DTMF Based Intelligent Farming Robotic Vehicle

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Abstract - *: The main objective of designing of this robotic vehicle is just to lower the burden of the farmers and to facilitate them with great technology to do farming. From the last few years, many developments have taken place in the field of robotics and agriculture. DTMF (Dual tone multiple frequencies) technologies are used in the project. The robot is controlled by the cell phone even from a very far distance so as to help the farmers to do his agricultural work without going to the field with an easy control over the robot. This robot is having a great advantage of sensing the moisture of soil and sawing the seeds accordingly which would help the farmer up to a great level. This is how we can use this robot in different agriculture fields so as to produce satisfactory results in the field of technology.*

Key Words: **Arduino, DTMF, Microcontroller, Robotics, Bluetooth.**

1. INTRODUCTION

Agriculture was the key development in the rise of sedentary human civilization. Because of the advancement in the technology now, the things became very easy. This agriculture and robotic system allow work to be more efficient, more safer, and more environmentally friendly. In addition, robotics technologies enable more reliable monitoring and management of natural resources, such as air and water quality which results in reduced environmental and ecological impact. This rover provides the advantages of automation in seed sowing, soil moisture detection as well as power control by a cell phone, for proving a great range for communication over the network. Typically, robots with RF circuit were used, having a great disadvantage of limited range and limited control. This project is designed to overcome the drawback of limited range for the improvement of the society. We are

controlling this robot by using DTMF technology which provides a wireless communication between two cell phones used. we have also made use of 8051 microcontrollers, Arduino and Bluetooth module for the functioning of the different integrated parts within the rover.

1.1 TECHNOLOGY USED

This project employs DTMF(Dual-tone Multiple frequencies) Technology. DTMF signaling was elaborated to signal the destination telephone number of calls without demanding a telephone engineer or manager. It was standardized by the International Telecommunication Union (ITU) Telecommunication Standardization Sector.

DTMF technology make use of two frequency to make the rover to move – left, right, forward and backward. DTMF keypad mainly consists of lower frequencies represented by the rows, also consist of higher frequencies represented by the column. There are four lower frequencies in corresponds to four higher frequencies. Whenever a key or button is pressed, the lower frequency is combined with corresponding higher frequency and a tone is generated. The generated tone identify what function need to do from which part.

There are total 12 tones which are generated by the combination of different rows and columns frequencies. This DTMF technology is used mainly for the movement of the robot in different four direction.

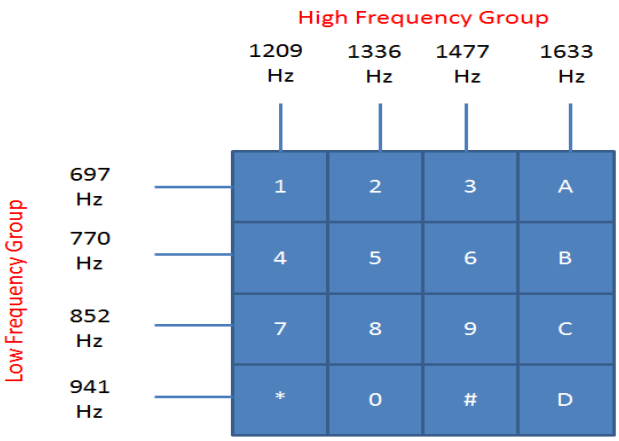


Figure-1: DTMF KEYPAD

It basically has the advantage of providing the rangeless controlled to the controller to move the robotic vehicle.

Button	Low DTMF frequency (Hz)	High DTMF frequency (Hz)	Binary coded output			
			Q4	Q3	Q2	Q1
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

1.2 PROPOSED ARCHITECTURE

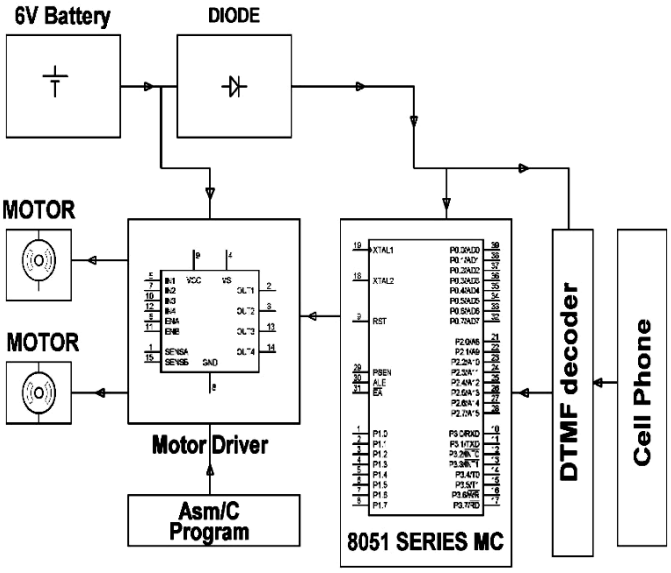


Figure-2: Block diagram and description.

The block diagram mainly consists of a motor driver, 8051 micro-controller, DTMF decoder, cell phone, motor, and battery.When the call is made to the cell phone of the robot, the tone is generated according to the key pressed by the user. Then this tone transfers to the DTMF decoder which decodes the function the tone and further pass it to the controller so as to perform the action. The controller then gives the respective command to the motor driver and the motor driver make the movement of one of the motor connect to it and hence make the rover to move accordingly.

Motor driver IC used in this project is L293D.It generally consists of 16 pins. The pins 2, 7, 10, 15 are used to take input and pins 3,6,11,14 are used to produce the output. These output pins are connected to the two motors of the robotic vehicle.

2. How DTMF Based Robotic Vehicle Circuit Works?

- Arrange the robot mechanically i.e. connect the wheels to the motors, place the circuit on the robot with a mobile fixed to it.
- Now press '5' from your mobile, the robot starts moving forward.
- Now press '0' from your mobile, the robot starts moving backward.
- Now press '2' to rotate the robot in the left direction.
- Now press '8' to rotate the robot in the right direction.

2.1 MICRO-CONTROLLER USED

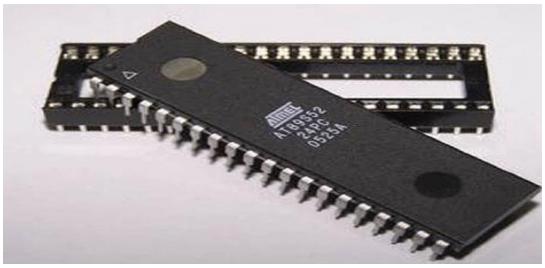


Fig -3 8051 Microcontroller

8051 is the microcontroller which is used in the project. 'AT89S52' is one of the types of 8051 micro-controller The AT89S52 basically consist of 4 ports and each port is having 8 input/output lines.Hence providing total 32 input/output transmission lines.The 8051 micro-controller is used in the project to control the motor driver which is connected to its output port.The 8051 transfer the encoded output of the decoder to the output lines. AT89S52 belongs to the family of 8051 micro-controller which offers a large number of the functionality of the robot.

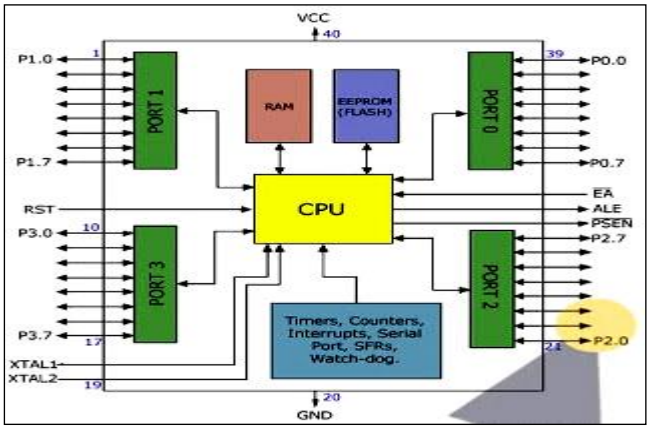
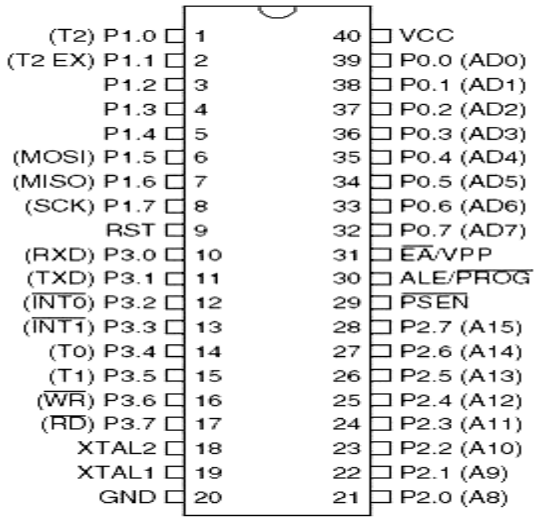


Figure-4 internal diagram of microcontroller

The pin diagram of the 8051 micro-controller is shown below with different ports--



The whole project is divided into two sections one is transmitter section and other is receiver section. The transmitter prototype is shown in figure 2 and the transmitter section consists of ATMEGA16 microcontroller, one 3-axis accelerometer, and one Bluetooth transmitter module.The receiver prototype is shown in figure 3. The receiver section consists of one Bluetooth receiver module, PIC microcontroller, one motor driver IC, four DC motor, four wheels. Here, two separate 5-volt power supply is applied to both the sections.

Finally, the microcontroller reads the analog output values i.e., x-axis, y-axis and z-axis values from the 3 axis accelerometer and converts the analog value to respective digital value. The digital values are processed by the microcontroller and send to the Bluetooth transmitter which is received by the Receiver and is processed at the receiver end which drives the motor to a particular direction. The robot moves forward, backward, right and left when there is tilt in the palm of the user in forwarding, backward, right and left respectively directions as shown in **Figure** 1.

2.1.1 ARDUINO

Arduino is a platform used in the field of electronics for performing different functions by making use of codes. These are basically used for handling the robots or robotic system.In this project, we have used Arduino for measuring the moisture of the soil and then providing sufficient moisture to the soil.All the functions like moisture sensing, seed sawing and providing water from the tank are done by this 8051 micro-controller.

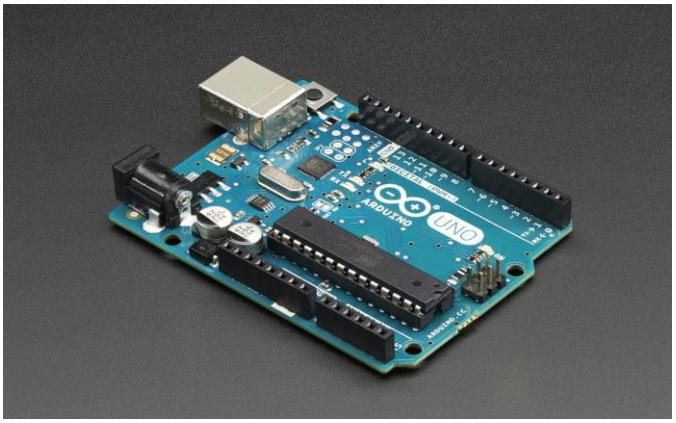


Figure-5. Arduino Model

2.1.2 BLUETOOTH MODULE

Bluetooth module is the device which is designed or manufactured in the field of technology for wireless communication. The Bluetooth used here is an HR-05 module which provides a serial connection between the devices.This module also includes a Bluetooth processor, also some other integrated hardware needed to run the device.

Fig -6 8051 Bluetooth Module

2.1.3 DC MOTOR

The DC Motor is an electrical machine which works on the basic mechanism of converting the electrical energy to the mechanical energy.This motor rotates the rover when direct current is given to it. In this project, we are using the DC Motor for the movement of the rover and also to control the seed sawing process.

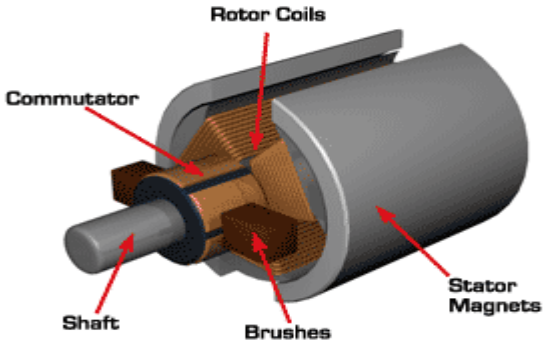


Fig -7 DC Motor

3. APPLICATION AND FUTURE SCOPE

- **Agricultural use**- This robot is designed in such a manner to provide control over the different processes from an even far distance. Seed sawing and watering the crop accordingly is greatly done by this rover.

- **Moisture measurement** -The project provides the great advantage of measuring soil moisture and accordingly providing water to the crop by an automatic process.

4. CONCLUSIONS

The project has many advantages which have reduced the difficulty of farmers to do farming in an unsuitable weather condition. This rover provides rangeless control and different multitasking agriculture feature

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