

# ANDROID CONTROLLED ROBOT

**K . Aishwarya<sup>1</sup>, K . Dhenu Sri<sup>2</sup>, K . Prashanth<sup>3</sup>, TN, Swetha<sup>4</sup>**

<sup>1</sup>K . Aishwarya, Dept of ECE, Geethanjali College of Engineering & Technology, Cheeryala, T.S.

<sup>2</sup>K . Dhenu Sri Dept of ECE, Geethanjali College of Engineering & Technology, Cheeryala, T.S.

K . Prashanth, Dept of ECE, Geethanjali College of Engineering & Technology, Cheeryala, T.S.

<sup>4</sup>TN, Swetha Asst.Professor, Geethanjali College of Engineering & Technology,cheeryala,T.S,India.

**Abstract:** Today the field of robotics is gaining popularity, because of their intelligence. These robots are performing a variety of activities in different fields. In this new era of robotics, continuous path tracking robots are drawing much importance because of their sophisticated closed loop control with completely automation features. The robot deigned here is also controlled through android device via WiFi. The main theme of this project work is design and develop a robot that can be operated as a line following robot as well as control the robot through android device for reading different parameters like obstacle, pit detection and fire sensing.

The robotic vehicle designed here follows the line/path marked with black paint in a closed loop and senses the parameters that are constructed with sensing circuits on the vehicle. The path sensing sensors are arranged at the front bottom end of the vehicle and DC motors are used to drive the wheels. The microcontroller used in this project work is programmed to control the motors independently. Two DC motors with reduction gear mechanism are used to drive the robot and depending up on the control signals received in the input through the sensors or the android device; the output is controlled by the controller. The two DC motors are connected to the rear wheels of the vehicle for the vehicle movement. The required power supply for the vehicle is provided through the high power rechargeable battery of 12V.

The advancement of technology has made possible the implementation of embedded systems in each and every field. This has added new capabilities and features. However most of the time, the Implementations are proprietary and networking is not always possible. Yet there is an increasing demand for advancements, where devices react automatically to changing environmental conditions and can be easily controlled through one common device. This project work presents a possible solution whereby the user controls the robot for fire sensing, pit or obstacle sensing by a mobile phone through its android interface. This results in a simple, cost effective and flexible system, making it an excellent feature for future smart robotic operations.

The robot is designed to move freely in all directions and all required devices including heavy-duty battery is arranged over the chassis of the vehicle. DC motors with reduction gear mechanism are used to drive the vehicle, with the help of sensing circuits pits, obstacles and fire are sensed and will be informed to the android device that are connected through WiFi.

## INTRODUCTION

Since ancient times, people have dreamed of having intelligent machines capable of offering us companion ship, entertaining us, or just helping us to do our least favorite tasks. Robots are humanity's attempt to allow the intellectual power of the computer to interact with the physical world. Science fiction has contributed to the development of robotics by planting ideas in the minds of young people who might embark on careers in robotics, and by creating awareness among the public about this technology. Today Robotics has become an applied Engineering science that includes diverse fields like control theory, microelectronics, mechatronics, Electrical engineering and artificial intelligence.

There are three important topics that service robot must take into account which are the navigation strategy, control architecture, and sensory system. Navigation strategy is the most basic problem to be handled as the selection of sensors and control schemes will depend on navigation design in general. Generally, there are many navigation methods for a robot to reach its destination or goal such as navigation using infrared and radio frequency which are more common. The selection of using which navigation method is based on the situation, environment and the budget for the particular robot. Beside this, the sensory information is essential for a service robot in an unstructured environment.

Autonomous path following system consists of three events to happen, they are: Taking Input, Process the operation and Giving Output. The input of this system is given through the start button to start performing the task of path following. A toggle switch is used to differentiate between the path following mechanism and the android control mechanism by the controller. So, a microcontroller is individually dedicated to perform the above mentioned tasks. The output of this system goes to the Actuators i.e., the movement designed through the DC motors.

To prove the theme practically, a prototype module is constructed, which can be called as "Mobile Robot" that functions based on Software, Hardware and mechanical systems working together. The robot/vehicle is intended to move on the path specified, so a closed loop is to be designed.

## Introduction to Wi-Fi (802.11)

The IEEE 802.11 specification (ISO/IEC 8802-11) is an international standard describing the characteristics of a wireless local area network (WLAN). The name Wi-Fi (short for "Wireless Fidelity", sometimes incorrectly shortened to WiFi) corresponds to the name of the certification given by the Wi-Fi Alliance, formerly WECA (Wireless Ethernet Compatibility Alliance), the group which ensures compatibility

between hardware devices that use the 802.11 standard. Today, due to misuse of the terms (and for marketing purposes), the name of the standard is often confused with the name of the certification. A Wi-Fi network, in reality, is a network that complies with the 802.11 standard.

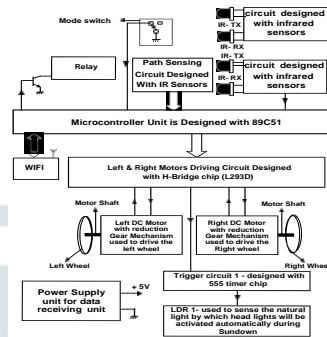
Wi-Fi providers are starting to blanket areas that have a high concentration of users (like train stations, airports, and hotels) with wireless networks. These access areas are called "hot spots".

The 802.11 standard reserves the low levels of the OSI model for a wireless connection that uses electromagnetic waves, i.e.:

- The physical layer (sometimes shortened to the "PHY" layer), which offers three types of information encoding.
- The data link layer, comprised of two sub-layers: Logical Link Control (or LLC) and Media Access Control (or MAC).

Proposed model

### Block diagram



Block diagram

The overall function of this project is to create a robot that will follow a specific color of line, also android instructions and measure or sense the parameters and indicate it to the android device through WiFi. This way it (line following or android controlled vehicle) has to move depending on the inputs. To achieve this, a step-by-step systematic approach is essential to get good results.

So one autonomous robot, which follows the line is designed that moves on the path specified. A line following robot is a precursor to other autonomous robots not confined to following a line. Line follower is a machine that can follow a path. The path can be visible like a black line on a white surface (or vice-versa) or it can be invisible like a magnetic field

### Basic operations for robot are as follows:

Capture the black line with the help of mounted sensors on the vehicle front while moving forward. The sensors used are optical i.e. they consisting of transmitting and receiving LED's. Steer the vehicle to track the line with differential steering method. This is achieved by using two DC geared motors.

- 1) Sense the obstacles and pits through the IR sensors
- 2) Sense the fire through the LDR.
- 3) Also operate the vehicle through the WiFi android app.

### Path sensing

The path-sensing block is designed with four sets of IR LED's arranged at the bottom of the vehicle, in which two are at the front and two are the back of the vehicle. Each set contains IR signal transmitting LED and IR signal detector. Both the LED's are arranged side by side with a distance of 1cm approximately. As long as the transmitting LED is over the black tape, the IR signal is not reflected; hence the receiving LED doesn't receive any IR signal. If there is any deviation, in that condition the transmitting LED is out of track, there by the signal is reflected by the normal floor and this reflected signal is detected through IR signal detector. The output of the detector is amplified through a transistor and is fed to micro controller through NOT gates

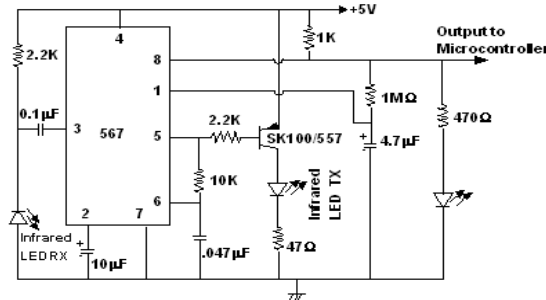


Sensor

### Sensing circuit

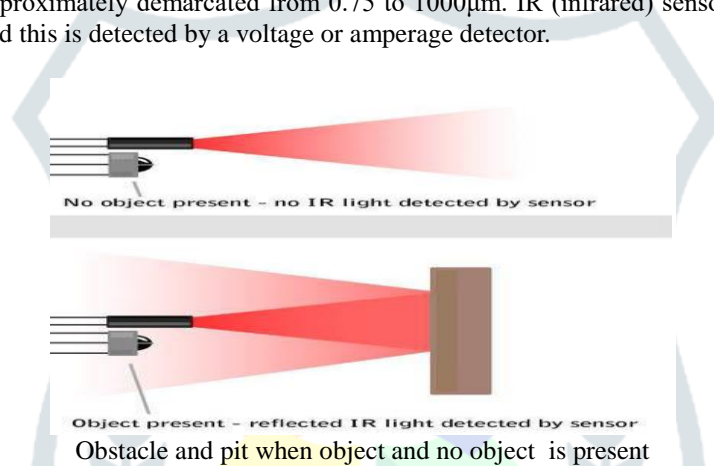
The basic function of the detector circuit is by radiating energy into space through IR LED and detecting the echo signal reflected from an object. The reflected energy that is returned to the IR sensor indicates the presence of a object which is within the range. A portion of the transmitted

energy is intercepted by the target and re-radiated in many directions. The radiation directed back towards the system is collected by the receiving LED causes to produce a high signal at Pin No.8 of LM567 IC. The output of the receiver is fed to the Microcontroller. Whenever the controller receives a high signal from the reference point, the microcontroller energizes the voice chip to announce the information



Sensing circuit for pit and obstacle

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, but shorter than microwaves. The infrared region is approximately demarcated from 0.75 to 1000µm. IR (infrared) sensors detect infrared light. The IR light is transformed into an electric current, and this is detected by a voltage or amperage detector.



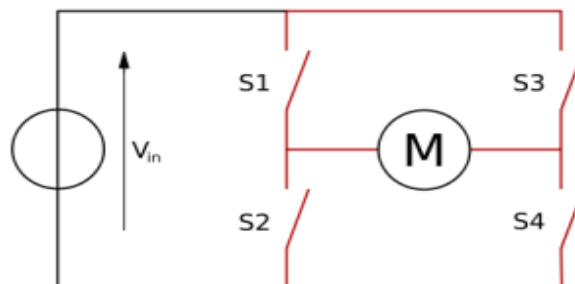
**Fire sensing circuit**

As described in the abstract LDR is used for detecting the fire through light intensity. Generally for measuring the light intensity LDR's are preferred because of their wide variation in the resistance. Measurement of light intensity is an important management for many applications. Generally the light intensity is measured in Lux or Lumens, in some places it is measured in Foot candles also, Lux is the popularly known unit, and therefore the light measuring instrument can be called as "LUX METER".

There are many techniques existed in the world for measuring the fire, these differ depending up on the availability of sensors, the main function of the LDR light sensor is to sense the brightness of light as the intensity of light will be high when fire occurs. Here LDR is used as a light sensing device, the purpose of sensing the light is to control the street lights, not for measuring the light. The LDR used in this project work is a very sensitive device, which converts the light energy into variable resistance, and the resistance of this LDR will vary according to the light intensity. As the light intensity increases, resistance decreases (inversely proportional). The amount of light falling on the surface of the light sensing device is to be converted in to the proportionate DC level. A 10k resistor is connected in series with the LDR to form a potential dividing network.

**H-Bridge**

H-Bridge is an electronic circuit which enables a voltage to be applied on either side of the load and the H-bridge DC motors allow the car to run backwards or forwards. H-Bridge is a configuration of 4 switches, which switch in a specific manner to control the direction of the current through the motor. Below figure shows simplified H-bridge as switches. The states of these four switches can be changed in order to change the voltage across the motor, of the current flow and the rotation of motor.



H-bridge depending upon the voltage applied across the switches.

Truth table for H-bridge

S1	S2	S3	S4	Result
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes
1	0	1	0	Motor brakes

### Introduction about micro controller:

A Micro controller consists of a powerful CPU tightly coupled with memory, various I/O interfaces such as serial port, parallel port timer or counter, interrupt controller, data acquisition interfaces-Analog to Digital converter, Digital to Analog converter, integrated on to a single silicon chip. If a system is developed with a microprocessor, the designer has to go for external memory such as RAM, ROM, EPROM and peripherals.

But controller is provided all these facilities on a single chip. Development of a Micro controller reduces PCB size and cost of design. One of the major differences between a Microprocessor and a Micro controller is that a controller often deals with bits not bytes as in the real world application. Intel has introduced a family of Micro controllers called the MCS-51. The microcontroller plays the major role in any embedded project. In this my project

we use two microcontrollers they are made by the ATMEL Company. That is AT89S52.

### Keil Software

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software.

The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all 8051 derivatives and help you get your projects completed on schedule.

### Advantages:

1. One of the advantages of an embedded system is to decrease power consumption and space.
2. All embedded systems that are based on micro controller have low power consumption in addition to some form of I/O, COM port and ROM all on a single chip.

### Conclusion:

The project work designed and developed successfully, for the demonstration purpose prototype module is constructed and results are found to be satisfactory. We have given lot of importance for the structure; for this purpose lot of mechatronics books related to the electromechanical structures are referred, and a good-looking robust mechanical structure is designed. All electronic hardware including mechanical transmission section is mounted to this structure. Heavy-duty battery is also accommodated over the structure. Two small DC motors with built in reduction gear mechanism are used to drive the line following and android controlled vehicle.

### Reference

- [1] Linear Integrated Circuits – By: D. Roy Choudhury, Shail Jain
- [2] Digital Electronics. By JOSEPH J.CARR
- [3] The concepts and Features of Micro-controllers - By: Raj Kamal