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Abstract

We survey the new and exciting approach of Smartphone based robotics for research and education. The increase in the computational power and sensing of smartphones plus the recent availability of interface boards, have made this trend popular across a wide range of enthusiasts. Many of the wireless-controlled robots use RF modules. But this project makes use of Android mobile phone for robotic control. In this project we show you how to make an android phone control car using Bluetooth module and Arduino Uno Board. Overall this project cover everything you need to build up a mobile controlled car (Hardware + coding). We are using Arduino IDE software for compiling the code and Arduino Bluetooth Control mobile app for moving the car. The user can control the Car with the help of the joystick provided in the app or Voice Control.

TABLE OF CONTENT

LIST OF FIGURES

Page NO

Chapter 1

INTRODUCTION

Nowadays Smart-Phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. Bluetooth is mainly used for data exchange; add new features to smart phones. Bluetooth technology, created by telecom vendor Ericsson in 1994, shows its advantage by integrating with smart phones. Bluetooth controlled car is controlled by using Android mobile phone instead of any other method like buttons, gesture etc. Here only needs to touch button in android phone to control the car in forward, backward, left and right directions. So here android phone is used as transmitting device and Bluetooth module placed in car is used as receiver. Android phone will transmit command using its in-built Bluetooth to car so that it can move in the required direction like moving forward, reverse, turning left, turning right and stop.

1.1. Problem Statement

As the car is connected by Bluetooth module the range will not be great enough to control it from long distance**.** We connect the mobile Bluetooth with Bluetooth module i.e. HC-06 and use the Bluetooth controller app for moving the car in forward direction. Through this we can travel the things over a distance. It provides the better connectivity of communication.

1.2. Aim and Objective

 Our main Objective is to supply or receive objects from one place to another within the Bluetooth range. We are using the mobile for controlling the car and also kids can use this as toy car for playing games. It can also be used by handicapped persons.

Chapter 2
LITERATURE SURVEY

2.1 Android Phone controlled Bluetooth Robot

Robot is a reprogrammable, multifunctional device which is primarily designed to do work like human such as pick and place, loading and unloading, surveillance, health care, industrial, aerospace application. Robots can perform dangerous and accurate work to increase the productivity as they can work 24 hours without rest. This paper deals with the design and control of automated vehicle type robot which can move in desired direction and captures pictures and videos of required location. An android application has developed using MIT App inventor and a Bluetooth communication is made with robot which interfaces with microcontroller to control its speed and direction. Aim of this work is to design and control the motion of robot using Bluetooth device of an Android phone. [1]

 Advantages:

• Easy Control through mobile phone.

• Control at any time through any location.

• Accuracy in work

Disadvantages:

• Entirely based on a mobile phone.

• Bluetooth connectivity issues.

2.2 Android Application Based Bluetooth Controlled Robotic Car

Here main motto of this project is to control the car with android application. Here the requirements are mainly Arduino UNO (ATMEGA 328P), Bluetooth module (HC-05). Interfacing the Bluetooth module with the system so that we can easily control the system by smart phone application. This project is more necessary to the modern society in context of spying and surveillance. The project aims in designing a Robot that can be operated using Android mobile phone. The controlling of the Robot is done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in the project the Android smart phone is used as a remote control for operating the Robot. The controlling device of the whole system is a Microcontroller. Bluetooth module, DC motors are interfaced to the Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. The controller acts accordingly on the DC motors of the Robot. In achieving the task, the controller is loaded with a program written using Embedded 'C' language. Still there exists a requirement of a cost-effective automation system, which will be easy to implement. An example of such a cost-effective project has been proposed here[2].

Advantages:

• Pollution Free due to mobile controller.

• Save Time and Energy

Disadvantages:

• Sometime Robot can do Mistakes if code is not applied accurately.

• High Maintence is required to buy components.

2.3. AndroRC: An Android remote control car unit for search missions

The AndroidRC is a remote-control car (RC) unit controlled by a smartphone running on an Android application. The car is meant to be used in search missions in the occurrence of natural disasters. It is developed to autonomously avoid obstacles that are not visible to the user driver. The RC unit is developed based on a Tamiya 70112 Buggy car chassis set with an extra servo motor added to provide the left and right directions. The RC is equipped with an ultrasonic distance sensor, a camera, a Bluetooth receiver, a Wi-Fi transmitter, two 9-V batteries and two Arduino microcontroller boards (UNO and MEGA). The Arduino MEGA controls the propulsion and direction, while the UNO processes the information received from the distance sensor to stop the RC at a pre-defined distance. The Android application uses the embedded orientation sensor on the smartphone to determine the four directions (forward, backward, left and right) intended by the user; hence, rotating the smartphone to different directions results in to the corresponding propulsion of the RC unit. The control commands are transmitted to the RC unit through the Bluetooth communication. The Android application also receives (via Wi-Fi) and displays the information from the camera in real-time. The Android RC was characterized and examined on bench-top settings. [3]

Advantages:

• Military uses for security and surveillance.

• Due to the Wi-Fi it has long range network

Disadvantages:

• Due to the Wi-Fi network it reduces fast mobile charge.

• It makes the real life stagnant.

Chapter 3
SYSTEM METHODOLOGY

3.1. Hardware Requirements:

3.1. Arduino Uno:

The micro controller board used in our design is Arduino Uno, it is an open source platform used for building the electronic projects, it has both physical board and has own unique simplified programming language and has the endless possibilities such as we can interface several sensors, actuators like motors.
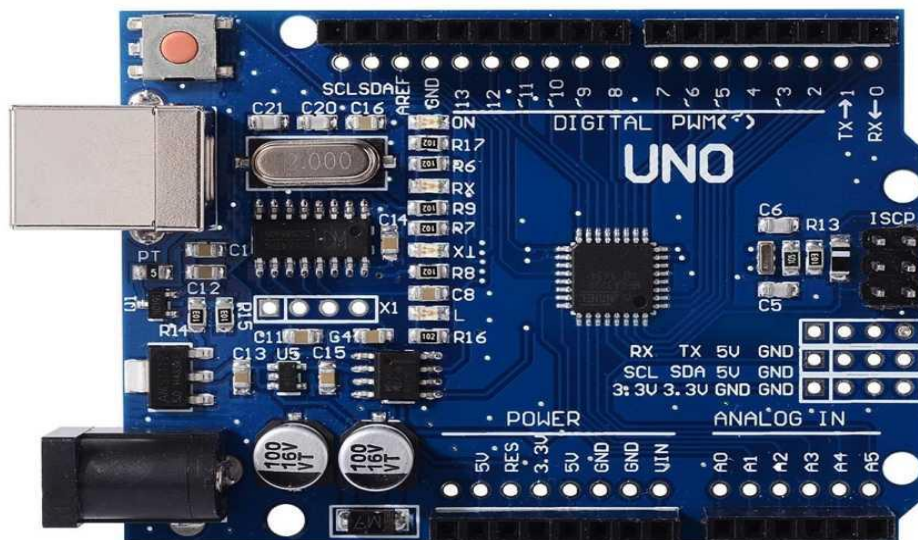

Fig 3.1. Arduino UNO [2]

3.2. Bread Board:

A Breadboard is a solder-less device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.
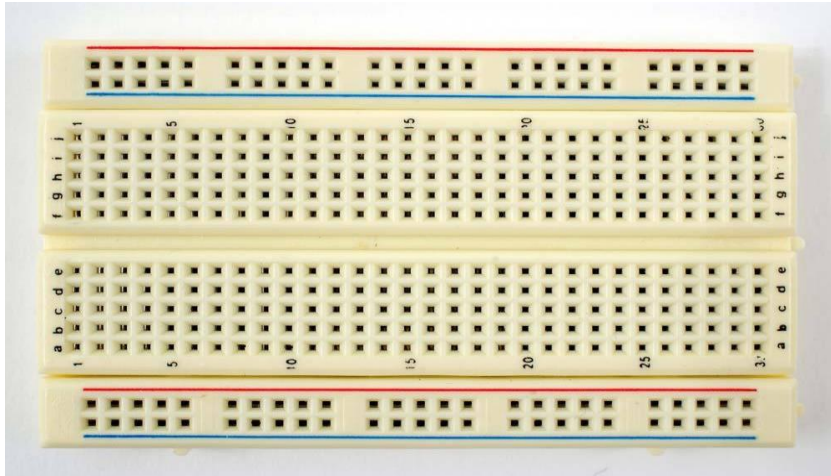
Fig 3.2. Bread-Board [1]

3.3. Bluetooth Module:

HC-06 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup

**Fig 3.3. Bluetooth Module [3]**

3.4. Motor Driver IC:

A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

Fig 3.4. Motor Driver IC [1]

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3.5. DC Motor:

For the working of the robot wheels we used the 200 rpm geared dc motors, the voltage limit of these geared dc motors is 5v-12v which can be connected to the Arduino micro controller board through the Motor Driver IC.
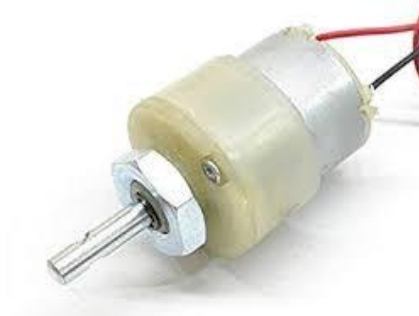
3.5. DC Motor [6]

3.6. Battery:

Lithium Ion Battery is used to supply the power for the rotation of the Motors, the specifications of the Battery is 12 V voltage and 2amp ampere hours.

Fig 3.6. Battery [4]

3.7. Chassis Kit:

The material of the Chassis is metal and it is rectangular shaped. And it is provided with spaces for mounting components.
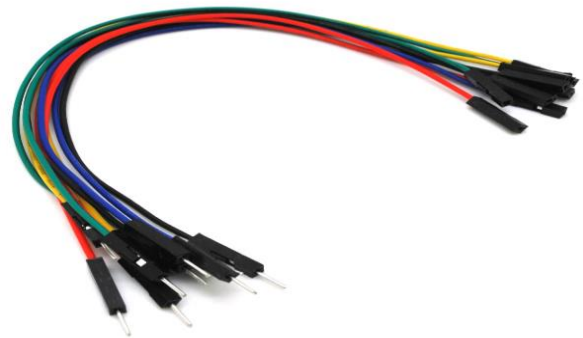
Fig 3.7. Chassis [2]

3.8. Jumper Wires:

Jumper wires are simply **wires** that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. **Jumper wires** are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.
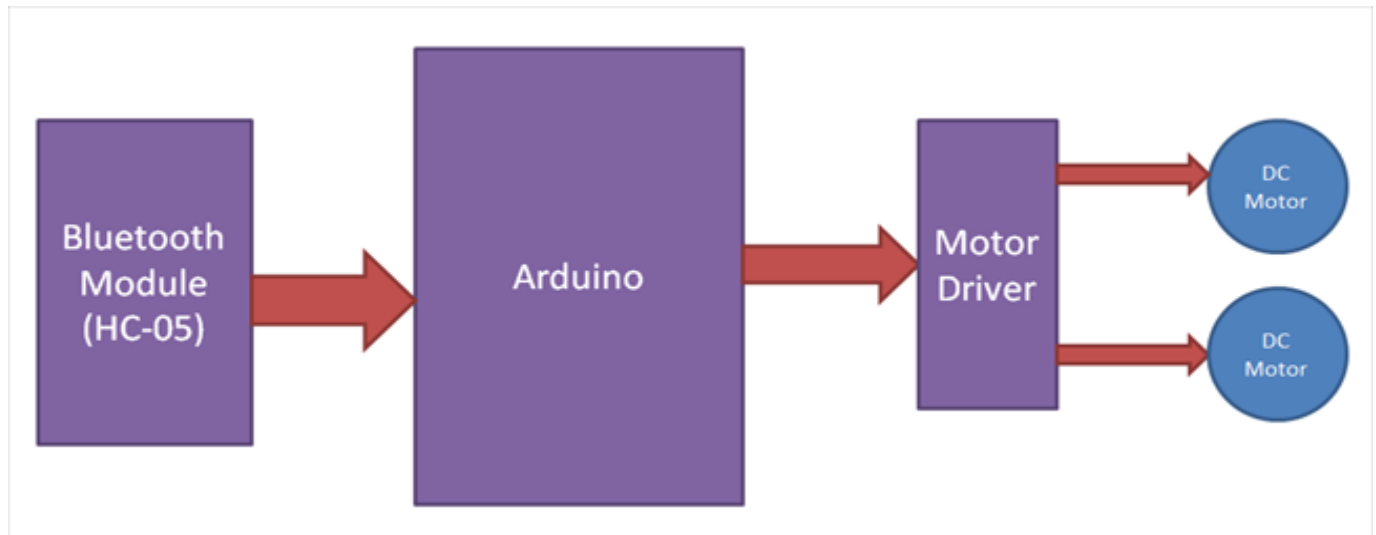

3.8. Male – Male Wires [3]

3.8. Male – Female Wire [3]

3.2. Software Requirement:

1. Operating System: Windows 10.

2. Coding Language: C language / Python language.

3. Application: Arduino IDE & Arduino Bluetooth Control App.

3.3 System Architecture

The system architecture of our machine is as follows:

3.3.1 System Architecture[6]

This car has four dc motors two at its front and two at its rear side. Front side motor is used for giving direction to car means turning left or right side (like real car steering feature). And rear side motors are used for driving the car in forward and backward direction. A Bluetooth module is used to receive command from android phone and Arduino UNO is used for controlling the whole system. Bluetooth controlled car moves according to button touched in the android Bluetooth mobile app. To run this project first we need to download Bluetooth app form Google play store. We can use any Bluetooth app that supporting or can send data. Here are some apps' name that might work correctly.

- Bluetooth Arduino Controller app
- Bluetooth Voice Control app

3.3.1. Flow of the Project:

1. The user connects to the Bluetooth module through his/her smartphone.
2. The user then opens the android application on the smartphone.
3. On this, the motors are connected to the wheels, on pressing the forward button on the app makes the machine moves in the forward directions.
4. And same applies to the other directions ie, Right, Left & Backwards.
5. To apply brakes on the machine we press the backward button on the app.

3.3.2 Constraints:

The drawback of our mini project is that is the most basic model and can be used on a very small area.

It cannot sense the obstacle in the surroundings.

Since Bluetooth is used, the range or the distance coverage will get reduced.

Since we are using Arduino UNO in our project implementation of extra activities gets limited.

It is slow and takes time

3.4. Implementation:

The Arduino Uno application is installed on the laptop for coding.

This code is then compiled and then uploaded in the Arduino through Arduino cable.
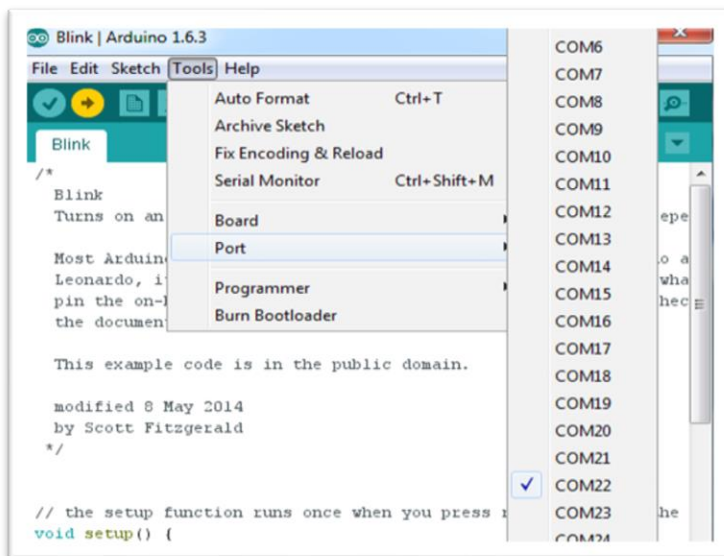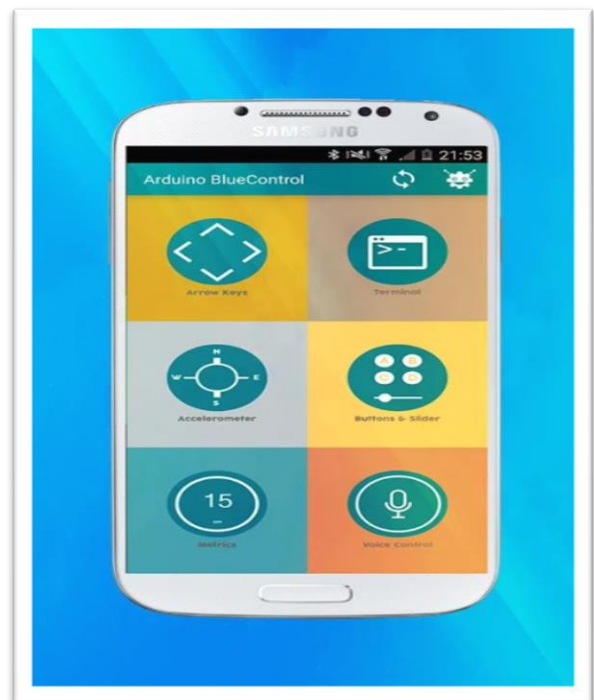

Fig 3.4.1 code Application [8]

Fig 3.4.2. Mobile App

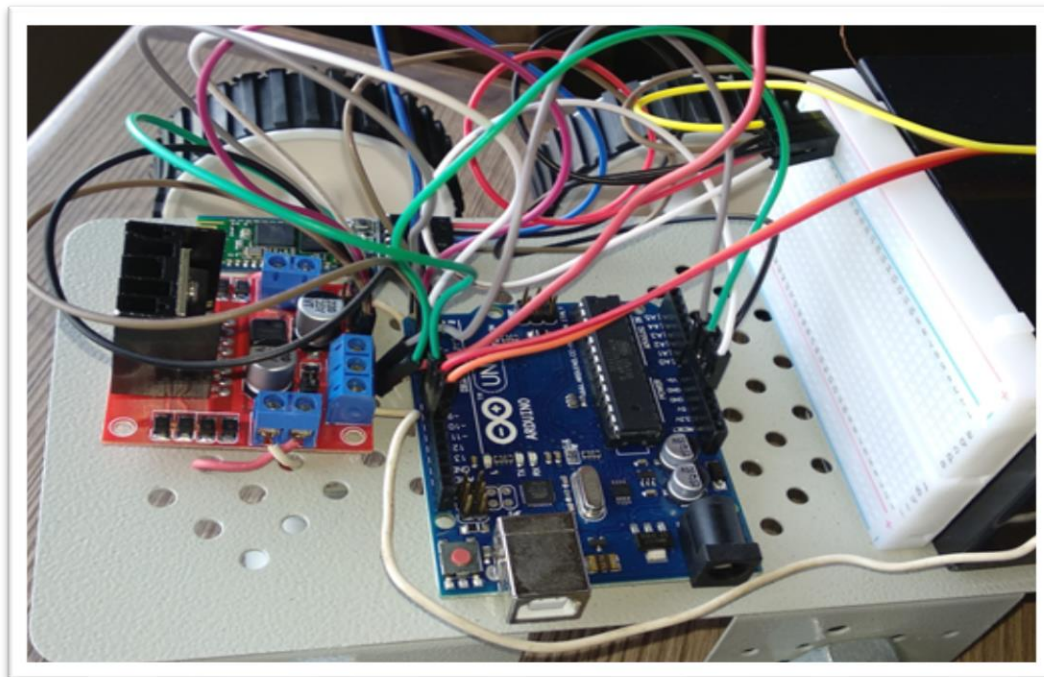The cables are connected as shown in the figure below.

Fig 3.4.3 Connection

In this diagram shown above bridge module is connected to the Arduino UNO using jumper wires and the bread board. It is mounted onto the chassis as shown in the figure.
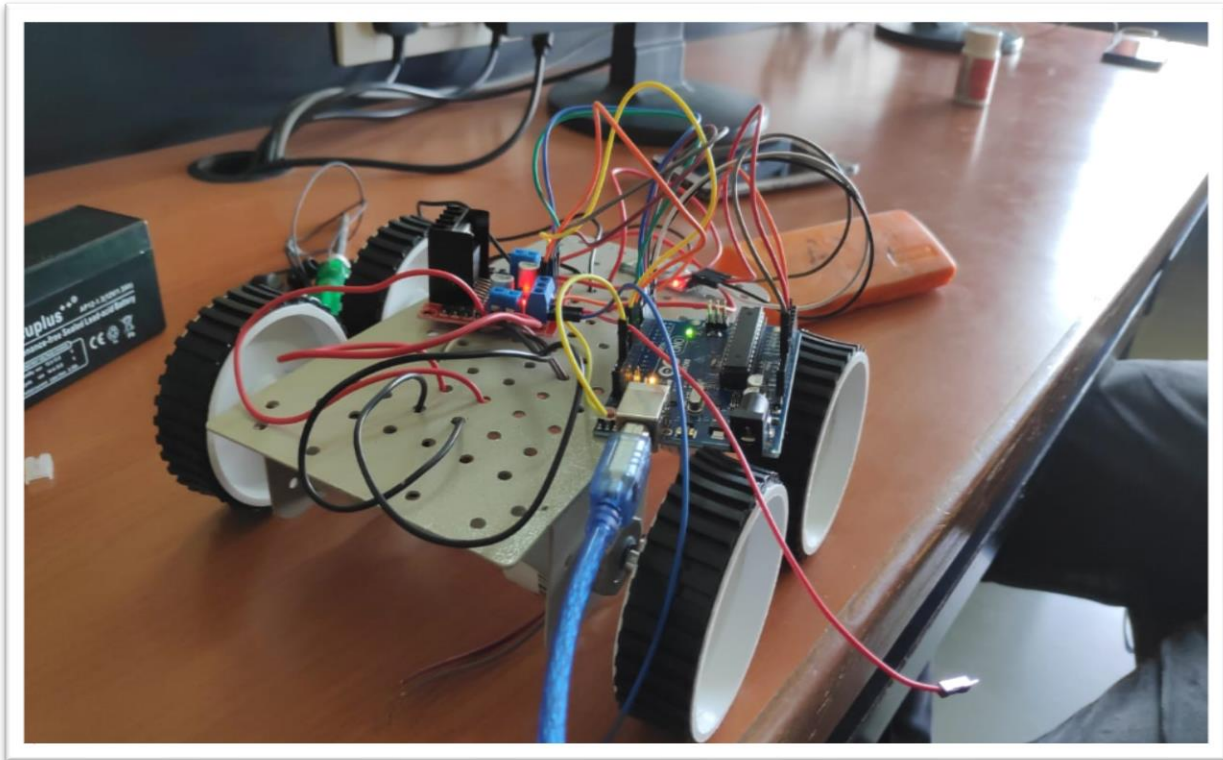

Fig 3.4.4 Back View

This figure represents the final implementation of the project. It consist of Arduino UNO, Bluetooth Module and a bridge module which are interconnected to each other. And all of this is been mounted on the chassis.

Chapter 4
CONCLUSION

Wireless control is one of the most important basic needs for all living beings. But unfortunately, due to a huge amount of data and communication overheads the technology is not fully utilized. Many of the wireless-controlled robots use RF modules. But this project makes use of Android mobile phone for robotic car control which is very cheap and easily available. The control commands available are more than RF modules. For this the android mobile user has to install an application on her/his mobile. Then user needs to turn on the Bluetooth in the mobile. The wireless communication techniques used to control the robot is Bluetooth technology. User can use various commands like move forward, reverse, move left, move right using these commands which are sent from the Android mobile. Robot has a Bluetooth receiver unit which receives the commands and give it to the microcontroller circuit to control the motors. The microcontroller then transmits the signal to the motor driver IC's to operate the motors the objective of the paper is to realize the smart living, more specifically the home lighting control system using Bluetooth Technology. Robot and smart phones are a perfect match, especially mobile robots. As phones and mobile devices are each time more powerful, using them as robot for building robot with advanced feature such as voice recognition. Android Bluetooth-enable phones and Bluetooth module via HC-06 and communication among Bluetooth devices.

It is concluded that smart living will gradually turn into a reality that consumer can control their home remotely and wirelessly.

4.1 Future Scope

We achieved Bluetooth control communication between the mobile -via android application- and the vehicle. In future we do a wireless camera is mounted on the robotic car vehicle for spying and surveillance purpose even in night time by using infrared lighting.

4.2. Limitations:

To setup Bluetooth home automation system you need to have a custom micro controller like the 8051 micro-controller, plus electro-mechanical relays that are capable of interfacing with the micro-controller like the power relay, contactor, time delay relay etc. Plus for the communication between the micro-controller and your mobile phone you will require a Bluetooth module.

Bluetooth will be a functionality issue.

1. Bluetooth communication only has range of 10-20 meters.

2. Once Bluetooth is disconnected app also disconnects and reconnecting Bluetooth is a task.

3. If you want another user to join this system a whole lot of code and configuration is needed.

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