CAR ANTI COLLISION SYSTEM

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ABSTRACT

The Anti–Collision device is a detection device meant to be incorporated into cars for the purpose of safety. As opposed to the anti–collision devices present in the market today, this system is not designed to control the vehicle. Instead, it serves as an alert in the face of imminent collision. The device is intended to find a way to implement a minimum spacing for cars in traffic in an affordable way. It would also achieve safety for the passengers of a moving car. The device is made up of an infrared transmitter and receiver. In India, the rate of population is highly increased. The increase rate in population affects traffic system a lot. In day-to-day life traveling and vehicle becomes essential parts of our life. As we all heard about the tag line of a tyre manufacturing company that roads are 'full of idiots' and that is somewhat true also. Now-a-days we consistently come across the news of road accidents and poor traffic system. Road accidents occur due to the poor traffic system. The aim of our project is to contribute in reducing the road accidents. To reduce the road accidents we can use "car anti-collision system" with 'fuzzy logic'. This car anti-collision system is based on 'obstacle avoidance and obstacle detection" by IR sensor application. System packed with component microcontroller, D.C. motor, Capacitor, I.R. sensor & Relay etc. Also, this system indicates obstacles in the form of LED, when detecting the obstacles.

Keyword: - *IR sensor, Fuzzy logic, Microcontroller, relay, obstacle avoidance and obstacle detection*

1. INTRODUCTION

Safety is a necessary part of human beings. Today's world is based on the saying 'fittest is the survivor' and to survive in competition among develop and developing country becomes the essential phenomenon. Every country wants to accelerate their speed of development. Being the developed country strong and safe transportation system plays the vital role. In the competition of excellence, unfortunately we have increased the numbers of reported accidents. That's why it is prime important to pay more attention on the designing of efficient car driving aiding system. It is expected that if such a device is designed and incorporated into cars for road safety, it will reduce the incidence of road accidents and in various premises too, with subsequent reduction in loss of life and property [2].

The aim of engineering is to reduce the human efforts and enrich the life with safety. Though human being has limitation to avoid dangers but with the inborn quality of innovation man can certainly reduce the risk factors. When it comes to the use of a motor vehicle, accidents that have occurred over the years tell us that something is needed to be done about it from an engineering point of view.

Suffice to say that the implementation of certain highway safety means such as speed Restrictions, among others, has done a lot in reducing the rates of these accidents. The issue here is that policies of safe driving alone would not eradicate this; the engineer has a role to play, after all the main issue is an engineering product (the motor vehicle). Many motorists have had to travel through areas with little light under much fatigue, yet compelled to undertake the journey out of necessity. It is not always irresponsible to do this. A lot of cases reported that many head-on collisions have taken place just because of drivers sleeping off while driving. Not many have had the fortune to quickly avert this. It is therefore imperative to consider the advantages of an early warning system where the driver gets the alert of a possible collision with some considerable amount of time before it occurs. The idea of incorporating radar systems into vehicles to improve road traffic safety dates back to the 1970s. Such systems are now reaching the market as recent advances in technology have allowed the signal processing requirements and the high angular

resolution requirements from physically small antennas to be realized. Automotive radar systems have the potential for number of different applications including adaptive cruise control (ACC) and anti-collision devices [4]. The problem with this brand of cars is that they are expensive. This becomes an even bigger challenge when you consider a developing country like Malaysia.

The Infrared Anti-Collision Device are expected to be made of relatively inexpensive components for easy purchase and incorporation. This research aims at the design of a prototype showing how this could function. The main objective is to find a way to implement a minimum pacing for cars in traffic in an affordable way, alongside to achieve safety for passengers of a moving car. The anti-collision device, when wired into the circuitry of a vehicle would help in the reduction of road mishaps. Though not every kind of collision can be helped by this, and it must be stated here that no allusion is being made that technology is the best line of action to take. It should be further noted that some already existing laws made use of technologies like the street lights and traffic lights. This would be a supplementation and not a replacement [4].

Road accidents are severe threat to human lives. It is harmful to human fitness as well as it's become the cause of financial collapse. Vehicles are designed to facilitate a smooth means of transportation. Manufacturers also spend their long time in the designing of vehicles which based on the principles of reliability and safety. However, there are many reasons of road mishaps such as human-error, circumstantial error and negligence, etc. So, ultimately it is the need of our time to develop such a technology which can reduce the road accidents.

Services provided by the Intelligent Transportation System (ITS) include collision warning; collision avoidance; and automatic control are eventually expected to result in a reduction of critical traffic accidents. The data is provided by sensors, information systems and analyzer devices located side the vehicles. Low-cost vehicular enhancements are an impediment for large scale deployment.

In this project we are using infrared sensor to show the demonstration. IR sensor is placed at four side of the vehicle. IR sensors will indicate the obstacles present at any side. It will be detected by microcontroller and distance of object will be indicated by LED bulb. In this way driver gets alert and it will helps to prevent accident.

2. DESIGN AND FABRICATION

William Martin (2009) presented paper on 'Autonomous robot obstacle avoidance using a fuzzy logic control scheme'. He introduced that, one of the considerable hurdles to overcome, when trying to describe a real-world control scheme with first-order logic, is the strong ambiguity found in both semantics and evaluations. Although one option is to utilize probability theory in order to come up with a more realistic model, this still relies on obtaining information about an agent's environment with some amount of precision. However, fuzzy logic allows an agent to exploit inexactness in its collected data by allowing for a level of tolerance. This can be especially important when high precision or accuracy in a measurement is quite costly. The proposed applications for fuzzy logic range from controlling robotic hands with six degrees of freedom to filtering noise from a digital signal. Due to its easy implementation, fuzzy logic control has been popular for industrial applications when advanced differential equations become either computationally expensive or offer no known solution. This project is an attempt to take advantage of these fuzzy logic simplifications in order to implement simple obstacle avoidance for a mobile robot [1].

Radu Bazawan & Rodica Strungaru (2010) submitted paper on 'obstacle avoidance fuzzy system for mobile robot with IR sensor'. This paper presents implemented control architecture for behavior-based mobile robot. The mobile robot is able to interact with an unknown environment using a reactive strategy determined by sensory information. Current research in robotics aims to build autonomous and intelligent robots, which can plan its motion in a dynamic environment. Autonomous mobile robots are increasingly used in well structured environment such as warehouses, offices and industries. Fuzzy behavior able to make inferences is well suited for mobile robot navigation because of the uncertainty of the environment. A rule-based fuzzy controller with reactive behavior was implemented and tested on a two wheels mobile robot equipped with infrared sensors to perform collision-free navigation. The experimental results show that the proposed architecture provides an efficient and flexible solution for small wheeled mobile robots [2].

Adamu Murtala Zungeru presented paper on 'Development of an anti-collision model for vehicles'. He says that, anti–Collision device is a detection device meant to be incorporated into cars for the purpose of safety. As opposed to the anti–collision devices present in the market today, this system is not designed to control the vehicle.

Instead, it serves as an alert in the face of imminent collision. The device is intended to find a way to implement a minimum spacing for cars in traffic in an affordable way. It would also achieve safety for the passengers of a moving car. The device is made up of an infrared transmitter and receiver. Also incorporated into it is an audio visual alarm to work in with the receiver and effectively alert the driver and/or the passengers. The device works by sending out streams of infrared radiation and when these rays are seen by the other equipped vehicle, both are meant to take the necessary precaution to avert a collision. The device would still sound an alarm even though it is not receiving infrared beams from the oncoming vehicle. This is due to reflection of its own infrared beams. At the end of the design and testing process, overall system was implemented with a constructed work, tested working and perfectly functional [4].

Lorate Shiny, A. Rajakumaran, S. Vijay [2015] presented paper on 'Vehicle Control System with Accident Prevention by Using IR Transceiver'. The project presented here is an approach towards vehicle navigation & safety implementation. As the title suggests, the project is aimed at automatically sensing the areas / zones like "School zone", "Work zone" or "Curve zone". As an example, near school zone, the sign board displays "School Zone Ahead, Drive Slowly", or near construction area, "Drive slowly, Work under construction". Drivers go at very high speed usually near school zone, or indulge in speeding causing inconvenience to the other vehicle users and pedestrians. Even though these are meant for the safety of the vehicles traveling and also for the general public, it is not usually practiced and ignored by the vehicle drivers. The main objective is to design a Vehicle controller meant for vehicles speed control and monitors the zones, which can run on an embedded system. Vehicle Controller can be custom designed to fit into a vehicles dashboard, and displays information on the vehicle. Once the information is received from the zones, the vehicles embedded unit automatically alerts the driver, to reduce the speed according to the zone, it waits for few seconds, and otherwise vehicles controller unit automatically reduces the speed [5].

3. EXPERIMENTAL SETUP

The Infrared Anti-Collision Device is expected to be made of relatively inexpensive components for easy purchase and incorporation. This research aims at the design of a prototype showing how this could function. The main objective is to give safety for moving cars having less space between two vehicles. The anti-collision device, when wired into the circuitry of a vehicle would help in the reduction of road mishaps. Though not every kind of collision can be helped by this, and it must be stated here that no allusion is being made that technology is the best line of action to take. It should be further noted that some already existing laws made use of technologies like the street lights and traffic lights. This would be a supplementation and not a replacement.

Robot Working

The sequence of operation for the machine robot is as follows:

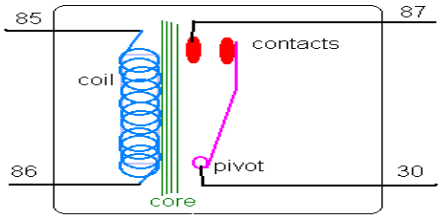
1. Front side sensor detects obstacle and then robot stop.
2. Right side sensor detect obstacle then robot move left side.
3. Left side sensor detect obstacle then robot move right side.
4. Back side sensor detect obstacle then robot stop.
5. Right & left side sensor detect obstacle simultaneously then robot stop.
6. Front & back side sensor detect obstacle simultaneously then robot stop.
7. Right, left, & front side sensor detect obstacle simultaneously then robot stop.
8. All four side sensor detect obstacle simultaneously then robot stop.

4. FEATURES AND WORKING OF COMPONENTS

1. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as

amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operation.



TERMINALS ASSOCIATED WITH THE SPST RELAY

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A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Fig 4.1: Relay

2. Infrared (I.R.) Sensor

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

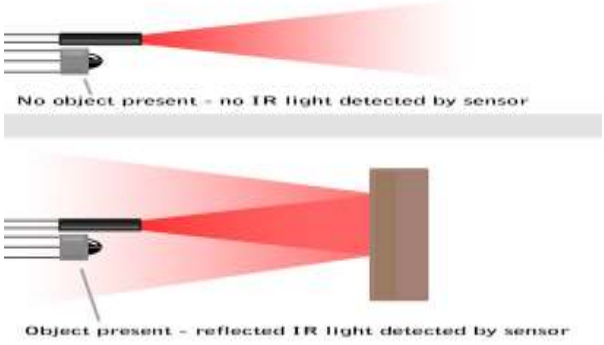

Fig 4.2: Infrared (I.R.)

3. Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store electrical energy temporarily in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e. an insulator that can store energy by becoming polarized). The conductors can be thin films, foils or sintered beads of metal or conductive electrolyte, etc. The non conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, air, vacuum, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

Fig 4.3: Capacitor

4. Transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals.

Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

Fig 4.4: Transistor

5. Voltage regular I.C.7805

7805is 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. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

6. Microcontroller 89S52

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions. The first one is to

perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/output pin.There are two different memory types RAM and EEPROM. Shortly, RAM is used to store variable during program execution, while the EEPROM memory is used to store the program itself, that's why it is often referred to as the 'program memory'. It is clear that the CPU (Central Processing Unit) is the heart of the micro controllers. It is the CPU that will Read the program from the FLASH memory and execute it by interacting with the different peripheralsDiagram below shows the pin configuration of the 89S52, where the function of each pin is written next to it, and, if it exists, the dual function is written between brackets. Note that the pins that have dual functions can still be used normally as an input/output pin. Unless the program uses their dual functions, all the 32 I/O pins of the microcontroller are configured as input/output pins.

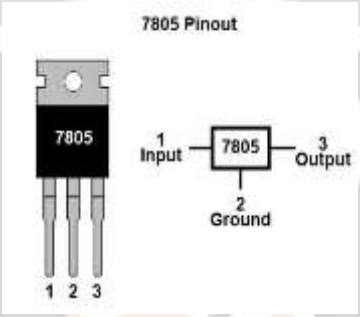

Fig 4.5: I.C. 7805

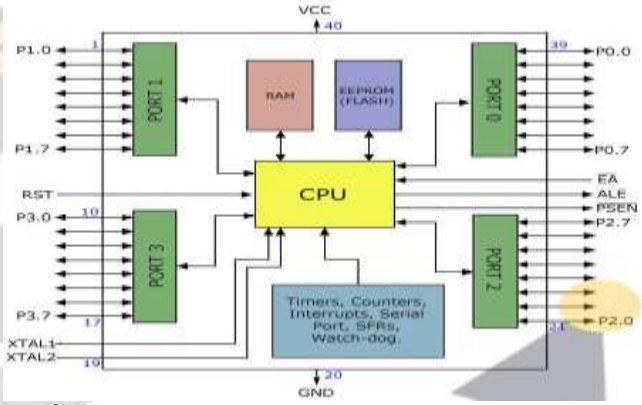

Fig 4.6.1: Actual diagram of Microcontroller 89S52

Fig 4.6.2: Port diagram of Microcontroller 89S52

5. DETAILS CONSTRUCTION & WORKING OF CIRCUIT

Circuit contained with components such as transistor, capacitor, I.R. sensor, voltage regulator, microcontroller, relay, D.C. motor & battery.

4 I.R. sensors is connected to first port of microcontroller. 4 transistors with 4 relay switch are connected to 2nd port. Other two ports are empty.

Relay required 9 volt power supply so it takes power directly from battery of 9 volt. Microcontroller 89S52 required 5 volt power supply so here we used power regulator I.C.7805 which reduced voltage of battery. With the help of regulator we supply required voltage to microcontroller.

When IR1 detect object then relay one is switch ON & microcontroller takes the necessary decision. Here is 4 I.R. sensors which operates there corresponding relays.

Relay 3 is normally connected to second port of microcontroller so that motor 1 & 2 always ON & robot move forward. IR1 is on right side which gives signal to relay 1. When it detect object robot move on left side by changing direction of rotation motor controlled by microcontroller. Likewise when relay 2 is ON, robot move right side, when IR3 detect object it gives signal to relay 3 & robot move reverse. Relay 4 is ON robot moves forward direction.

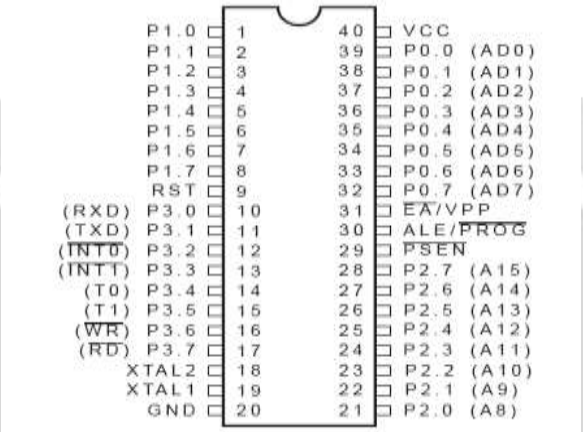

Fig. 4.6.3 Pin diagram of Microcontroller 89S52

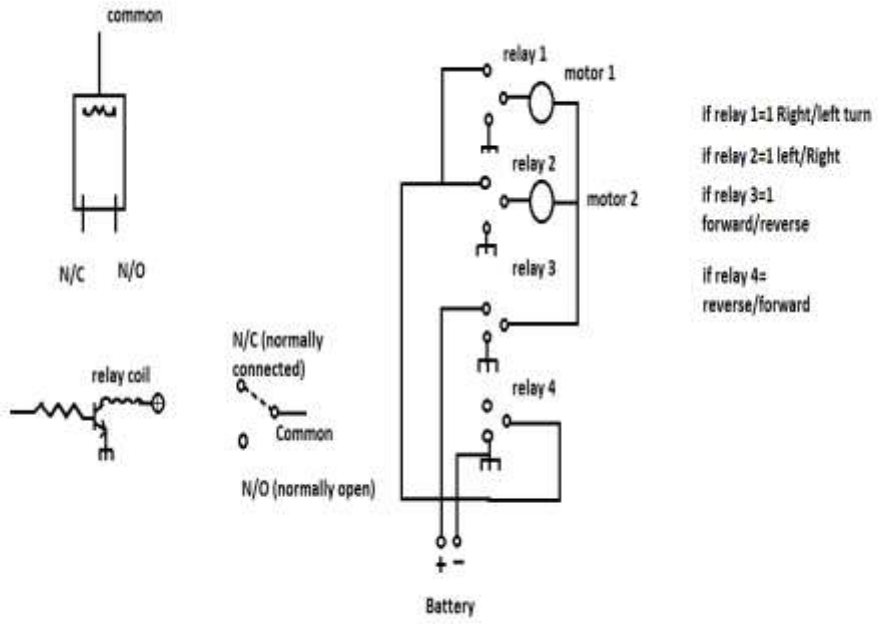

Fig. 5.1 Relay and motor circuit diagram with battery

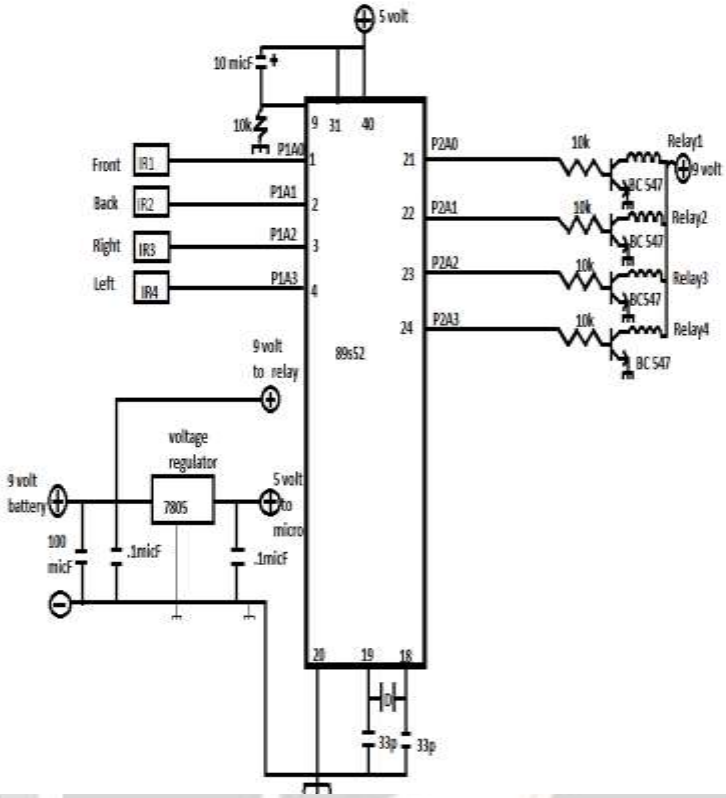

Fig. 5.2 Circuit Diagram of system

5.1Fuzzy logic

Here microcontroller used fuzzy logic so importance of fuzzy logic is increased. Fuzzy logic is a form of many-valued logic in which the truth values of variables may be any real number between 0 and 1, considered to be "fuzzy". By contrast, in Boolean logic, the truth values of variables may only be 0 or 1, often called "crisp" values. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false. Furthermore, when linguistic variables are used, these degrees may be managed by specific (membership) functions.

The term fuzzy logic was introduced with the 1965 proposal of fuzzy set theory by Lotfi Zadeh. Fuzzy logic has been applied to many fields, from control theory to artificial intelligence. Fuzzy logic had however been studied since the 1920s, as infinite-valued logic-notably by Łukasiewicz and Tarski.

In order to apply fuzzy logic to the robot's motion, a control scheme had to be developed to interpret measured distances. While the final algorithm depended critically on the geometry of the robot itself and how it operates, some basic guidelines were followed. Similar research projects provided both simulation results and ideas for implementing fuzzy control [1].

6. CONCLUSIONS

The system which is the design and construction of an anti-collision system for vehicles was designed considering some factors such as economy, availability of components and research materials, efficiency, compatibility,

portability and also durability. The performance of the system after test met design specifications. The general operation of the system and performance is dependent on the presence of two moving cars as they get closer to each other. However, it should be stated here that the system was aimed at fabricating prototype, a replica of the actual thing. It is economically viable to undertake certain system this way since testing would not cost so much. Any desire to implement this design into a vehicle would require a laser detector. The problem of power supply would not arise due to the amount of battery power from the car battery. Also the operation of the system is dependent on how well the soldering is done, and the positioning of the components on the Vero board. The IC's were soldered away from the power supply stage to prevent heat radiation which, might occur and affect the performance of the entire system. The construction was done in such a way that it makes maintenance and repairs an easy task and affordable for the user should there be any system breakdown. All components were soldered on one Vero-board which makes troubleshooting easier. In general, the system was designed, and the real time implementation done with a photo-type of the model.

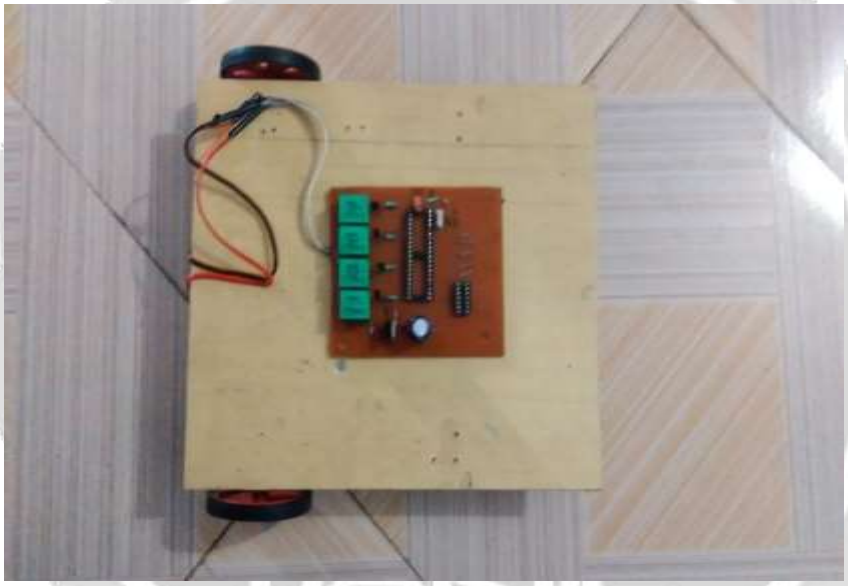

Fig.5.1.1 Fabricated View

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