CS09 608(P) MINI-PROJECT

Cell Phone Controlled Land Rover Robot with Home Automation

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CERTIFICATE

This is to certify that the report titled **Cell Phone Controlled Land Rover Robot with Home Automation** is a bona-fide record of the work related to the paper CS09 608(P) MINI-PROJECT done by **JISHNU P (Reg. No. VEANECS032)** of S6 Btech CSE (2013 admission) of Vidya Academy of Science & Technology, Thrissur - 680 501 in partial fulfillment of the requirement for the award of the Degree of Bachelor of Technology of University of Calicut.

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Abstract

The project is designed to develop a robotic vehicle that is controlled by a cell phone. DTMF commands from a phone are sent to another cell phone which is mounted on the robot. These commands are fed to an Arduino uno r3 to operate the vehicle movement through motor interface. The main scope of project is to send commands from one cell phone to be received by another cell phone mounted on the robot to receive the DTMF (Dual Tone Multi Frequency) mode commands which are then decoded by a DTMF decoder. The corresponding codes are then fed to an Arduino uno r3, programmed to recognize those codes to operate two DC motors through motor driver IC for any direction movement as per the sent commands from senders mobile. The motors are controlled using motor driver IC which is interfaced to the arduino. It uses arduino and a battery for power source.Further the project can be enhanced by interfacing it with additional motors for multipurpose activity. For example, it can be developed into pick n place robot or fire fighting robot with water pump etc.Home automation is done by the help of visuals received from the camera.

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Chapter 1

INTRODUCTION

A remote control vehicle is defined as any mobile device that is controlled by an external device. This is often a radio control device, cable between control and vehicle, or an infrared controller. A remote control vehicle (RCV) differs from a robot in that the RCV is always controlled by a human and takes no positive action autonomously.

One of the key technologies which underpin this field is that of remote vehicle control. It is vital that a vehicle should be capable of proceeding accurately to a target area; manoeuvrings within that area to fulfill its mission and returning equally accurately and safely to base

1.1 Motivation

Conventionally, wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: reception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task (action) is performed using motors or with some other actuators. so the motive is that to increase the range of remote controlled products.for this mobile phone operated control is best

because we can globalize our project & no limitation of range. As the provided DTMF is noise resistant technology it is a global approach for the design of land Rover robot.

1.2 Problem Statement

- Today it seen that wireless controlled robot have some limitations of short working range, limited frequency range and limited control.
- Sometimes it is difficult to perform home automation without the visuals of current circumstances.

1.3 Objective

The purpose of this project is to design a simple and automated system that can be used to control a land Rover robot. The means of accessing the system will be through a remote call (cell phone). The purpose of the land Rover is to move in various directions by steering with the cell phone, which can access inaccessible areas. In this case it achieves home automation by sending images to the owner.

1.4 Summary

The application areas are also vast with the simplest of modifications. Since all we need is a mobile call establishment to instruct the robot due to the cell phones unending and cheap availability, this is highly feasible. The signals received at the robots mobile is decoded with DTMF decoder which is easy to use. No heavy motors are employed in the making of the robot, and thus it becomes very light weight. The level of sophistication is quite low and hence its working is user friendly. Since this robot is highly flexible adding components to facilitate application specific working yields a robot that has high use in vast areas. This project can also be subjected to standardization and hence has a good future scope, such as night vision, radar implementation, position logging and distance sensing, multiple sensor detection etc.

Chapter 2

REQUIREMENT ANALYSIS

2.1 Hardware Requirements

- DTMF decoder IC (HT9170P)
- Motor Driver IC (L293d)
- DC Motors
- Batteries
- Arduino Uno r3
- Robot body
- Camera
- System Type: PC with 1GHz or higher
- RAM: 1 GB minimum
- Storage:1GB or higher

2.2 Software Requirements

- Arduino compiler
- Operating system : Windows 7 or higher

2.3 Functional Requirements

1. Land rover robot

   Forward, Backward, Right side motion, Left side motion, Stop.

2. Home Automation

   ON, OFF

Chapter 3

LITERATURE SURVEY

3.1 Arduino UNO R3

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

3.2 DTMF Decoder

This DTMF (Dual Tone Multi Frequency) decoder circuit identifies the dial tone from the telephone line and decodes the key pressed on the remote telephone. Here for the detection of DTMF signalling, we are using the IC MT8870DE which is a touch tone decoder IC. It decodes the input DTMF to 5 digital outputs. The M-8870 DTMF (Dual Tone Multi Frequency) decoder IC uses a digital counting technique to determine the frequencies of the limited tones and to verify that they correspond to standard DTMF frequencies. The DTMF tone is a form of one way

communication between the dialler and the telephone exchange. The whole communication consists of the touch tone initiator and the tone decoder or detector. The decoded bits can be interfaced to a computer or microcontroller for further application.

Table 3.1: DTMF Table
DTMF keypad frequencies and corresponding binary coded output

Button	Low DTMF frequency (Hz)	High DTMF frequency (Hz)	Binary coded output			
			Q1	Q2	Q3	Q4
1	697	1209	0	0	0	1
2	697	1336	0	0	1	0
3	697	1477	0	0	1	1
4	770	1209	0	1	0	0
5	770	1336	0	1	0	1
6	770	1477	0	1	1	0
7	852	1209	0	1	1	1
8	852	1336	1	0	0	0
9	852	1477	1	0	0	1
0	941	1336	1	0	1	0
*	941	1209	1	0	1	1
#	941	1477	1	1	0	0

3.3 Motor Driver L293D

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor.

In a single l293d chip there two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. Its like a switch.

3.4 Channel Relay

A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output cont actor). It is frequently used in automatic control circuit. To put it simply, it is an automatic switch to controlling a high-current circuit with a low-current signal.

The advantages of a relay lie in its lower inertia of the moving, stability, long-term reliability and small volume. It is widely adopted in devices of power protection, automation technology, sport, remote control, reconnaissance and communication, as well as in devices of electro mechanics and power electronics. Generally speaking, a relay contains an induction part which can reflect input variable like current, voltage, power, resistance, frequency, temperature, pressure, speed and light etc. It also contains an actuator module (output) which can energize or de-energize the connection of controlled circuit. There is an intermediary part between input part and output part that is used to coupling and isolate input current, as well as actuate the output. When the rated value of input (voltage, current and temperature etc.) is above the critical value, the controlled output circuit of relay will be energized or de-energized.

Chapter 4

MATERIALS AND METHODS

4.1 Proposed System

Cell phone frequency is used to overcome the range limit of the robot. Visuals transmitted through wireless display to do home automation.

4.2 Design Description

It has five modules

1. DTMF decoder: Decode analog frequency to binary digits.
2. Arduino uno: To program the robot to take action according to the input binary input signals.
3. Motor driver: Lead motor according to the inputs.
4. Wireless Camera: To transmit visuals.
5. Cell phones: To use cell phone communication frequencies

4.3 Block Diagram

Fig 4.1: In order to control the robot, need to make a call to the cell phone attached to the robot from any phone, which sends DTMF tunes on pressing the numeric buttons. The cell phone in the robot kept in 'auto answer' mode (if the mobile

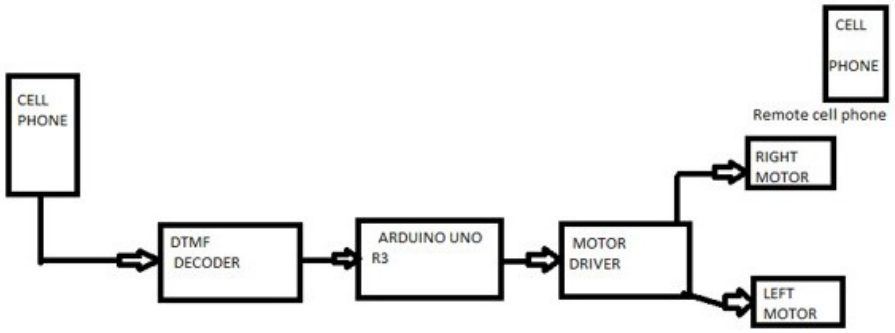

Figure 4.1: Cell phone operated land rover robot

does not have the auto answering facility, receive the call by 'OK 'key on the rover connected mobile and then made it in hands-free mode.) so after a ring, the cell phone accepts the call now you may press any button on your mobile to perform actions as listed in the table. The DTMF tones thus produced are received by the cell phone in the robot. These tones are fed to the circuit by headset of the cell phone.

The DTMF decoder decodes the received tone and sends the equivalent binary number to the arduino. According to the program in the arduino, the robot starts moving. When you press key '2' (binary equivalent 00000010) on your mobile phone, the arduino outputs to drive motors M1 and M2 in forward direction. Similarly, motors M1 and M2 move for left turn, right turn, backward motion and stop condition as per input from the cell phone.

Fig 4.2: In order to control the robot, need to make a call to the cell phone attached to the robot from any phone, which sends DTMF tunes on pressing the numeric buttons. The cell phone in the robot kept in 'auto answer' mode (if the mobile does not have the auto answering facility ,receive the call by 'OK 'key on the rover connected mobile and then made it in hands-free mode.) so after a ring, the cell phone accepts the call now you may press any button on your mobile to

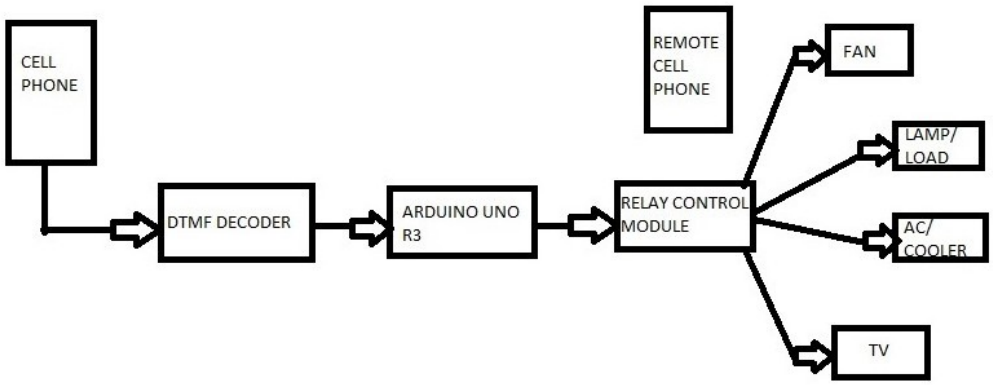

Figure 4.2: Cell phone operated home automation

perform actions as listed in the table . The DTMF tones thus produced are received by the cell phone in the robot. These tones are fed to the circuit by headset of the cell phone.

The DTMF decoder decodes the received tone and sends the equivalent binary number to the arduino. According to the program in the arduino, the robot starts moving. When you press key '1' (binary equivalent 00000001) on your mobile phone, the arduino outputs to channel relay. It perform the home automation.(press 1 in cell phone for ON, 3 for OFF).

Chapter 5

IMPLEMENTATION DETAILS

We are dividing projects into several modules. Programming of arduino uno using arduino programming language. Connect the circuits using jumper wires.

5.1 Tools Used

- Arduino 1.6.8 : The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board.
- Soldering iron
- lead wire

5.2 Languages Used

- Arduino programming language

  Arduino programs may be written in any programming language with a compiler that produces binary machine code. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written

in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It is designed to introduce programming to artists and other newcomers unfamiliar with software development.

Chapter 6

EXPERIMENTAL RESULTS AND DISCUSSIONS

6.1 Testing

6.1.1 Unit Testing

It is done on individual modules. Testing done by checking the motors rotating direction according to the program.

6.1.2 Integrated Testing

Tested using various batteries according to their power capacity. Found that power of motor varies according to it.

6.2 Gallery

Figure 6.1: Channel relay

Figure 6.2: Arduino uno r3

Figure 6.3: Motor driver L293D

Figure 6.4: DTMF decoder HT9170P

Figure 6.5: bulb ON

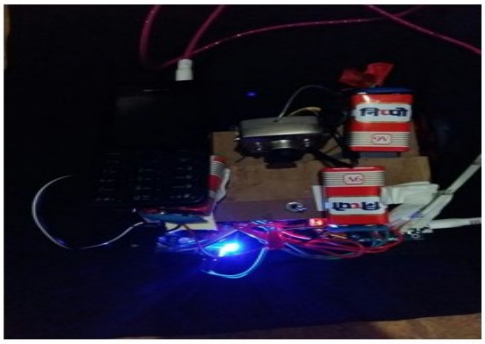

Figure 6.6: Land rover robot

Figure 6.7: Home automation

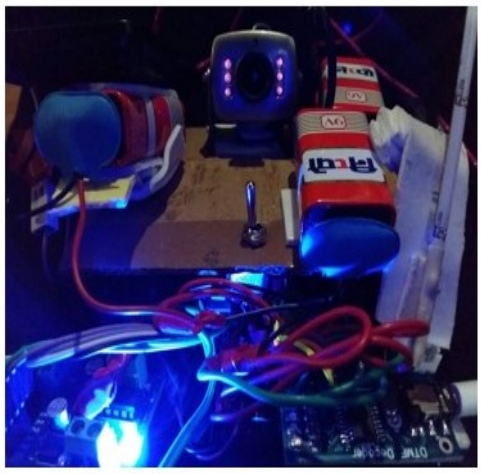

Figure 6.8: Robot

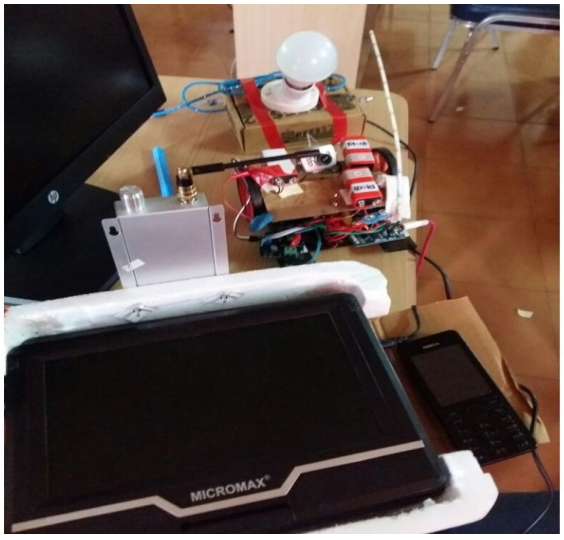

Figure 6.9: Cell phone controlled land rover robot with home automation

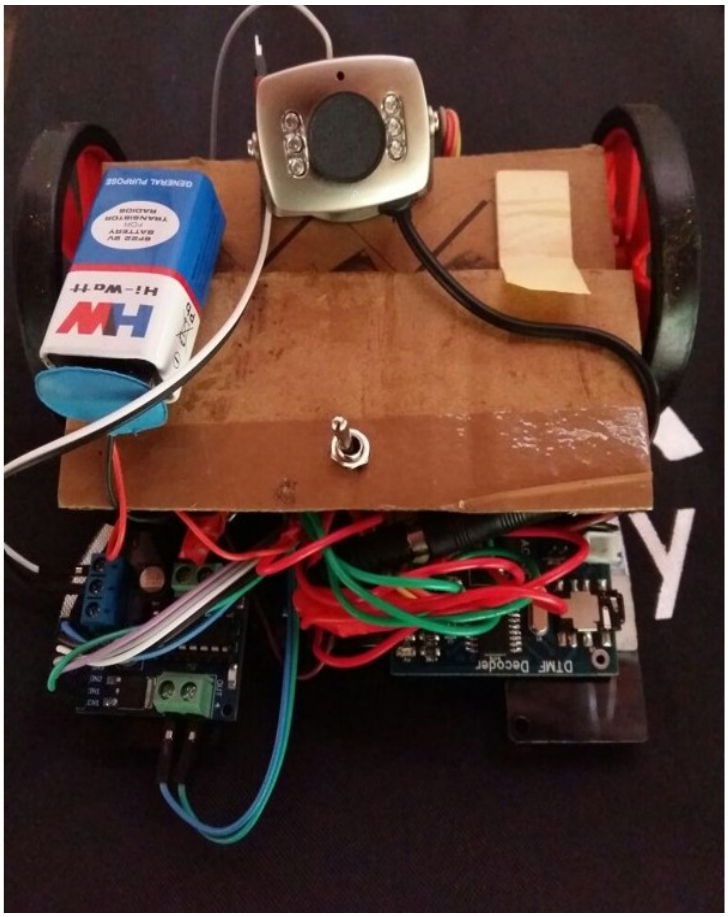

Figure 6.10: Cell phone operated land rover robot

Chapter 7

CONCLUSION AND FUTURE WORKS

Today it seen that wireless controlled robot have some limitation of short working range, limited frequency range and limited control. As the operation of robot is control by cellular frequency which having very large range compare to any other wireless remote control. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: reception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, a0nd the task (action) is performed using motors or with some other actuators. So the motive is that to increase the range of remote controlled products. For this mobile phone operated control is best because we can globalize our project & no limitation of range.

Todays homes require sophistication control in its different gadgets which are basically electronic appliances. This has revolutionized the area of home automation with respect to an increased level of affordability and simplicity through the integration of home appliances with mobile phone connectivity. Smart phones are already feature-perfect and can be made to communicate to any other devices in an ad hoc (A wireless ad hoc network (WANET) is a decentralized type of wireless network. The network is ad hoc because it does not rely on a pre existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Network with a connectivity options like blue-

tooth. As the operation is control by cellular frequency which having very large range compare to any other wireless remote control. It provides the advantages of robust control, working range as large as the coverage area of the service provider.

In future, this cell phone operated robot can also use for military purpose by eliminating its low security problem over its controlling.

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