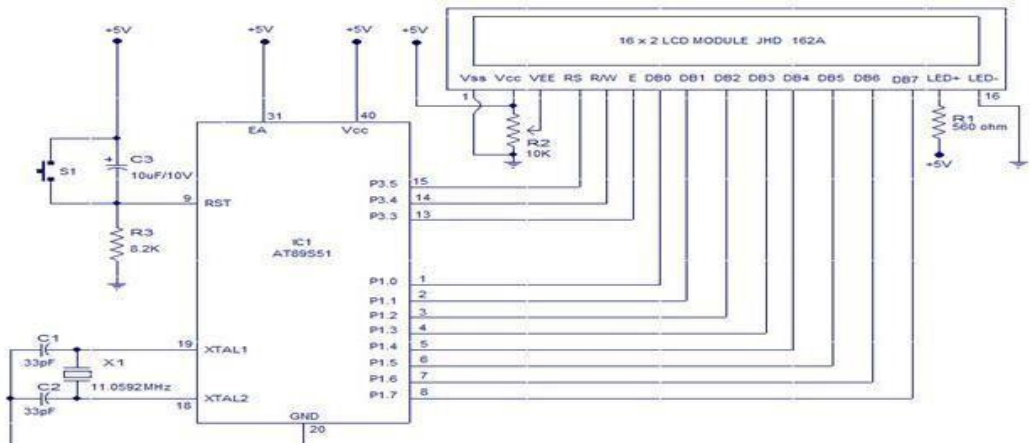


Fig 9- circuit diagram

Working of LCD

A display is made up of millions of pixels. The quality of a display commonly refers to the number of pixels; for example, a 4K display is made up of 3840 x2160 or 4096x2160 pixels. A pixel is made up of three sub-pixels; a red, blue an called RGB. When the sub-pixels in a pixel change color combinations, a different color can be produced. With all the pixels on a display working together, the display can make millions of different colors, a picture is created.

The way a pixel is controlled is different in each type of display; and newer types of displays all control pixels differently. LCDs are lit by a backlight, and pixels are switched on and off electronically while using liquid crystals to rotate polarized light. A polarizing glass filter is placed in front and behind all the pixels, the front filter is. In between both filters are the liquid crystals, which can be electronically switched on and off.

LCDs are made with either a passive matrix or an active matrix display grid. The active matrix

LCD is also known as a thin film transistor (TFT) display. The passive matrix LCD has a grid of

conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any pixel. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently, improving the screen refresh time.

Some passive matrix LCD's have dual scanning, meaning that they scan the grid twice with current in the same time that it took for one scan in the original technology. However, active matrix is still a superior technology out of the two.

Types of LCD

Types of LCDs include:

- Twisted Nematic (TN)- which are inexpensive while having high response times. However, TN displays have low contrast ratios, viewing angles and color contrasts.
- In Panel Switching displays (IPS Panels)- which boast much better contrast ratios, viewing angles and color contrast when compared to TN LCDs.
- Vertical Alignment Panels (VA Panels)- which are seen as a medium quality between TN and IPS displays.
- Advanced Fringe Field Switching (AFFS)- which is a top performer compared IPS displays in color reproduction range.

Function of LCD keys

- Pin1 : This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 : This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 : This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 : This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1.

- Pin5 : This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 : This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 : These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7. Pin15 ;This pin is connected to +5V Pin 16 : This pin is connected to GND.

FEATURES OF LCD16X2

THE FEATURES OF THIS LCD MAINLY INCLUDE THE FOLLOWING.

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills.

Fig10- DC Motor

Components of dc motor

- Commutator
- Rotor coil
- Air gap
- Bearing
- stator magnets

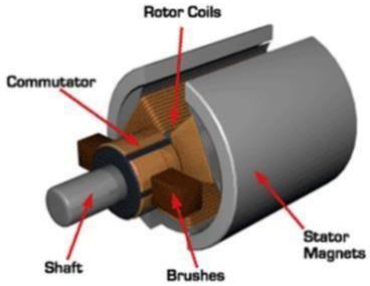


Fig11- dc motor

Commutator

A commutator is a rotary electrical switch in certain types of electric motors and electrical generators that periodically reverses the current direction between the rotor and the external circuit. It consists of a cylinder composed of multiple metal contact segments on the rotating armature of the machine. Two or more electrical contacts called "brushes" made of a soft conductive material like carbon press against the commutator, making sliding contact with successive segments of the commutator as it rotates. The windings (coils of wire) on the armature are connected to the commutator segments.

Commutators are used in direct current (DC) machines: dynamos (DC generators) and many DC motors as well as universal motors. In a motor the commutator applies electric current to the windings. By reversing the current direction in the rotating windings each half turn, a steady rotating force (torque) is produced. In a generator the commutator picks off the current generated in the windings, reversing the direction of the current with each half turn, serving as a mechanical rectifier to convert the alternating current from the windings to unidirectional direct current in the external load circuit. The first direct current commutator- type machine, the dynamo, was built by Hippolyte Pixii in 1832, based on a suggestion by André-Marie Ampère

Commutators are relatively inefficient, and also require periodic maintenance such as brush replacement. Therefore, commutated machines are declining in use, being replaced by alternating current (AC) machines, and in recent years by brushless DC motors which use semiconductor switches.

Rotor coil

A field coil is an electromagnet used to generate a magnetic field in an electro-magnetic machine, typically a rotating electrical machine such as a motor or generator. It consists of a coil of wire through which a current flows.

In a rotating machine, the field coils are wound on an iron magnetic core which guides the magnetic field lines. The magnetic core is in two parts; a stator which is stationary, and a rotor, which rotates within it. The magnetic field lines pass in a continuous loop or magnetic circuit from the stator through the rotor and back through the stator again. The field coils may be on the stator or on the rotor.

The magnetic path is characterized by *poles*, locations at equal angles around the rotor at which the magnetic field lines pass from stator to rotor or vice versa. The stator (and rotor) are classified by the number of poles they have. Most arrangements use one field coil per pole. Some older or simpler arrangements use a single field coil with a pole at each end.

Air gap

The distance between the rotor and stator is called the air gap. The air gap has important effects, and is generally as small as possible, as a large gap has a strong negative effect on performance. It is the main source of the low power factor at which motors operate. The magnetizing current increases with the air gap. For this reason, the air gap should be minimal. Very small gaps may pose mechanical problems in addition to noise and losses.

Bearing

The rotor is supported by bearings, which allow the rotor to turn on its axis. The bearings are in turn supported by the motor housing. The motor shaft extends through the bearings to the outside of the motor, where the load is applied. Because the forces of the load are exerted beyond the outermost bearing, the load is said to be *overhung*.

Stator

The stator is the stationary part of the motor's electromagnetic circuit and usually consists of either windings or permanent magnets. The stator core is made up of many thin metal sheets, called laminations. Laminations are used to reduce energy losses that would result if a solid core were used. Resin-packed motors, used in washing machines and air conditioners, use the damping properties of resin (plastic) to reduce noise and vibration. These motors completely encapsulate the stator in plastic.

Motor supply and control

A DC motor is usually supplied through a slip ring commutator as described above. AC motors' commutation can be achieved using either a slip ring commutator or external commutation, can be fixed-speed or variable-speed control type, and can be synchronous or asynchronous type. Universal motors can run on either AC or DC.

- DC motors can be operated at variable speeds by adjusting the DC voltage applied to the terminals.
- AC motors operated at a fixed speed are generally powered directly from the grid or through motor soft starters.
- AC motors operated at variable speeds are powered with various power inverter, variable-frequency drive or electronic commutator technologies.
- The term electronic commutator is usually associated with self-commutated brushless DC motor and switched reluctance motor applications.

IR Sensor

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 a

passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. 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 that 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 the output voltages will change in proportion to the magnitude of the IR light received.

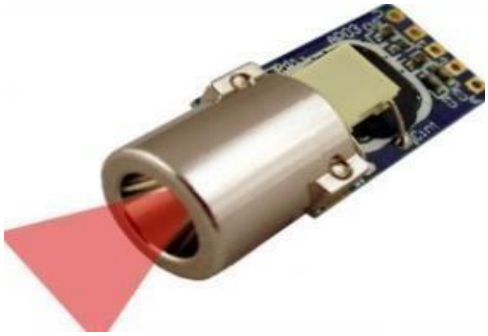


Fig12- or sensor

IR Sensor circuit diagram

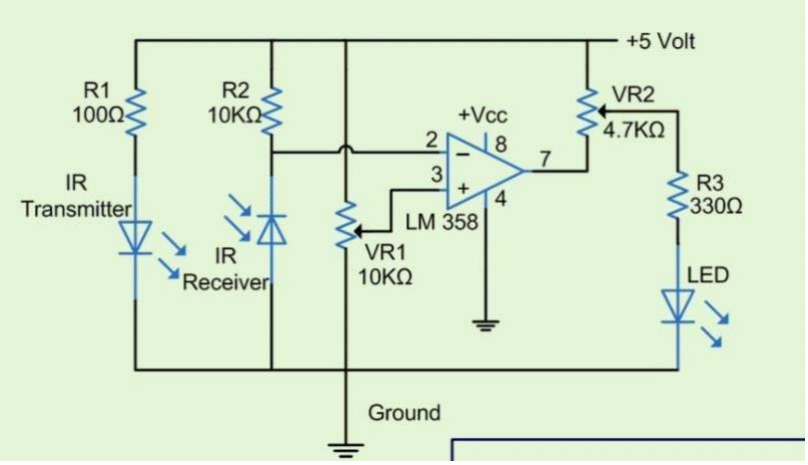


Fig13- circuit diagram

Working of IR Sensor

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real-time. This circuit comprises of the following components-

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo-ohms.
- Variable resistors.
- LED (Light Emitting Diode).

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.

Types of it sensor

- The speed sensor is used for synchronizing the speed of multiple motors.
- The temperature sensor is used for industrial temperature control.
- PIR sensor is used for automatic door opening system and Ultrasonic sensor are used for distance measurement.

Transformer

Transformers are electrical devices consisting of two or more coils of wire used to transfer electrical energy by means of a changing magnetic field.

One of the main reasons that we use alternating AC voltages and currents in our homes and workplace's is that AC supplies can be easily generated at a convenient voltage, transformed

(hence the name transformer) into much higher voltages and then distributed around the country using a national grid of pylons and cables over very long distances.

Voltage transformer

The **Voltage Transformer** can be thought of as an electrical component rather than an electronic component. A transformer basically is very simple static (or stationary) electro-magnetic passive electrical device that works on the principle of Faraday's law of induction by converting electrical energy from one value to another.

Fig14- voltage transformer

Single Phase Voltage Transformer

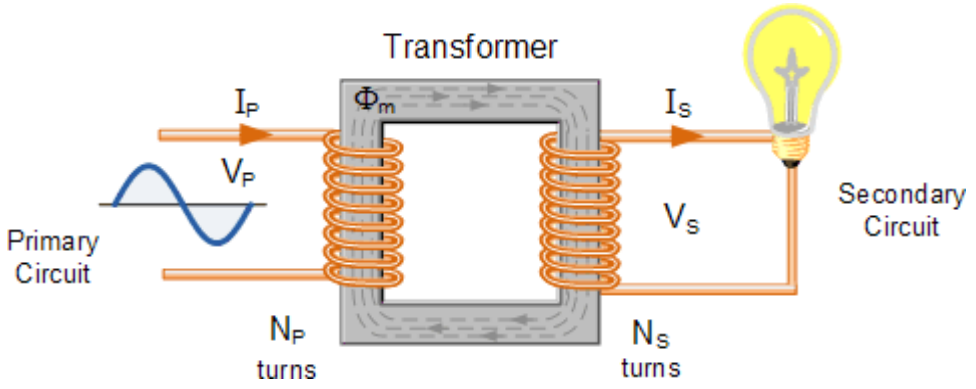


Fig15

A transformer there is no direct electrical connection between the two coil windings, thereby giving it the name also of an **Isolation Transformer**. Generally, the primary winding of a transformer is connected to the input voltage supply and converts or transforms the electrical power into a magnetic field. While the job of the secondary winding is to convert this alternating magnetic field into electrical power producing the required output voltage as shown.

TRANSFORMER CONSTRUCTION (SINGLE-PHASE)

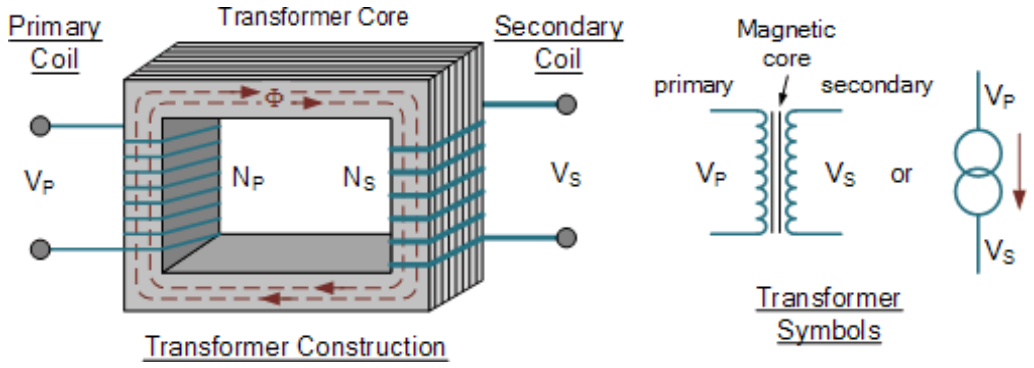


Fig16-

- Where:
- V_P – is the Primary Voltage
- V_S – is the Secondary Voltage
- N_P – is the Number of Primary Windings
- N_S – is the Number of Secondary Windings
- Φ (phi) – is the Flux Linkage

Notice that the two coil windings are not electrically connected but are only linked magnetically. A single-phase transformer can operate to either increase or decrease the voltage applied to the primary winding. When a transformer is used to “increase” the voltage on its secondary winding with respect to the primary, it is called a Step-up transformer. When it is used to “decrease” the voltage on the secondary winding with respect to the primary it is called a Step-down transformer.

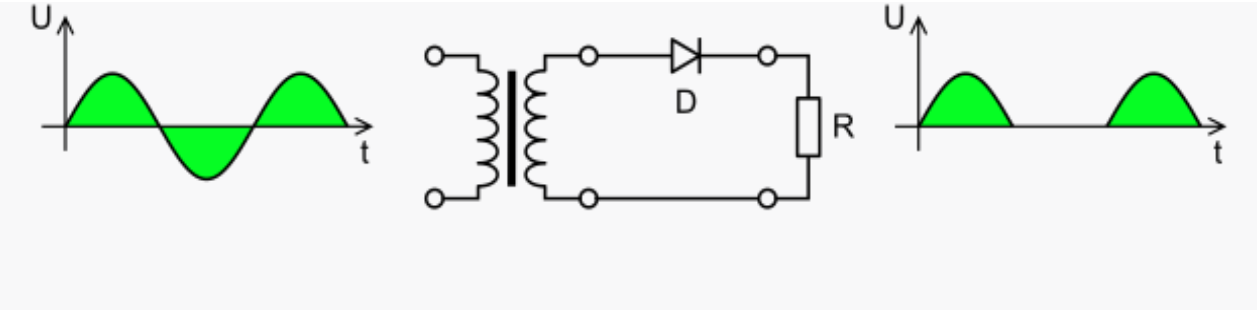
RECTIFIER

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction.

SINGLE-PHASE RECTIFIERS

- *Half-wave rectification*

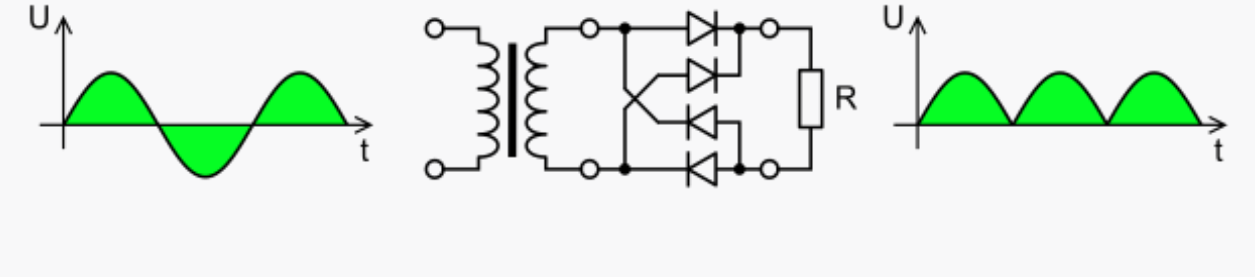
In half-wave rectification of a single-phase supply, either the positive or negative half of the AC wave is passed, while the other half is blocked. Mathematically, it is a step function (for positive pass, negative block): passing positive corresponds to the ramp function being the identity on positive inputs, blocking negative corresponds to being zero on negative inputs. Because only one half of the input waveform reaches the output, mean voltage is lower. Half-wave rectification requires a single diode in a single-phase supply, or three in a three-phase supply. Rectifiers yield a unidirectional but pulsating direct current; half-wave rectifiers produce far more ripple than full-wave rectifiers, and much more filtering is needed to eliminate harmonics of the AC frequency from the output.



- *Full-wave rectification*

A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output. Mathematically, this corresponds to the absolute value

function. Full-wave rectification converts both polarities of the input waveform to pulsating DC (direct current), and yields a higher average output voltage. Two diodes and a center tapped transformer, or four diodes in a bridge configuration and any AC source (including a transformer without center tap), are needed. Single semiconductor diodes, double diodes with common cathode or common anode, and four-diode bridges, are manufactured as single components.



SOFTWARE DESCRIPTION

KEIL Microcontroller Programming Software

Keil has compiler designed specifically for the 8051 microcontroller. Keil provides a broad range of development tools like IDE (Integrated Development environment), Project Manager, Simulator, Debugger, C Cross Compiler.

Compilers are programs used to convert a High Level Language source code (written in assembly language or C language) into its object code. Then a linker is used to create an absolute object module suitable for your circuit.

8051 project development cycle: - these are the steps to develop 8051 project using keil

1. Create source files in C or assembly.
2. Compile or assemble source files.
3. Correct errors in source files.
4. Link object files from compiler and assembler.
5. Test linked application.

KEIL Software Programming Procedure

Step-1) Install Keil MicroVision on PC, Then Click on that “Keil UVision” icon. After opening the window go to toolbar and select Project Tab then close previous project.

Step-2) Next select New Project from Project Tab.

Step-3) Then it will open “Create New Project” window. Select the path where you want to save project and edit project name.

Step-4) Next it opens “Select Device for Target” window, it shows list of companies and here you can select the device manufacturer company.

Step-5) For an example, for your project purpose you can select the chip as 89c51/52 from Atmel Group. Next Click OK Button, it appears empty window here you can observe left side a small window i.e., “Project Window”. Next create a new file.

Step-6) From the Main tool bar Menu select “File” Tab and go to New, then it will open a window, there you can edit the program.

Step-7) You can edit the program of either Assembly language or C language

Step-8) After editing the program save the file with extension as “.c” or “.asm”, if you write a program in Assembly Language save as “.asm” or if you write a program in C Language save as “.c” in the selected path. Take an example and save the file as “test.c”.

Step-9) Then after saving the file, compile the program. For compilation go to project window select “source group” and right click on that and go to “Add files to Group”.

Step-9) Here it will ask which file has to Add. For an example here you can add “test.c” as you saved before.

Step-9) After adding the file, again go to Project Window and right click on your “c file” then select “Build target” for compilation. If there is any “Errors or Warnings” in your program you can check in “Output Window” that is shown bottom of the Keil window.

Step-10) Here in this step you can observe the output window for “errors and warnings”.

Step-11) If you make any mistake in your program you can check in this slide for which error and where the error is by clicking on that error.

Step-12) After compilation then next go to Debug Session. In Tool Bar menu go to “Debug” tab and select “Start/Stop Debug Session”.

Step-13) Here a simple program for “Leds Blinking”. LEDS are connected to PORT-1. You can observe the output in that port.

Step-14) To see the Ports and other Peripheral Features go to main toolbar menu and select peripherals.

Step-15) In this slide see the selected port i.e., PORT-1.

Step-16) Start to trace the program in sequence manner i.e., step by step execution and observe the output in port window.

Step-17) After completion of Debug Session Create an Hex file for Burning the Processor. Here to create an Hex file go to project window and right click on Target next select “Option for Target”.

Step-18) It appears one window; here in “target tab” modify the crystal frequency as you connected to your microcontroller.

Step-19) Next go to “Output’ tab. In that Output tab click on “Create HEX File” and then click OK. Finally Once again compile your program. The Created Hex File will appear in your path folder.

CHAPTER 05

RESULT

- In this project we have shown the concept of parking a car with ease by knowing the availability of slots beforehand.
- This happens when the entry and exit of cars through the gate is sensed automatically and intimates the next free available slot if present.
- The sensing is done with help of infrared transmitters and receivers.
- By using this 8051, we have designed the AUTOMATIC CAR PARKING SYSTEM.
- This project provided a unit in which cars are stored into retrieve from addressed slots automatically.

CHAPTER 06

ADVANTAGES AND APPLICATIONS

Advantages:-

1. Quick and efficient method.
2. It is highly feasible for extremely small sites that are unable to accommodate a conventional ramped parking structure.
3. There is no need for driving while looking for an available space.
4. There are less chances for vehicle vandalism.
5. There is high parking efficiency.
6. We can add the **Pick and Place** facility to park the cars automatically.
7. It can allot automatically generated empty parking slot in the car parked for the ease of parking.
8. It shows the exact location, parking slot with direction, when it is near to the allotted parking slot.
9. Less numbers of labours are required in this and sometimes no labour at all if using personall

Applications:-

- This project can be used for parking system at any place.
- This can be used in any shopping mall, multiplex.
- It can be used in industries, commercial places, educational institution.
- Because they are more flexible in terms of where they can be placed, these automated vehicle parking systems give architects and designers increased freedom
- This can be expanded in the sense of security. Using metal detectors and CCTV cameras security of the parking area can be enhanced.

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A

[Automatic Car Parking System]

FUTURE SCOPE

- Bus station

CHAPTER 08

CONCLUSION

The various types of smart parking system and has been presented. From the various examples of the implementation of the smart parking system being presented, its efficiency in alleviating the traffic problem that arises especially in the city area where traffic congestion and the insufficient parking spaces are undeniable. It does so by directing patrons and optimizing the use of parking spaces. With the study on all the sensor technologies used in detecting vehicles, which are one of the most crucial parts of the smart parking system, the pros and cons of each sensor technologies can be analysed. Although, there are certain disadvantages in the implementation of visual based system in vehicle detection as described earlier, the advantages far outweigh its disadvantages.

- The system benefits of smart parking go well beyond avoiding time wasting.
- Enables cities to develop fully integrated multimodal intelligent transportation systems with great security and efficiency.
- Developing smart parking solutions within a city solves the vandalism and pollution problem.

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APPENDIX

MICROCONTROLLER PROGRAM

```
;=================================
```

```
lcddatabus      equ     80h     ;LCD Data Bus   P0
```

```
lcdrs           equ     0a7h     ;LCD RS          P2.7
lcden           equ     0a6h                      P2.6
                                 ;LCD EN


IRip_Slot11     equ     90h

IRip_Slot12     equ     95h

IRip_Slot21     equ     93h

IRip_Slot22     equ     91h



LED_slot11      equ     A5h      ;

LED_slot12      equ     A3h      ;4

LED_slot21      equ     A4h      ;

LED_slot22      equ     A2h      ;

;=================================
org 0000h
call init



loop:
jb       IRip_Slot11,chk_ir_12       call
                 action_slot11

                 jmp chk_ir_12_next
```

```
chk_ir_12:
```

```
                jb IRip_Slot11,chk_ir_12_new jmp
                chk_ir_12_next


chk_ir_12_new:
                call action_slot11_off
chk_ir_12_next:
                jb IRip_Slot12,chk_ir_21 call
                action_slot12


                jmp chk_ir_21_next


chk_ir_21:
                jb IRip_Slot12,chk_ir_21_new jmp
                chk_ir_21_next


chk_ir_21_new:
                call action_slot12_off


chk_ir_21_next:
                jb IRip_Slot21,chk_ir_22 call
                action_slot21


                jmp chk_ir_22_next


chk_ir_22:
                jb IRip_Slot21,chk_ir_22_new jmp
                chk_ir_22_next
```

```
chk_ir_22_new:
                call action_slot21_off


chk_ir_22_next:


                jb IRip_Slot22,loop_next1
                call action_slot22 jmp
                loop


loop_next1:
                jb IRip_Slot22,chk_ir_11_new jmp
                loop


chk_ir_11_new:
                call action_slot22_off
               jmp loop
;=========================
= action_slot11:


                clr LED_slot11 call
                disp_YES11


action_slot11_ret:
                ret
;=========================
```

```
= action_slot12:

                  call disp_YES12

action_slot12_ret:
                ret
;========================== action_slot21:
                clr LED_slot21 call
                disp_YES21

action_slot21_ret:
                ret
;========================== action_slot22:
              clr LED_slot22 call
                disp_YES22

action_slot22_ret:
                ret
;========================== init:
                call lcdinit

                call clear_bits

                mov dptr,#msgwelcome
```

```
                call lcddisp call
                delay2sec

                mov dptr,#msgcommon
                call lcddisp ret
;==========================
= lcdinit:
                mov lcddatabus,#38h call
                lcdcmd

                mov lcddatabus,#0ch
                call lcdcmd mov
                lcddatabus,#01h
                call lcdcmd mov
                lcddatabus,#06h
                call lcdcmd ret
;============================================== lcdcmd:
                clr lcdrs setb
                lcden clr
                lcden call
                lcddelay ret
;============================================== lcddata:
```

```
                setb lcdrs

                setb lcden

                clr lcden

                call lcddelay

                ret

;================================================

lcddelay:       mov 31,#08              ;delay for LCD
lcddelay1:
                mov 32,#250 djnz
                31,$

                djnz 32,lcddelay1 ret

;================================================
lcddisp:

lcddisp2:       movc a,@a+dptr cjne
                a,#'@',lcddisp1 jmp
                lcddisp2


lcddisp1:
                cjne a,#'$',lcddisp3
                ret

lcddisp3:       mov lcddatabus,a
                call  lcddata inc

                dptr

                jmp lcddisp2

;================================================

debounce:       mov 31,#12              ;delay for LCD
debounce1:
                mov 32,#250 djnz
                31,$

                djnz 32,debounce1 ret
```

```
;================================================


delay1sec:      mov 31,#10

delay1sec1:     mov 32,#200

delay1sec2:     mov  33,#250
                djnz 31,$


                djnz 32,delay1sec2

                djnz 33,delay1sec1

                ret

;================================================

delayhalf:      mov 31,#05

delayhalf1:     mov 32,#200

delayhalf2:     mov  33,#250
                djnz 31,$


                djnz 32,delayhalf2

                djnz 33,delayhalf1

                ret

;================================================
delay2sec:       call
 delay1sec
call delay1sec ret

;================================================
delay4sec:  call delay1sec
 call

                delay1sec call

                delay1sec call

                delay1sec ret

;================================================
```

```
action_slot11_off:
                jb 01h,action_slot11_off_ret
                setb 01h setb LED_slot11

                mov 40h,#80H call
                disp_NO11

action_slot11_off_ret:
                ret
;================================================
```