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A PROTOTYPE FOR GEOPONICS

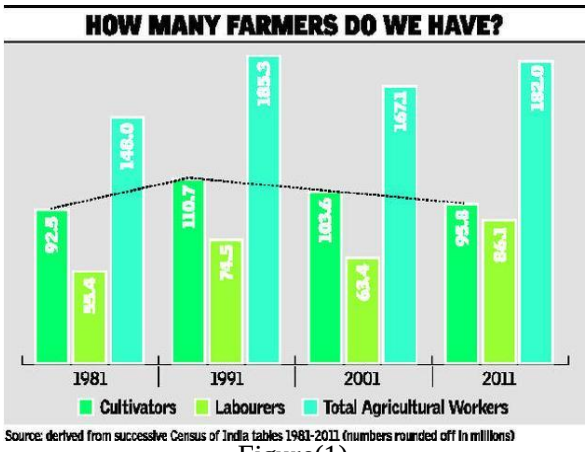
1.NISHITH H M 2. PAVANKUMAR R G 3.RAKSHITH V4.NANDISHWAR C 5. CHANDA V REDDY
1,2,3,4 Department of Telecommunication Engineering, KammavariSangham Institute of Technology, Bengaluru-61

Abstract-Today, we live in such a fast world that even single minute is important for us. This is a robot designed for agricultural purposes. It is designed to minimize the labor of farmers in addition to increasing the speed and accuracy of the work. This robot can be trained to follow a particular path. It performs the elementary functions involved in farming that is ploughing the field, sowing of seeds, cutting,manuring. The robot is autonomous and provides the facility for optional switching of these functions through android application. It also includes obstacle detection and live video surveillance from the robot.

Keywords:*Geoponics, autonomous, optional switching, obstacle detection, farming robots.*

I.INTRODUCTION

We live in a country where agriculture is its backbone, but from several decades interest in agriculture has been decreased. The figure (1)shows census of farmers (1981-2011). In the year 1981 we



Figure(1)

92.5million farmers and in 2011, 95.8 million farmers even though numerically its increasing but when compared with population percentage there is a huge decrease from 24% to 12%. In 1990's there was bit interest gained in the field of agriculture as tractors were introduced in India, to common people.

Considering the evolutions, previously they used bullock carts and man power and now we have high-powered tractors doing work of several bullocks and now we have robotics which can do the work of several tractors which supports multitasking and which gives enormous developments and possibilities in the field of agriculture.

II. PREVOIUS WORK

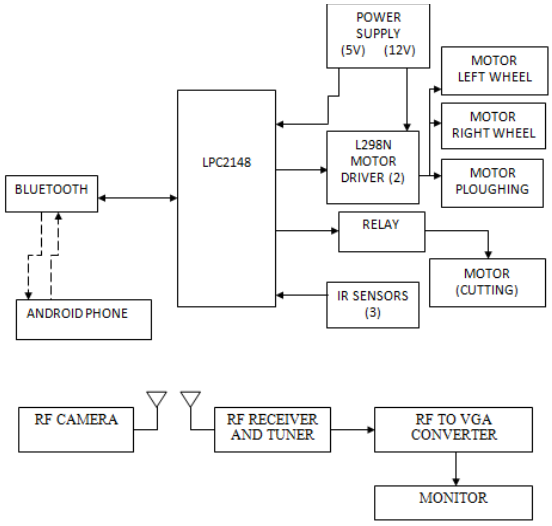
There are many previous works done related to agricultural robots. One of them is called as Agribot. Agribot is a robot designed for agricultural purposes. It performs the elementary functions involved in farming that is ploughing the field, sowing of seeds and covering the seeds with soil [1]. Agribots were upgraded to have three key abilities: to navigate, to interpret the scene in front of them and to be able to help the farmer, by blasting a weed, applying a chemical or harvesting the crop [2].The Agribots can plough the field, water it and sow seeds for a fixed period of time, with the help of a timer [3].Robotic Agriculture Machine, the robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. The machine can be controlled remotely and solar panel is used to charge DC battery. Assembly language is used in programming the microcontrollers. The microcontroller is used to control and monitor the process of motion of vehicle with the help of DC motors [4].

III.WORKING PRINCIPLE

The embedded C code is dumped onto ARM7 (LPC2148). LPC2148 is interconnected to all the sensors and the H bridge motor driver. H bridge motor driver is in turn connected to the motors for wheels, cutter etc. Sensors are the inputs to the firmware present in LPC2148 and the ARM gives output based on the behavior of the sensor devices connected. The Bluetooth is used for inter-communication between android and the firmware present.The prototype is a one level structure where the complete prototype is built using the acrylic plate. In this layer all the components such as battery, ARM controller, Bluetooth receiver, motor drivers, wireless RF camera, IR sensors are placed at right corner, left corner and at the center of the front end thesethree IR sensors for obstacle detection in front of the bot.. The rare end consists of the plough along with the seed/manure pack attached to it. The plough is moved up and down using plough motor along with gears and the locomotion wheels driven by DC motors. The front end contains the cutter which is operated by a relay and mounted on a motor with the feeder mechanism, two free wheels which are used to give flexibility during turns. Also a live video surveillance is done using RF camera placed at front end.

IV BLOCK DIAGRAM:

Figure(2) shows the interfacing of LPC2148 microcontroller with other devices. The LPC2148 is the heart of the robot which performs the function of controlling all the other hardware connected to it. It runs on a power supply of 3.3Volt to 5Volt. Bluetooth



Figure(2)

module connected to the LPC2148 receives the data transmitted by the android phone. The L298 is a motor driver IC which is used to drive two motors simultaneously. We have utilized two, L298 IC's, one to drive locomotive motors and another to drive plough and cutter. IR sensor is used to sense the obstacles based on reflection of light from the objects around the robot. If the IR sensor receives the reflected signal then interrupt is given to micro-controller hence all the undergoing operations will be halted. The RF camera is used for live video surveillance so that farmer at the remote place can easily watch every motion of the robot with the help of monitor. The android application provides a manual approach to the robot movement, besides automatic methodology, for ploughing and cutting operations.

V.SOFTWARES REQUIRED

The software's required to drive the vehicle as per the necessity are as follows:

Keil µVision4:- It is a programming tool used to program the microcontroller, say, LPC2148.

LPC2000 FLASH UTILITY V2.2.2:- It is used to interface computer with the microcontroller.

Embedded C:- It is the programming language to program microcontroller.

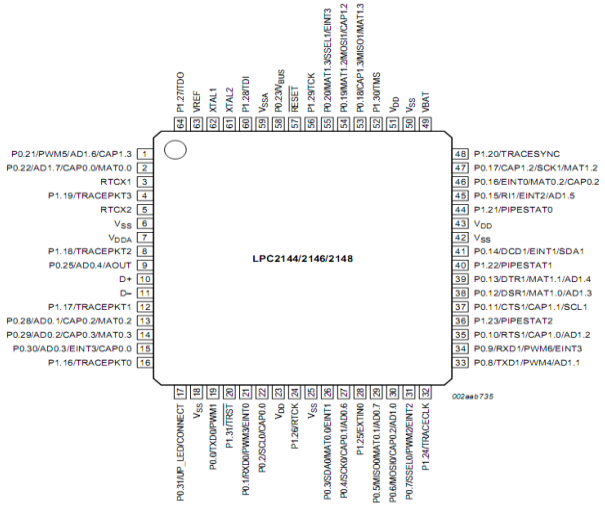
PUTTY:- It is used for serial communication of microcontroller and Bluetooth module.

Android Platform:- To build an android application to ensure manual controlling.

VI. HARDWARE REQUIREMENTS

The physical components are the hardware of the project. The hardware's used are as follows:

LPC2148 Microcontroller:- It is found by Philips. LPC2148 is an ARM7TDMI-S based high-performance 32-bit RISC Microcontroller. ARM7 has Princeton memory architecture.CPU operating voltage range is of 3.0 V to 3.6 V. It also has a watch dog timer. The embedded C code is dumped onto this microcontroller. It has 512KB on-Chip Flash Memory additionally it has 10 A/D Inbuilt Converters.

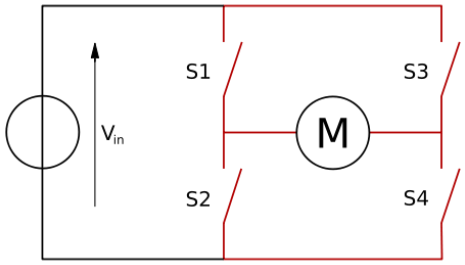


Figure(3)

L298 IC [5]:- It is a motor driver IC. It has two inbuilt H-bridges so that it can drive two motors simultaneously, clockwise and anti-clockwise. Supply voltage for Motors is 9-12V (up to 36V). Supply voltage to enable IC is 5V.

00	STOP
01	CLOCKWISE
10	ANTI CLOCKWISE
11	STOP

Table(1)



Figure(4)

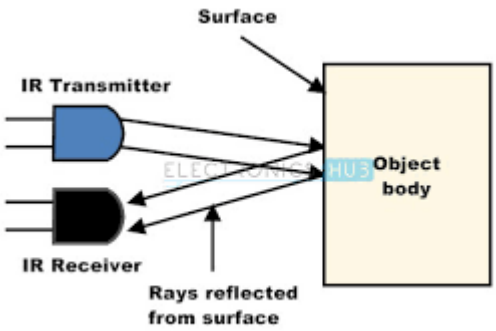
Bluetooth:- It is used for serial communication. The standard operating voltage is 3.3V, but can operate up to 4.2V.

Figure(5)

DC motor: A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic;

Figure(6)

IR Sensors: The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, its resistance and correspondingly, its output voltage, change in proportion to the magnitude of the IR light received. This is the underlying principle of working of the IR sensor.



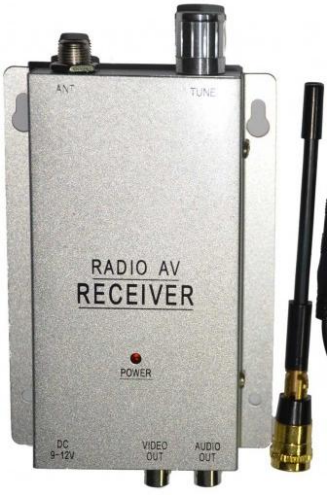
Figure(6)

RF Wireless Camera: Wireless technology is being applied to just about everything these days, and video surveillance takes good advantage of it. Above Figure 3.6.1 shows RF wireless camera. A wireless camera includes a built-in transmitter to send video over the air to a receiver instead of through a wire. Many people aren't aware that there are multiple types of wireless technology in use, each with unique advantages.

There are two basic types of RF transmissions, Analog and digital. Analog devices send out a constant string of data when they transmit. The data can be picked up by any receiver that picks up signal in its frequency range. This means that anyone with a properly tuned receiver can pick up a transmitter. It also makes interference more likely. If there are multiple transmitters in the same area, the most powerful signal will knock out any others in range.

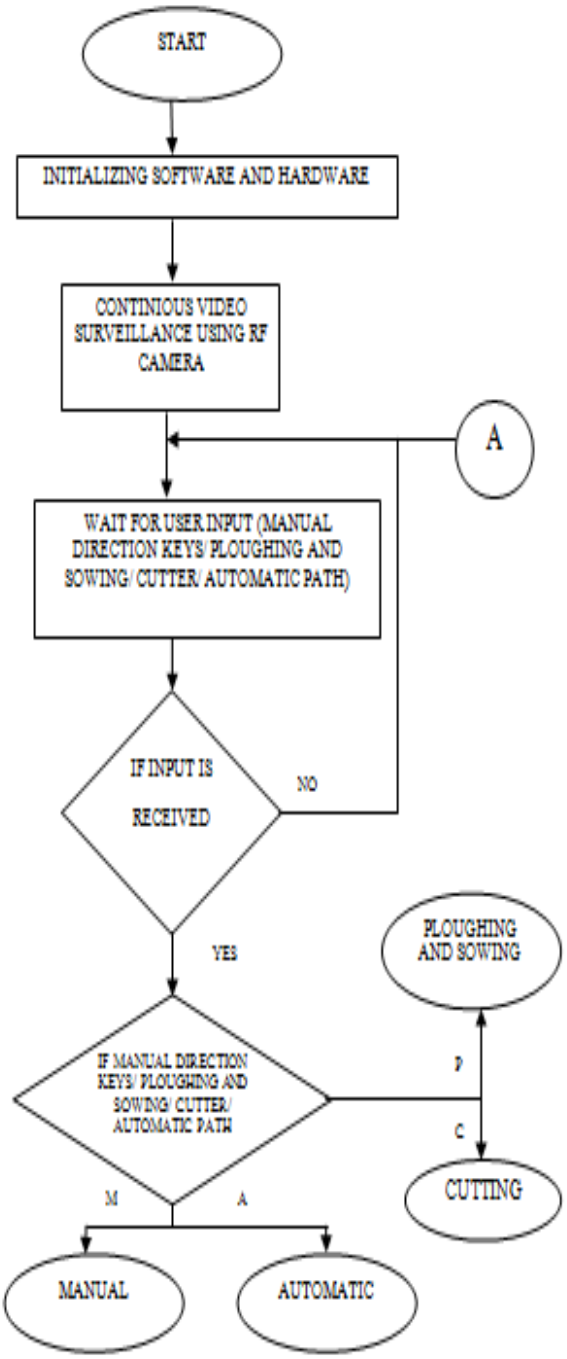
RF camera and RF devices work on a simple principle. The camera contains a wireless radio (RF) transmitter. This transmitter broadcasts the camera's video, which can be picked up by a receiver, which will be converted to video by the RF (Radio Frequency) to VGA (Video Graphics Array) converter as shown in Figure 3.12 which will be connected to a monitor or recording device recording device is used for storing the live video for further usage.

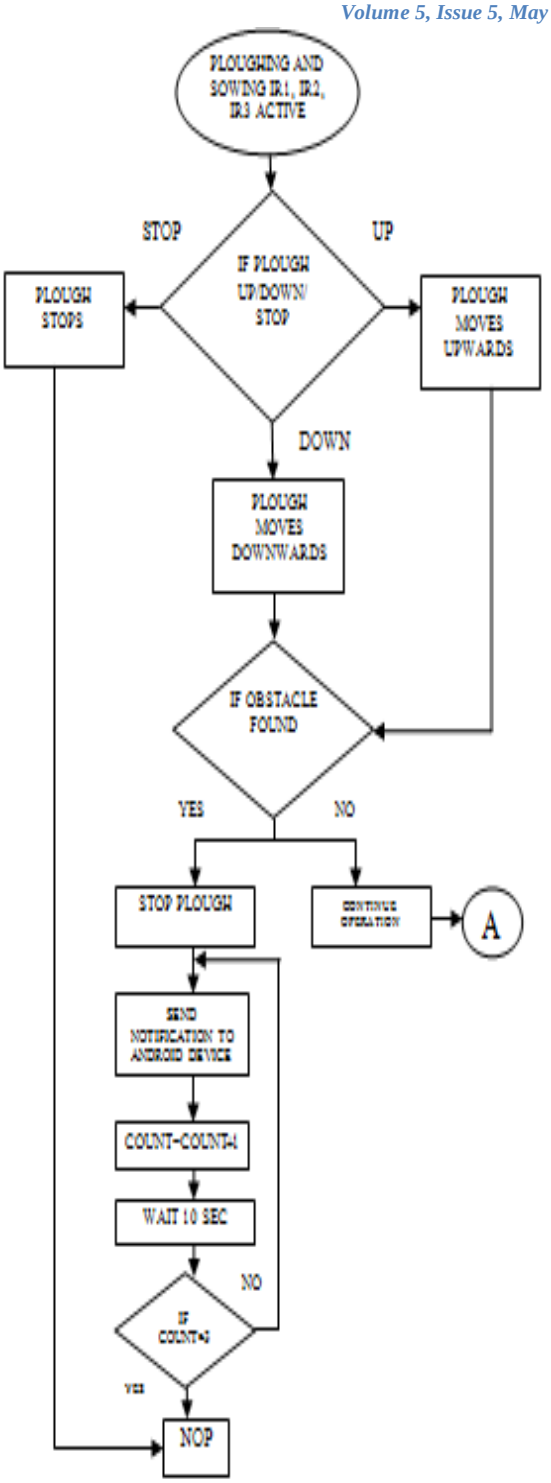
Figure(7)



Figure(8)

VII.FLOWCHART

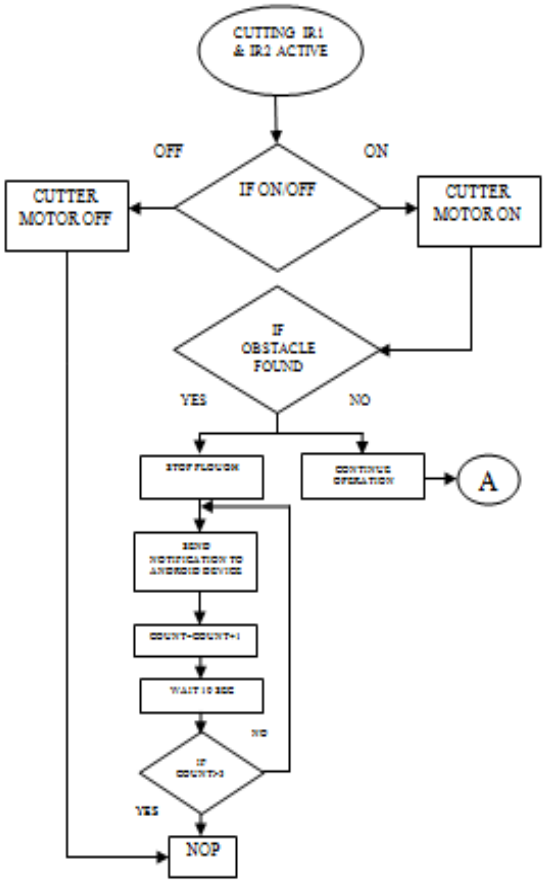


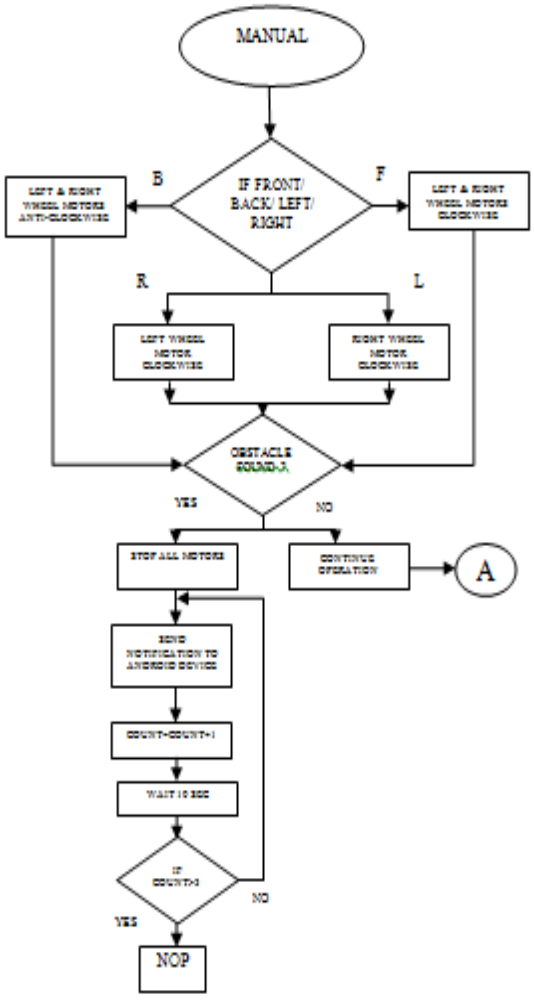


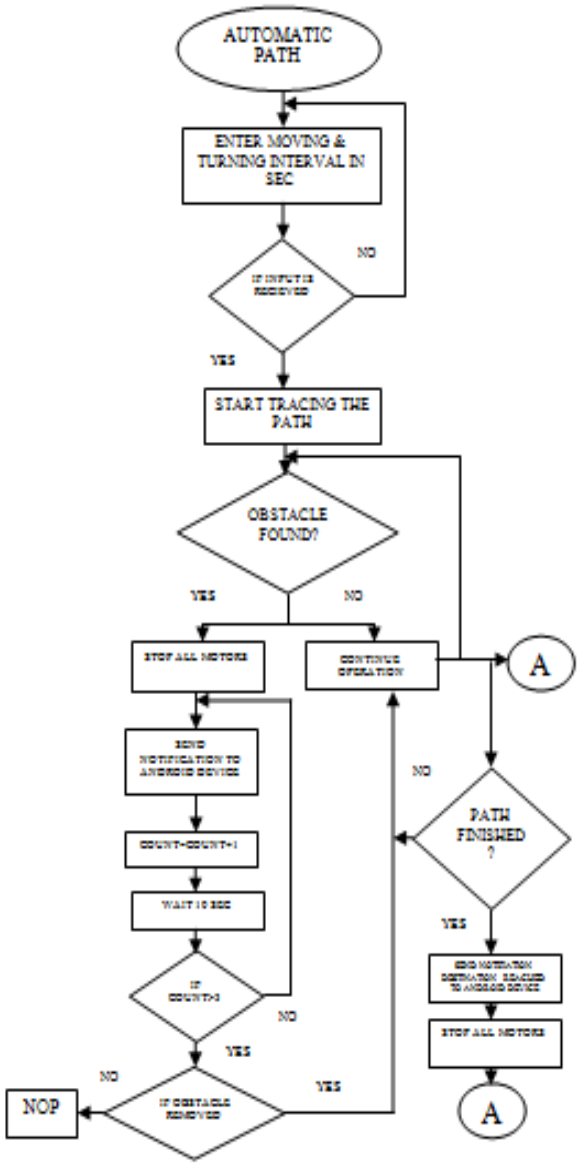
The flowchart describes the complete flow of this project. Initially both software and hardware will be initialized, such as powering the robot dumping the code and tuning the RF receiver for continuous video surveillance. The program always waits for the user input from the android device communicated through Bluetooth device, The inputs may be ploughing and sowing, cutting, manual, automatic path. When the input is received the program control will jump to respective modules. If user does not give any input it waits for the input.

In ploughing operation three IR sensor will be active, if plough up/down/stop is given then plough motor moves according to the given input, if obstacle is found in between it stops plough motor then it intimates the user with notification message three times with a time gap of 10seconds, if obstacle is not present then continues the given operation.

Cutter operation is very similar to the ploughing operation. One of the major change is IR sensor at middle is made low permanently.



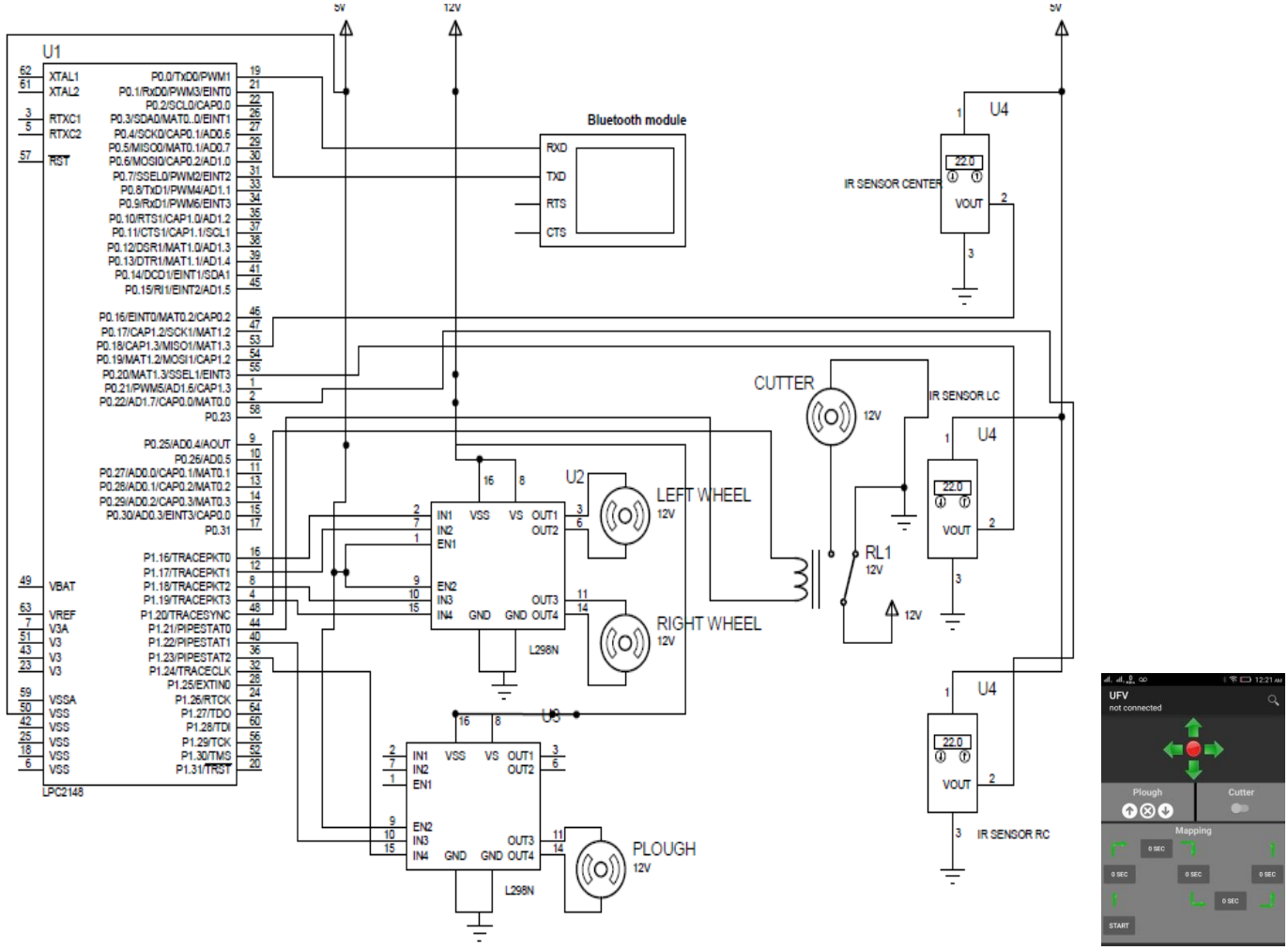




For manual operation the user can input any of the direction keys like forward, backward, left or right. After this directional key is pressed if any obstacle is found on its path, it stops the robot and then it intimates the user with notification message three times with a time span of 10seconds. If obstacle is not present then it continues to perform the given operation.

For the automatic path selection, the user has to give the moving and turning interval of time in seconds. If user inputs the above said mentioned time the robot traces the path defined in the flash memory of the microcontroller. If there is an obstacle on the tracing path then, it stops the robot and then it intimates the user with notification message three times with a time span of 10seconds. If obstacle is not present then it continues to perform the given operation. If obstacle is removed then the robot would continue the path else no operation. The program always checks two conditions obstacle found and path finished. If obstacle is found then the above mentioned steps gets repeated. If the pre - defined path is completed then there will be a notification message stating that the "destination reached".

VIII. SCHEMATIC



As we have seen in the previous chapters, all the hardware components such as DC motor, IR sensors, Bluetooth module, RF camera, receiver, VGA converter and LEDs have been interfaced. Now we develop the complete schematic of the whole system. The hardware components, four DC motors, three IR sensors, two motor drivers, Bluetooth, microcontroller, android phone, cutter and other peripherals are connected. The system schematic of the proposed method gives the complete idea about the project undertaken including pin number, port number, inputs and outputs

IX .CONCLUSION

The designed prototype enables the movement of the vehicle in any desired direction (forward, backward, right, and left) with the help of android application. The android GUI has inputs for ploughing& sowing, cutting and mapping of the path. The android device communicates with LPC2148 through Bluetooth. Apart from the regular manual operation of the robot in this project we also provide planned path which is customizable according to the user requirements, once the path is finished "Destination reached" message will be sent to android device. A 'V' projection is done beside the cutter this adds the extra feature, the cut-counterpart will be placed in between the wheels which will be easy for the user. The live video surveillance is also made using the RF camera, the receiver is tuned to get maximum clarity and live video is relayed on the remote monitor screen.

The robot also provides efficient risk management by obstacle detection and obstacle avoidance, to provide safety for the robot and pets acting as obstacles. Whenever the obstacle is found it sends three notifications to the user mobile with an interval of 10seconds each. If still obstacle is not removed then system will stop working until obstacle is removed.

X .FUTURE WORKS

The design of the prototype of the robot as mentioned in the previous chapters can be modified by considering the following points.

- The present robot does not have the intelligence to overcome the obstacle on its own.
- While performing the cutting operation cutter will not discriminate between weed and crop it just cuts everything on its way. Intelligence to cutter can be provided in future
- The range of sensing can be further increased by using ultrasonic sensors.
- As robot is sophisticated with many operations, energy will be the major constraints. The energy from the motion of the wheels can stored in a battery and made use whenever necessary which increases the efficiency of the robot.

XII .REFERENCES:

1. Ankit Singh[1], Abhishek Gupta[2], Akash Bhosale[3], SumeetPoddar "Agribot: An Agriculture Robot" published in *International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 1, January 2015.*
2. http://robohub.org/reviewing-farmerbots-a-new-industrial-revolution-by-james-mitchell-crow/
3. http://www.thehindu.com/news/cities/Hyderabad/here-comes-the-agribot/article7901466.ece
4. P.KoteswaraKarthik&P.Ravi Chandra -"An Overview of Agricultural Robots" International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 1, January 2015.
5. L298 Dual Full-Bridge Driver https://www.sparkfun.com/datasheets/Robotics/L298_H_Bridge.pdf