ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Cell Phone Driven Land Rover

Prashanna Rangan R

Department of Mechatronics Engineering, Kongu Engineering College, Perundurai, India

Abstract: Automatic controlling of a vehicle is very essential in the recent scenario, which can become possible by implementing the dual tone multi frequency (DTMF) based obstacle avoider robot, by which any vehicle can be controlled by utiliing the mobile phone signal. This robot analyzes and make use of the unique frequencies (both low and high) provided by the carrier network to control the motions of the vehicle. The vehicle is controlled by the microcontroller, which is preprogrammed in a way to respond to the signals received from the DTMF decoder. The vehicle is equipped with pairs of sensors to avoid collisions. It is an efficient way of controlling a vehicle automatically. There will be a greater development in the fields of military and domestic application, when this technology is implied.

Keywords: Arduino ATmega 328P, DTMF board, Vehicle automation, Obstacle avoider, Dual full bridge L298 motor driver.

I. INTRODUCTION

Motivation for the Project

A vehicle (from Latin: vehiculum) is Arduino based vehicle controlling system, which does the same with the aid of a DTMF board attached to it.

Existing Technology

The system uses [1] ARM controller and ADC to bring all data in digital format. The Master and slave communication between two controller are developed via Controller area network (CAN) The System is having GSM (Global system for mobile communication) modem, which will help to communicate to or from remote location in case of any emergency. The system uses µcos-II operating system. This operating system enhances performance of control and simplifies the design and management software. In order to achieve high speed and secure data transmission CAN network is used among controllers. This information is given to central CPU via CAN. Fuel level, Obstacle measurement is carried by ultrasonic principle. Impact sensor gets activated in case of accident. Z axis movement is required as safety control if vehicle lifted on crane. PIR sensor is used to detect human body interface for motorized mirror. Reed relay is used for speed measurement. This speed can be governed by central CPU. It consists of one master node and two slave nodes. ARM controller act as the master controller, which controls the vehicle status with various sensors. Two ARM ICs are used as slave nodes to receive the inputs of vehicle status. The communication between these sensors is done by using CAN controller. Slave controller receives the signals from vehicles like temperature, fuel level, and obstacles. GSM is interfaced with master controller. Master controls the status of vehicle and sends the feedback to operator panel by providing digital information's via LCD display and alarms. Here Operator interface is digital type. By this operator can easily see the signals and able to control the vehicle. Obstacle sensor helps in identifying the obstacles presence around the vehicle. Vibration sensor detects external force (Hit by other vehicle or medium etc.,) and sends the signal to GSM. GSM will send the message to the owner of the vehicle. By GSM modem we can establish communication to or from vehicle. Human body sense for windows of vehicle is detected by PIR sensor.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Demerits of Prevailing Technology

The above discussed GSM based vehicle controlling technology is of high cost and the purpose of implementing this technology does not provide a complete automation to the vehicle. However it is difficult for middle class people to implement this technology into their vehicles, as they could not afford the huge sum, to do some simple operations.
Another major drawback in the existing system is that it does not provide a complete automation, yet sends only a signal to the owner of the vehicle stating the issues occurred.

Proposed System

The paper aims at providing automation to the vehicles by implementing mobile technologies. To make the automation of vehicles possible, the project comprises of a DTMF (Dual Tone Multi Frequency) board, by which the frequencies of the numbers are converted into logical values. The ultimate objective of the paper is to promote the information that the automobiles can also be controlled by a mobile phone with the help of tower signals which cost as low as the cost of a normal conversation. This idea is one of the efficient approaches in remote controlling as it uses the network signals which are available almost everywhere. The major advantage of this approach over other technologies is the availability of the carrier signal. The other objective is that the automobiles can be controlled remotely for both emergency as well as anti-robbery purposes.

II. COMPONENTS USED AND ITS WORKING

Electric Motor

There are two electric motors in this proposed model, a DC motor for driving the cross slide through a belt drive and a DC stepper motor for rotating the work piece to the preferred step angle for required number of teeth.

DC motor: The DC motor shown in the Fig. 1 is used to drive the cross slide to provide linear movement. This motor can deliver high output torque as it consists of worm and worm wheel arrangement fitted into its shaft and is housed perfectly. Rotation is possible in both clockwise and also in counter clockwise directions.

Fig. 1. DC motor.

DC motor specifications: The electric power supply necessary to run the DC motor is obtained from a H- Bridge motor driver board and a 12 V Battery. The technical specifications are mentioned in the Table 1.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Table 1. Technical specification of 12 V DC motor.

Voltage	12V DC
No Load Current	300 mA
Load Current	1.3 A
RPM	100 at 12 V
Stall torque	10 kg-cm at stall current of 1.3 Amp
Shaft diameter	6 mm
Shaft length	22 mm
Gear assembly	Spur
Brush type	Carbon
Motor weight	143 gms

DC motor driver: The motor drivers are used for quiet and smooth operation of the motor. The dual full bridge L298 motor driver shown in Fig. 2 is a high voltage, high current dual full- bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage and high precision current feedback and this is absolutely silent when the motor is stopped or turning slowly. It virtually eliminates stopped-motor heating regardless of power supply voltage. The Table 2 shows the technical specifications of the motor driver.

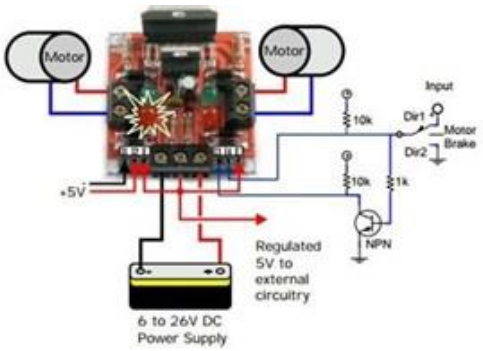

Fig. 2. Motor driver.

Table 2. Technical specification of motor driver.

Input Voltage	6 to 26 V DC
Current rating	Upto 4A max
Driving capacity	Can drive two motors at a time

Arduino Atmega 328-P

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board [2] (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. Arduino ATMEGA is a microcontroller board based on the ATmega328P which is shown in the Fig. 3.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Fig. 3. ARDUINO ATmega.

An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly overvarious pins, but many shields are individually addressable via an I²C serial bus—so many shields can be stacked and used in parallel. Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega328-P, ATmega1280, and ATmega2560. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer [3]. Currently, optiboot boot loader is the default boot loader installed on Arduino ATMEGA.

Specifications

The technical specifications of the Arduino ATmega and other related specifications are described on the Table 3.

Table 3. Technical specifications of Arduino ATmega.

Microcontroller	ATmega328P
Operating Voltage	5 V
Input Voltage (recommended)	7 – 12 V
Input Voltage (limits)	6 – 20 V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3 V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Dual Tone Multi Frequency

Definition: DTMF stands for Dual Tone Multi Frequency [4], i.e., each number in the mobile phone's dial pad consists of two unique frequencies, a low and a high frequencies. The Telephony Application Program Interface (TAPI) provides a way for a program to detect DTMF signals.

Working principle: There is always a possibility that a random sound will be on the similar frequency which will trip up the DTMF sounds system [5]. Accuracy is provided for sure, if two tones were used to represent a digit, the probability of a false signal happening is ruled out, thus the name 'Dual Tone'. This is the basis of using dual tone in DTMF communication. DTMF dialing uses a keypad with 12 or 16 buttons. Each key pressed on the keypad generates two tonnes of particular frequencies, so a voice or a random signal cannot mimic DTMF signaling tones. One tone is generated from a high DTMF frequency group of tones and the other from low DTMF frequency group.

When a button is pressed, both the row and column tones are generated by the telephone or touch tone instrument. These two tones will be distinctive and different from the tones of the other keys. So, there is a low and high frequency associated with a button. It is essentially the sum of two waves transmitted. This elementary principle can be extended to a range of applications. Each row and column of the keypad corresponds to a certain tone and creates a specific frequency. Each button lies at the intersection of the two tones.

Application of DTMF

DTMF involves a wide range of applications, which includes an additional application that it can be transmitted over a radio to switch ON or switch OFF home appliances, flash lights, motors, cameras, warning systems, irrigation systems and so on. These encoded data can be stored and processed in a microcontroller to perform different, i.e., Automatic Garage Door Opening System, Cell Phone Controlled Robotic Vehicle using DTMF Technology and so on (Fig. 4).

Fig. 4. DTMF board.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Usage of DTMF in the Model

A DTMF board is used in automised mobile controlled land rover, in order to receive the signals produced by the key press of a dialpad. This board actually distinguishes the frequencies of various dials and converts them into logical values, which are further processed and analyzed for the programmed execution of the movement of the vehicle with the aid of an ARDUINO BOARD.

III. WORKING OF THE MODEL

As soon as the frequencies from the mobile phone get trapped by the DTMF board and are converted and sent to the ARDUINO board. It is programmed in such a way that the logic values must be converted into their respective commands as they are pre-programmed.

First find target region using mask image and then find boundary of target region. For all the boundary points it defined patch and find the priority of these patches. It starts filling the target region from the highest priority patch by finding the best match patch. This procedure is repeated until entire target region is inpainted.
The algorithm automatically generates mask image without user interaction that contains only text regions to be inpainted.

IV. EXPERIMENTAL RESULTS

As soon as the frequencies from the mobile phone get trapped by the DTMF board and are converted and sent to the ARDUINO board. It is programmed in such a way that the logic values must be converted into their respective commands as they are pre-programmed (Fig. 5).

Block Diagram

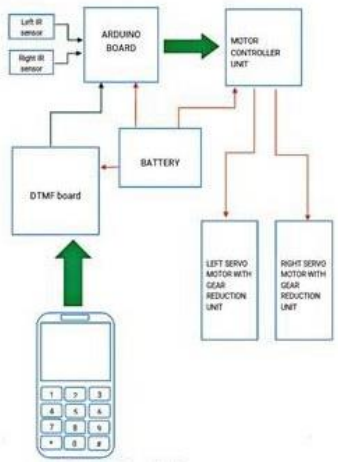

Fig. 5. Block diagram.

Working Principle

The program from Arduino IDE software is fed into the Arduino ATmega through USB cable. Battery powers the DC motor through motor driver. Initially the vehicle is powered with the help of the battery, but when the owner of the vehicle finds any suspicious activity, he is empowered to drive the vehicle irrespective of the distance.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

Coupling the Arduino board with the vehicle: This is the most important stage by which the commands are sent directly to the vehicle's engine and turn controls from the ARDUINO board. This involves an ELECTRO-MECHANICAL coupling in order to execute the commands. By implementing this innovative technology, it is possible to automate the vehicle and to override its manual drive, with the help of microprocessors, which judges every happenings of the road in a way similar to a human brain. The vehicle comprises of pairs of ultrasonic sensors which are fixed at positions all over the body of the vehicle, which senses any obstacle that comes its way, so as to avoid an imminent collision. The microcontroller is programmed in such a way that if any obstacle comes on its way, the vehicle immediately responds to it and behaves in a way to safeguard itself from any collision and accident. This technology of automizing the vehicles has an immense potential that it can avoid any road accidents, that occur due to the mistake committed by the drivers during their drive. Even if the vehicle is in manual drive, the sensors are active all the time from the start of the vehicle to the end. In a practical application, it also involves an additional GPS tracker chip attached to the vehicle in order to attain its exact location in real time.

Scenario of Working of the Prototype

The prototype of the present model is shown in the Fig. 6. It consists of a DTMF board, an ARDUINO MICROCONTROLLER containing ATMEGA 328-P IC, which provides the commands to the vehicle. Instead of gear box and engine, the vehicle moves with the aid of a pair of SERVO MOTORS, coupled to gear reduction unit. Thus, in this model, the output of the ARDUNIO board is coupled with the H-BRIDGE MOTOR DRIVER board which is used to run the servo motors. The motors are fixed to the chassis of the vehicle so as to drive the rear wheels.

In addition the prototype has a pair of IR sensors attached to it at the front in order to avoid an imminent collision.
There is a mobile phone connected to the vehicle with the help of an auxillary cable connected to the headphone jack of the mobile phone. In real time applications, there will be only a motherboard of a mobile phone with a sim card present in it. The board gets its power directly from the vehicle's battery, thereby minimizing the risk that someone else could find such a technology implemented to the vehicle. Further, the IR sensors are replaced by ULTRASONIC sensors which have the potential of detecting any obstacle at a much farther distance than the IR sensors.

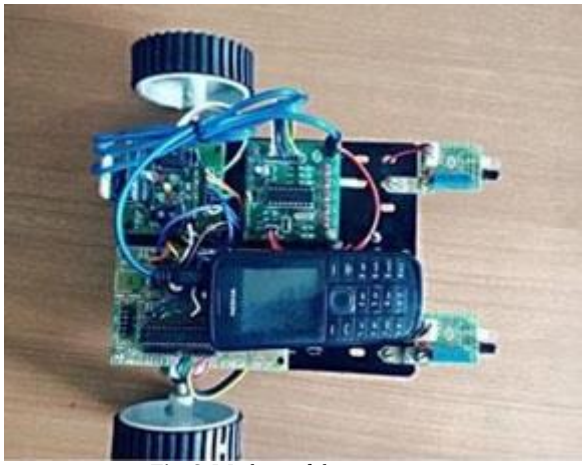

Fig. 6. Working of the prototype.

Advantages of this Technology

1. This system has many advantages when compared with the other technologies.
2. It gives a real-time control of vehicle irrespective of distance.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

3. It gives an additional safety to the vehicles and provides a fearless state to the owners regarding robbery of their vehicles.
4. It has the potential to reduce the road accidents that may occur due to lack of road sense and carelessness.

V. USES OF THIS TECHNOLOGY

Implementation of this vehicle automation technology involves a wide variety of uses which includes a high amount of safety to the vehicle owners and to those who travel in the vehicle.

Military Applications

When the vehicle automation technology is implemented correctly, an armored military jeep loaded with weapons can be built, which can be controlled remotely by making use of only a mobile phone. Thus, there comes safety to the soldiers at the war field, yet the task of safeguarding the nation is not disturbed in any way, as the vehicle functions of its own and responds to the commands given by the commander.

Domestic Applications

The vehicle automation technology has many pros for domestic applications. If a robbery occurs the owner of the vehicle immediately gets an alert message stating that there is a robbery and the present location of the vehicle is sent with the help of an additional GPS tracker, installed to the vehicle. Thus, the owner can control his / her vehicle from wherever they are, irrespective of the distance just by making a phone call. The vehicle comes to the owner's control and at this moment, there is possibly no chance for a manual override to control the vehicle. The doors of the vehicle also gets locked simultaneously and thus the thief cannot escape. An advantage is that the vehicle's program is in such a way that as soon as the GPS alert signal reaches the owner, it searches for a nearby police station and drives the car to it. As there are sensors installed all over the vehicle, there is no possibility for an accident to occur.

VI. MERITS AND DEMERITS IN IMPLEMENTING THE VEHICLE AUTOMATION TECHNOLOGY

Merits

1. The vehicle can be controlled remotely from anywhere irrespective of the distance.
2. Reliable and cost efficient.
3. The vehicle automation technology provides easy accessibility to the vehicle with mere mobile phone.
4. Risks of road accidents is reduced.
5. High levels of safety regarding the vehicle is ensured.

Demerits

1. Accuracy in controlling the vehicle depends mainly on signal strength.
2. The vehicle automation technology involves keen attention to drive the vehicle using a mobile phone in high densed traffic areas.

ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 6, Issue 5, May 2017

VII. CONCLUSION

It will be a great achievement when a vehicle is controlled by the owner's mobile phone with high degree of cost efficiency and accuracy. If the vehicle automation technology exists in future, then the development in the field of automobile automation and the parameter of safety and emergent availability will be achieved.

If the vehicle automation technology does not exist, then the automobile automation will become a daydream and go in a path, which will be of many problems, including high installation and maintenance costs for any other technology similar to this. Moreover, there will be no assurance for cent percent accuracy.

REFERENCES

[1] GSM based vehicle control system using “CAN” Protocol, Vol 2, no 6, 2015.
[2] M. Michael, "ARDUINO application via ARDUINO Cookbook". 2011.
[3] JD. Warren, A. Josh,M. Harald, "Advanced programming for ARDUINO from the ARDUINO Robotics". 2011.
[4] DTMF technology from the open source WIKIPEDIA.
[5] Dodd, Z. Annabel, "The essential guide to telecommunications", Prentice Hall PTR, pp. 183, 2002.