Department of Electronics and Communications Engineering

Robotic Vehicle Controlled Over GSM Network Using DTMF Technology

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April 2016

Letter of Transmittal

To
Md. Asif Hossain
Senior Lecturer
Department of Electronics and Communications Engineering
East West University

Subject: Submission of Project Report as (ETE-498)

Dear Sir,

We are pleased to let you know that we have completed our project on GSM based robot. The attachment contain of the project that has been prepared for your evaluation and consideration. Working on this project has given us some new concepts. By applying those concepts we have tried to make something innovative by using our theoretical knowledge which we have acquired since last four years from you and the other honorable faculty members of EWU. This project would be a great help for us in future.

We are very grateful to you for your guidance, which helped us a lot to complete my project and acquire practical knowledge.

Thanking You.

Yours Sincerely

Arefeen Binta Belal
ID# 2012-2-55-013

Mithila Mahjabin
ID# 2012-1-55-021

Dept. of ECE
East West University

Declaration

This is certified that the project is done by us under the course "Project (ETE-498)". The project of **Robotic vehicle based on GSM** has not been submitted elsewhere for the requirement of any degree or any other purpose except for publication.

Arefeen Binta Belal

ID# 2012-2-55-013

&

Mithila Mahjabin

ID# 2012-1-55-021

Acceptance

This project paper is submitted to the **Department of Electronics and Communications Engineering, East West University** is submitted in partial fulfillment of the requirements for the degree of **B.Sc** in **ETE** under complete supervision of the undersigned.

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Md. Asif Hossain
Senior Lecturer
Dept. of ECE
East West University

Abstract

In the past years, the motion of wireless robotic vehicles has been restricted by limited distance of control, line-off site control and interference which is mainly caused by the use of Infra-Red and Radio Frequency circuits for the remote control of the robot. This project presents a solution to such problem whereby a GSM based remote control system is used to control a robotic car. This is done in such a way that to control the robot, the user makes a phone call to the phone attached to the robot which automatically answers the call. During the phone call, the user can control the robotic car with the keys on the phone by the use of DTMF tone. Hence the user can control the robotic car from anywhere no matter the distance without interference so far as the robotic car can be seen by the user. The design methodology involves four stages, namely: power supply unit, the input unit, the control unit and the output unit. The performance evaluation of the designed work after series of tests was very satisfactory.

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CHAPTER1:
INTRODUCTION

Radio control (often abbreviated to R/C or simply RC) is the use of radio signals to remotely control a device. The term is used frequently to refer to the control of model vehicles from a hand-held radio transmitter. Industrial, military and scientific research organizations make use of radio-controlled vehicles as well.

A remote control vehicle is defined as any mobile device that is controlled by a means that does not restrict its motion with an origin external to the device. This is often a radio control device, cable between control and vehicle, or an infrared controller. A remote control vehicle (Also called as RCV) differs from a robot in that the RCV is always controlled by a human and takes no positive action autonomously. The IR system follows the line of sight approach which involves the process of actually pointing the remote at the device being controlled; this makes communication over obstacles and barrier quite impossible.

To overcome such problems, a signaling scheme utilizing voice frequency tones is employed. This is known as Dual Tone Multi-Frequency (DTMF), Touch Tone or simply tone dialing. A valid DTMF signal is the sum of two tones, one from a low group (697-941Hz) and the other from a high group (1209-1633Hz) with each group containing four individual tones. DTMF signaling therefore play an important role in distributed communication systems such as multiuser mobile radio. In this paper, phones making use of the GSM network interfaced directly with the DTMF decoder and the motor driver is used to remotely control an unmanned robotic vehicle thus overcoming the distance barrier problem and communication over obstacles with very minimal or no interference but is solely network dependent. The design of unmanned vehicle proposed here does not make use of any microcontroller. The transmitter use is a handheld cell phone.

CHAPTER 2:
HISTORY

History of Remote Controlled Vehicles:

The First Remote Control Vehicle I Precision Guided Weapon:

This propeller-driven radio controlled boat, built by Nikola Tesla in 1898, is the original prototype of all modern-day uninhabited aerial vehicles and precision guided weapons. In fact, all are remotely operated vehicles in air, land or sea. Powered by lead-acid batteries and an electric drive motor, the vessel was designed to be maneuvered alongside a target using instructions received from a wireless remote-control transmitter. Once in position, a command would be sent to detonate an explosive charge contained within the boats forward compartment. The weapon's guidance system incorporated a secure communications link between the pilots' controller and the surface-running torpedo in an effort to assure that control could be maintained evening the presence of electronic countermeasures. To learn more about Tesla system for secure wireless communications and his pioneering implementation of the electronic logic-gate circuit read 'Nikola Tesla—Guided Weapons & Computer Technology', Tesla Presents Series Part 3, with commentary by Leland Anderson.

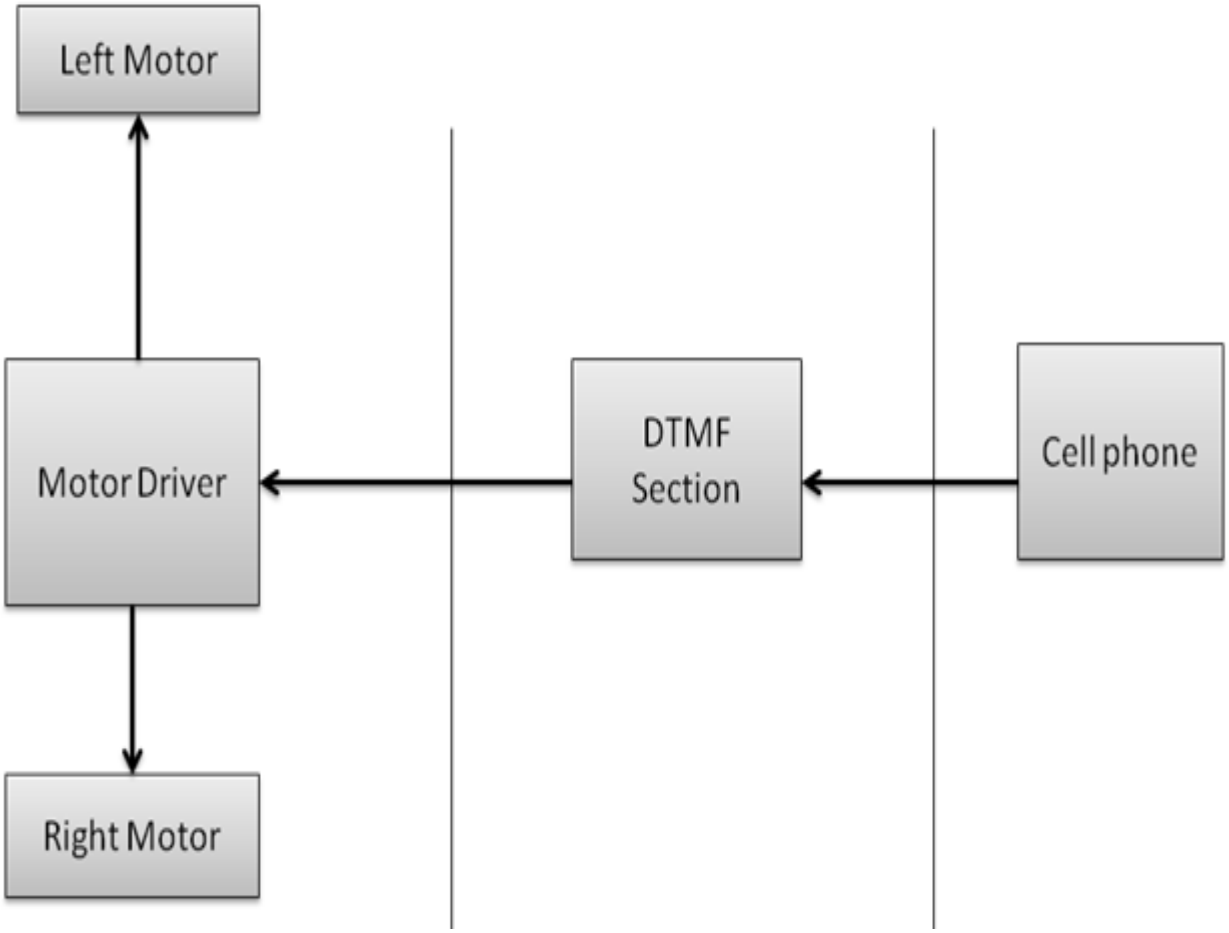
Use of Remote Controlled Vehicles During World War II:

During World War II in the European Theater the U.S. Air Force experimented with three basic forms radio- control guided weapons. In each case, the weapon would be directed to its target by a crew member on a control plane. The first weapon as essentially a standard bomb fitted with steering controls. The next evolution involved the fitting of a bomb to a glider airframe, one version, the GB-4 having a TV camera to assist the controller with targeting. The third class of guided weapon was the remote controlledB-17.

It's known that Germany deployed a number of more advanced guided strike weapons that saw combat before either the V-1 or V-2. They were the radio-controlled Henschel's Hs 293A and Ruhrstahl's SD1400X, known as 'FritzX,' both air-launched, primarily against ships at sea.

CHAPTER 3:
PRELIMINARY DESIGN

BLOCKDIAGRAM:



Description:

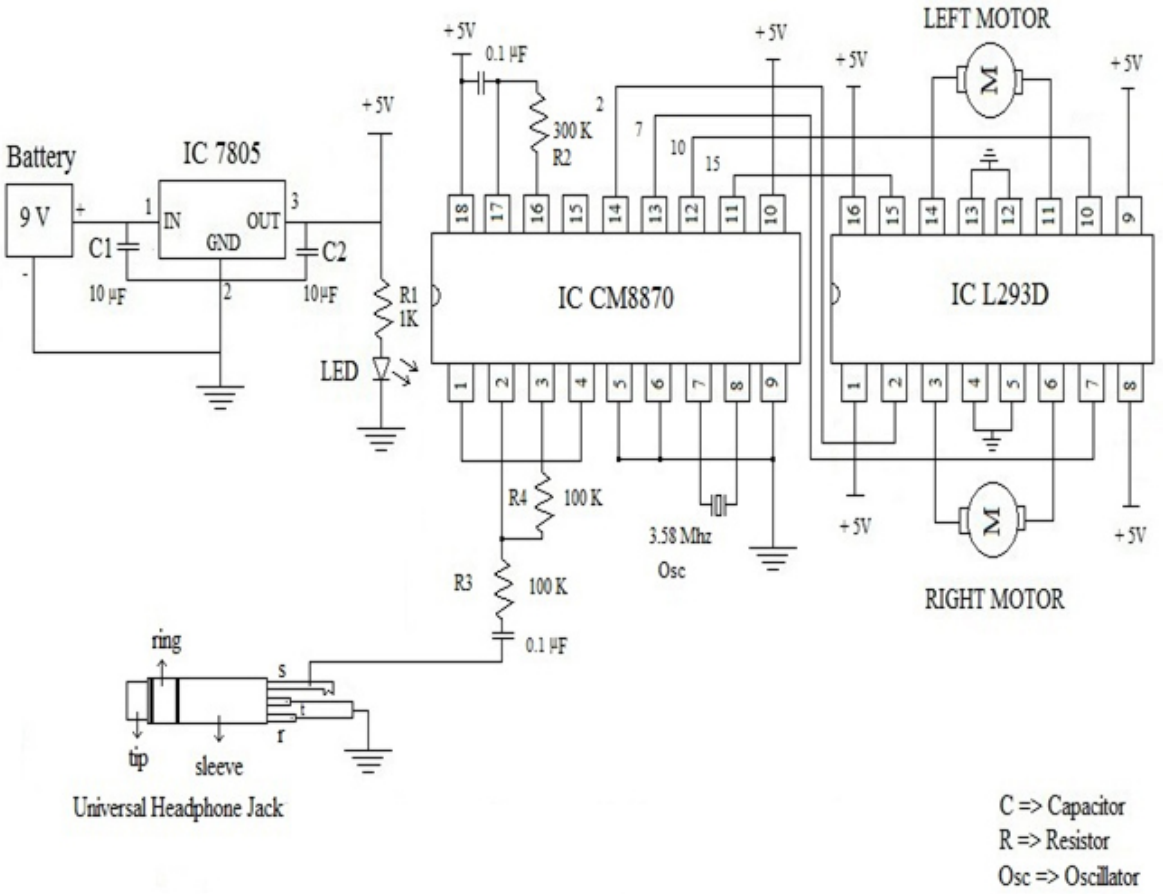
As shown in the above diagram, from the right, first block is the Cell phone. So it acts as a DTMF generator with tone depending upon key pressed. DTMF decode i.e. IC CM8870 decodes the received tone and gives binary equivalent of it to the Motor driver IC L293D. It drives the 2 DC motors connected to it. The concept used for driving is 'differential drive'. So ultimately the two motors rotate according to

the key pressed on the keypad of the cell phone.

Component List:

Product Name	Quantity
Robotic Chassis(with 2Wheels & DC Motors)	1
Breadboard	1
3.58 MHz Crystal Oscillator	1
IC L293D	1
IC CM8870	1
IC LM7805	1
Battery 9V	1
Battery AAA	4
10uF Capacitor	2
0.1uF Capacitor	2
1k ohm Resistor	1
100k Ohm Resistor	5
LED Blue - 5mm	1
Breadboard Jumper Wires	1
Universal Headphone Jack	1
Battery Holder & Snap	1

Circuit Diagram:



CHAPTER 4:
HARDWARE DESCRIPTION

Power Supply:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

Here in our application we need a 5v DC power supply for all electronics involved in the project. This requires step down transformer, rectifier, voltage regulator, and filter circuit for generation of 5v DC power.

For our project we have used one 9V battery and four AAA batteries.

Robotic Chassis(2 Wheels with DC Motor):

This robotic chassis kit contains of an acrylic base with two gear motors, two compatible wheels, a ball caster, and other accessories.

Package Contains:

- 2 x Rubber wires
- 2 x Deceleration motors
- 2 x Aluminum fasteners
- 1 x Nylon all-direction wheel
- 1 x Chassis
- 1 x Battery box (4 x AA batteries, not included)
- 1 x Screwdriver

DC motor specification:

- Rated voltage: 3-6V DC.
- Unloaded speed: 120 RPM.
- Load current: 190 mA (250 mA MAX).
- Maximum torque: 800 g. Cm min.
- Chassis specification:
- Dimensions: 7.72 in x 4.13 in x 0.12 in (19.6 cm x 10.5 cm x 0.3 cm)
- Weight: 14.29 oz (405 g)

Wheel specification:

- Width:30mm
- Diameter:65mm

3.58 MHz Crystal Oscillator:

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency. This frequency is commonly used to keep track of time, as in quartz wristwatches, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

Breadboard:

A breadboard is a construction base for prototyping of electronics. Originally it was literally a bread board, a polished piece of wood used for slicing bread. In the 1970s the solderless breadboard (AKA plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these. "Breadboard" is also a synonym for "prototype".

Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solder less breadboards are also extremely popular with students and in technological education. Older breadboard types did not have this property. A stripboard(veroboard) and similar prototyping printed circuit boards, which are used to build semi-permanent soldered prototypes or one-offs, cannot easily be reused. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

This project board is used for experimental, non-soldered setup of electronic circuits.

IC CM8870 (DTMF Decoder):

The IC CM8870D or IC MT8870D-1 is a complete DTMF receiver integrating both the band split filter and digital decoder functions. The filter section uses switched capacitor techniques for high and low group filters; the decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. External component count is minimized by on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface.

Features:

- Complete DTMF receiver
- Low power consumption
- Internal gain setting amplifier
- Adjustable guard time
- Central office quality
- Power-down mode
- Inhibit mode
- Backward compatible with CM8870C or MT8870C-1

Applications:

- Receiver system for British Telecom (BT) or CEPT Spec (CM8870D-1)
- Paging systems
- Repeater systems/mobile radio

- Credit card systems
- Remote control
- Personal computers
- Telephone answering machine

Specification:

- Recommended DC power supply:5.5V
- Recommended operating temperature:-40ºC to +85ºC
- Power dissipation:500 mw
- Maximum operating supply current:9mA

IC L239D:

The device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoides, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input.

A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

Applications:

This device is suitable for use in switching applications at frequencies up to 5 kHz.

Features:

- 600mA output current capability per channel
- 1.2A peak output current (non repetitive) per channel.
- Enable facility
- Over temperature protection
- Logical ”0” input voltage up to 1.5 v (high noise immunity)
- Internal clamp diodes.

Specification:

- Maximum supply voltage 36 V
- Maximum logic supply voltage 36 V
- Maximum input voltage 7 V
- Maximum enable voltage 7 V
- Peak output current (100 ms non repetitive) 1.2 A
- Total power dissipation at pins = 90 °C 4 W
- Storage and junction temperature – 40 to 150 °C

IC LM7805:

IC LM7805 three terminal positive regulators are available in the TO-220 package and with 5V output voltage. If adequate heat sinking is provided, they can deliver over 1A output current.

Specification :

- Typical output voltage:5V
- Typical short circuit current:230m

LED:

Those blinky things must have for power indication, pin status, opto-electronic sensors, and fun blinky displays.

This is a very basic 5mm LED with a blue lens. It has a typical forward voltage of 2.0V and a rated forward current of 20mA.

Features:

- High luminous intensity output.
- Low power consumption.
- High efficiency.
- Versatile mounting on PCB or panel.
- I.C. Compatible and low current requirement.
- Reliable and rugged.

Applications:

- Status indicator.
- Backlighting front panels.
- Light pipe sources.
- Lighted switches.

Specification:

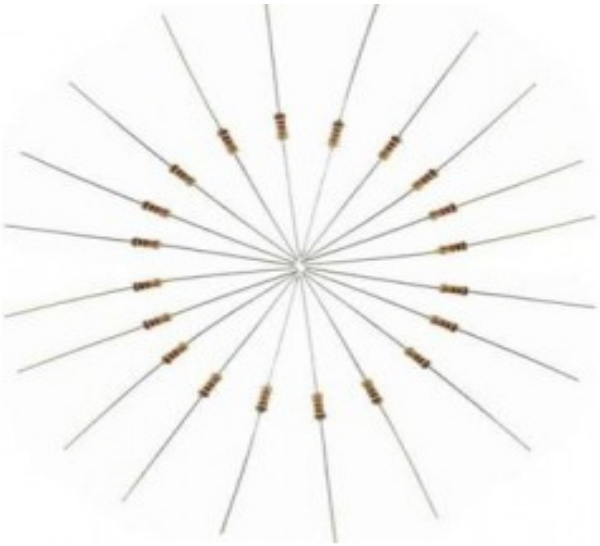
- Diameter:5mm
- Forward voltage :2.0V
- Forward current:20mA

100k ohm 1/4w Resistor:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors, that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

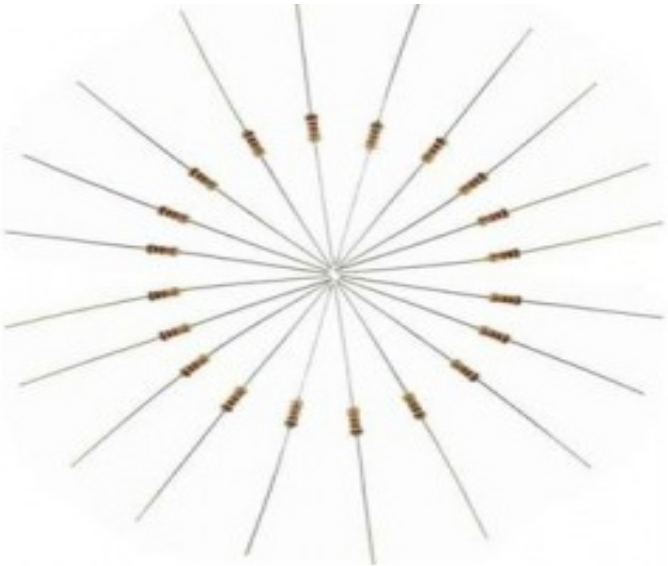
The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance will fall within a manufacturing tolerance.



3.3k ohm 1/4w Resistor:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors, that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.



0.1uF 50v Radial Lead Electrolytic Capacitor:

An aluminum electrolytic capacitor, usually simply called an electrolytic capacitor (e-cap), is a capacitor whose anode (+) consists of pure aluminum foil with an etched surface, covered with a uniformly very thin barrier layer of insulating aluminum oxide, which operates as a dielectric. The electrolyte, which covers the rough surface of the oxide layer, operates as the second electrode, the cathode (-). E-caps have the largest capacitance values per unit volume compared to the two other main conventional capacitor families, ceramic and plastic film capacitors, but articulately smaller capacitance than similar sized super capacitors.

Specification:

- Capacitance:0.1uF
- Operating voltage:50V
- Operating temperature:85°C
- Tolerance:±20%

10uF 25V Radial Lead Electrolytic Capacitor:

An aluminum electrolytic capacitor, usually simply called an electrolytic capacitor (e-cap), is a capacitor whose anode (+) consists of pure aluminum foil with an etched surface, covered with a uniformly very thin barrier layer of insulating aluminum oxide, which operates as a dielectric. The electrolyte, which covers the rough surface of the oxide layer, operates as the second electrode, the cathode (-). E-caps have the largest capacitance values per unit volume compared to the two other main conventional capacitor families, ceramic and plastic film capacitors, but articulately smaller capacitance than similar sized super capacitors.

Specification:

- Capacitance:10uF
- Maximum voltage rating:25V
- Maximum operating temperature:85°C
- Tolerance:±20%

Breadboard Jumper Wire Set:

This set of jumper wires can help remove the clutter on breadboard. It comes in 14 different lengths and 8 colors to keep circuit on the surface. All of them are pre-formed and pre-sorted. We can easily find the color and length that need within a sec.

CHAPTER 5:

FINAL DESIGN

We have connected each component part by part. The steps of connecting the components on the breadboard are given below:

1) Making Power Supply:

- We took the breadboard and connect the battery holder in horizontal position.
- We have inserted the positive and negative wire of battery snap in holder.
- Attached IC 7805 (Voltage Regulator), and placed one 10 µF capacitor in IN & GND connection of IC 7805 and other in GND & OUT connection.
- Took the positive supply from the battery holder via breadboard wire and placed it in IN of IC 7805, and also connected its negative supply in the last row of the breadboard.
- We placed the GND of IC 7805 in the last row of the breadboard, and transfer its OUT to the first row of the breadboard.
- As a result of these connections, +5V power is obtained in the first row of the breadboard.
- To check the power flow path, an LED was given a positive supply via 1K resistor.
- We have used separate +6V for driving the motor only. For this we have used 4 AAA batteries.

2) IC CM8870 (DTMF Decoder) Connections:

- We connected 1st & 4th pin of CM8870 (DTMF Receiver) together.
- Picked one 100K resistor and placed one side of it in 2nd pin and other side to the 0.1 µf capacitor.
- Took another 100K resistor and connected 3rd and 2nd pin.
- Provided GND connection to 5th, 6th, and 9th pins.
- Coupled 7th and 8th pins with 3.58 MHz oscillator.
- We also provided +5V supply to 10th and 18th pins.
- Took one 300K resistor, and place one side of it to 16th pin and other to 0.1 µf capacitor from 17th pin.

- Connected 0.1 µf capacitor to the 18th pin.

3) IC L293D (Motor Controller) Connections:

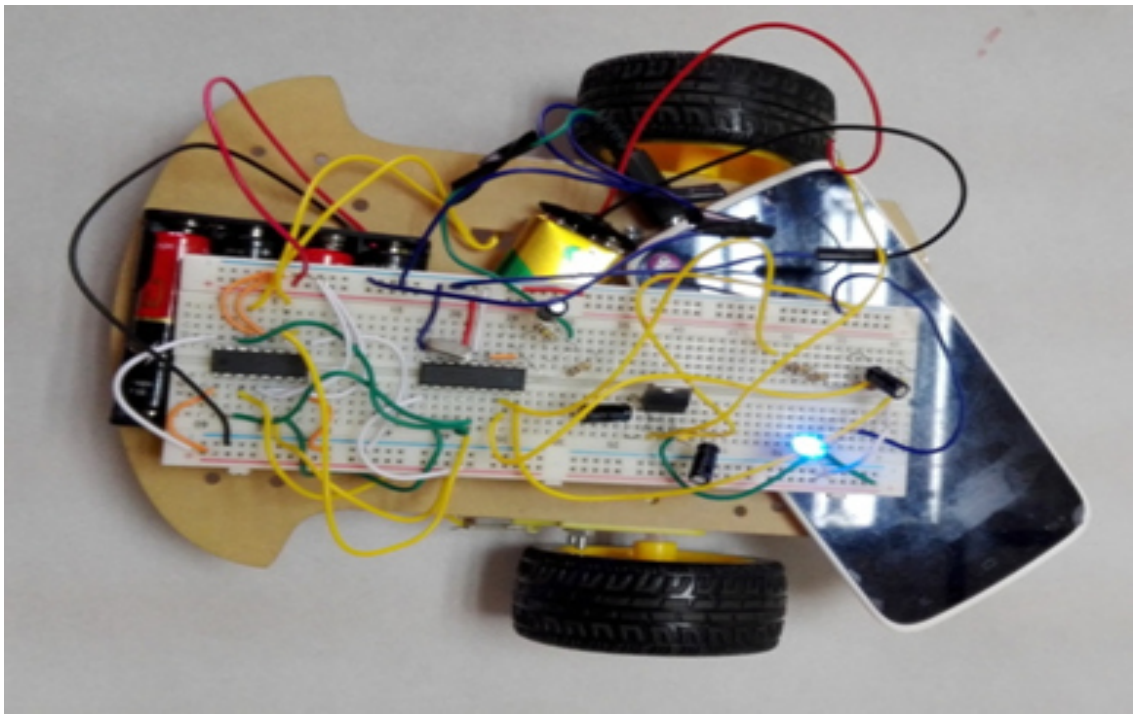
- We inserted IC L293D (Motor Controller) in the breadboard.
- Supplied +5V power to 1st, 8th, 9th, and 16th pins.
- Provided ground connection to 4th, 5th, 12th and 13th pins.
- We have attached 2nd, 7th, 10th, and 15th pins of L293D to 14th, 13th, 12th, and 11th pins of IC CM8870 respectively.

4) 12V DC Motor Connections:

- We took the wire of right motor and insert it in 3rd and 6th pins of IC L293D.
- Also, placed the wire of left motor in 11th and 14th pins of IC L293D.

5) Universal Headphone Jack Connection:

- There are three different layers in universal headphone jack such as a sleeve, tip, and ring.
- A closer view of the three layers is shown in the circuit diagram clearly.
- Connected the sleeve to the output of 0.1 µf capacitor (2nd pin) in the IC CM8870.
- At last provided GND connection to the tip and ring.



Operating The Robot:

After completing the construction, we connected the circuit with 9V battery. Also, connected the universal headphone jack to its respective cell phone with incoming facility and enabled keypad tones in the cell phone that we use to make calls.

Thus the robot gets ready to operate wirelessly with GSM facility once we make a call to the cell phone connected to the robot. By pressing the number keypads in the cell phone, we will be able to move the robot in various directions.

It is made possible with the help of Dual Tone Multi Frequency receiver (IC CM8870), in which the sleeve connection of the robot cell phone is connected to the IC CM8870. The tone received from our cell phone to the robot cell phone will be converted into binary form, and suitable output is provided by the IC CM8870 to IC L293D.

Output:

Input given on our cell phone	The output obtained from the robot
1	Right forward
2	Right forward
3	Right backward
4	Stop
5	Left forward
6	Left backward
8	Right forward
9	Both Forward
0	Right forward

CHAPTER 6:

TECHNOLOGIES USED

Dual-Tone Multi-Frequency Signaling (DTMF):

It is an in-band telecommunication signaling system using the voice-frequency band over telephone lines between telephone equipment and other communications devices and switching centers. DTMF was first developed in the Bell system in the United States, and became known under the trademark Touch-Tone for use in push-button telephones supplied to telephone customers, starting in 1963. DTMF is standardized by ITU-T recommendation Q.23. It is also known in the UK as MF4.

The Touch-Tone system using a telephone keypad gradually replaced the use of rotary dial and has become the industry standard for landline and mobile service. Other multi-frequency systems are used for internal signaling within the telephone network.

The DTMF telephone keypad is laid out in a 4×4 matrix of push buttons in which each row represents the low frequency component and each column represents the high frequency component of the DTMF signal. Pressing a key sends a combination of the row and column frequencies. For example, the key 1 produces a superimposition of tones of 697 and 1209 hertz (Hz). Initial pushbutton designs employed levers, so that each button activated two contacts. The tones are decoded by the switching center to determine the keys pressed by the user.

DTMF keypad frequencies (with sound clips)

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

GSM (Global System for Mobile Communications):

GSM (Global System for Mobile communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991. As of 2014 it has become the default global standard for mobile communications - with over 90% market share, operating in over 219 countries and territories.

2G networks developed as a replacement for first generation (1G) analog cellular networks, and the GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS).

Technical Details:

The GSM network can be divided into three broad parts. These are given bellow

1. The subscriber carries the mobile station.
2. The base station subsystem controls the radio link with the mobile station.
3. The network subsystem performs the switching of calls between the mobile users and other mobile and fixed network users.

Mobile Station:

The mobile station consists of the mobile equipment, i.e. the handset, and a smart card called the Subscriber Identity Module (SIM). The SIM provides personal mobility, so that the user can have access to subscribed services irrespective of a specific terminal. By inserting the SIM card into another GSM terminal, the user is able to receive and make calls from that terminal, and receive other subscribed services.

The mobile equipment is uniquely identified by the International Mobile Equipment Identity (IMEI). The SIM card contains the International Mobile Subscriber Identity (IMSI) used to identify the subscriber to the system, a secret key for authentication and other information. The IMEI and the IMSI are independent, thereby allowing personal mobility. The SIM card may be protected against unauthorized use by a password or personal identity number.

Base Station Subsystem:

The base station subsystem is composed of two parts, the base transceiver station and the base station controller. These communicate across a standardized "Abis" interface, allowing operation between components made by different suppliers.

The base transceiver station houses the radio transceivers that define a cell and handle the radio-link protocols with the mobile station. In a large urban area, there will potentially be a large number of base transceiver stations deployed, thus the requirements for a base transceiver station are ruggedness, reliability, portability and minimum cost. The base station controller manages the radio resources for one or more base transceiver stations. It is the connection between the mobile station and the mobile services switching center.

Network Subsystem:

The central component of the network subsystem is the mobile services switching center. This acts like a normal switching node of the PSTN (Public Switched Telephone Network) or ISDN (Integrated Services Digital Network) and connects the mobile signal to these fixed networks. It additionally provides all the functionality needed to handle a mobile subscriber, such as registration, authentication, location updating, call handover and call routing to a roaming subscriber.

Radio Spectrum:

Since radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible. The method chosen by GSM is a combination of Time and Frequency Division Multiple Access (TDMA/FDMA). The FDMA part involves the division by frequency of the (maximum) 25MHz bandwidth into 124 carrier frequencies spaced 200 kHz apart. One or more carrier frequencies are assigned to each base station.

GSM Spectrum Allocation in Bangladesh:

There are 05 GSM cellular (Mobile/Handy) operators in Bangladesh

1. Teletalk Bangladesh Ltd (State Owned) – Brand Name: TELETALK
2. Grameen Phone Ltd. – Brand Name: GP
3. Banglalink Digital Communication Ltd. : Brand Name: BANGLALINK

4. Robi Axiata Bangladesh Ltd – Brand Name: ROBI

5. Airtel Bangladesh Ltd. – Brand name: AIRTEL

System	Band	Up link (MHz)	Down link (MHz)	Channel number
GSM-900	900	890.0–915.0	935.0–960.0	1–24
GSM-1800	1800	1710.0–1785.0	1805.0–1880.0	512–885

GSM Spectrum allocation in Bangladesh which is allocated by Bangladesh Telecommunication Regulatory Commission (BTRC):

Teletalk: In 900 Band (Range is 890-895.2 MHz) ; In 1800 Band (Rang is 1710-1720 MHz)

CHAPTER 7:

APPLICATION

1. It can be used as a rescue robot.
2. The robot can be used for reconnaissance or surveillance. Like, if there is any hidden bomb under anything, it can be ensured and notified through the robot.
3. The robot is small in size so can be used for spying.
4. This robot can be used for the military purposes.
5. Cell phone controlled robot can be used in the borders for disposing hidden land mines.
6. This project uses mobile technology and since mobile has very large range, the project also has very large range. But finally it depends on the coverage of the mobile network.

The main advantage of that is the faster operating speed. In SMS based controlling of robot, need to send 1 SMS for 1 motion. But in 1 call can execute multiple motions. Another advantage is that call based controlling is cost effective than SMS based controlling.

Conventionally wireless-controlled robots use RF circuits, which have limited working range, limited frequency range and limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantage of Robust Control, working range as large as the area of the service provider, no interference with other controllers.

CHAPTER 8:

FURTHER IMPROVEMENTS

1. IR Sensors :

IR sensors can be used to automatically detect & avoid obstacles if the robot goes beyond line of sight. This avoids damage to the vehicle if we are maneuvering it from a distant place.

2. Password Protection:

Project can be modified in order to password protect the robot so that it can be operated only if correct password is entered. Either cell phone should be password protected or necessary modification should be made in the assembly language code. This introduces conditioned access & increases security to a great extent.

3. Alarm Phone Dialer :

By replacing DTMF Decoder IC CM8870 by a 'DTMF Transceiver IC' CM8880, DTMF tones can be generated from the robot. So, a project called 'Alarm Phone Dialer' can be built which will generate necessary alarms for something that is desired to be monitored (usually by triggering a relay). For example, a high water alarm, low temperature alarm, opening of back window, garage door etc.

When the system is activated it will call a number of programmed numbers to let the user know the alarm has been activated. This would be great to get alerts of alarm conditions from home when user is at work.

4. Adding a Camera:

If the current project is interface with a camera (e.g. a Webcam) robot can be driven beyond line-of-sight & range becomes practically unlimited as GSM networks have a very large range.

CHAPTER 9:

CONCLUTION

In this project, we have used the technique of DTMF and GSM network for remotely control the robot. With the help of these technologies we can control the robot from any location of world. We have not used any microcontroller. The robot can be controlled with the low price mobile sets. This robot is very low cost but very effective for various purposes. Due to the use of GSM network it has a great range of control. It overcomes the limitations of other remote techniques whose have very limited area range for control. Our project can be used in various sectors like in spying, surveillance, rescue and so on. In future we can add several sensors, cameras etc to get more features.

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