IOT Based Autonomous Multi-Purpose Agri BOT

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Abstract- ***More than 60 percent of the population in the India do agriculture as the primary sector occupation. At present, due to increase in shortage of labor interest has raised for the development of the autonomous vehicles like robots in the agriculture field. A robot called agribot has been designed to minimize the labor of farmers in addition to increasing the speed and accuracy of the work. The Proposed system aims at designing multipurpose autonomous agricultural robotic vehicle which can be controlled through IOT for seeding and spraying of pesticides. These autonomous vehicles are implemented to reduce human intervention, ensuring high yield and efficient utilization of resources.***

Index Terms- ***Agribot, IOT, NODE MCU, PIC Controller***

I. INTRODUCTION

Recent decrease in manpower has greatly affected the agricultural production and crop field maintenance. The intensity of the problem is high in cases of larger field areas. The main objective of this project is to identify a particular plant or a particular portion of the field of its health and perform related actions according to the data gathered with the help of sensors. Some of the parameters that are measured during this process are temperature and humidity around that plant along with the soil pH and moisture content. Analysis of these parameters can effectively give us the overall cause for the defect of the plant. Necessary actions such as spraying pesticides can be done by making use of preloaded pesticide tank. All these activities can be controlled via IOT and an android app such that autonomous activities can be carried out even without the presence of the field owner.

II. PROBLEM STATEMENT

The main problem associated with the field maintenance is that the difficulty in identifying theinfected crops increases with the increase in crop field area. Labor cost increases as more manpower is involved when we opt for manual checking. Sometimes the crops may also get damaged due to human intervention. In order to control and prevent these issues we take the help of IOT

III. OBJECTIVES

1. Connecting the sensors to monitor soil and air pressure temperature.
2. Connecting the surveillance Robot to the PIC controller.
3. Wiring the components according to the position.
4. Temporary plant and pot for checking the operations of PIC controller.
5. Programming the THING SPEAK app according to the operation.
6. Converting theAir temperature humidity into data.
7. Transfer the data into cloud and into mobile for live monitoring.

IV. PIC MICROCONTROLLER

Microcontroller is a general-purpose device, which integratesa number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. A microcontroller combines on to the same microchip:

- ➢ The CPU core
- ➢ Memory(both ROM and RAM)
- ➢ Some parallel digital i/o

PIC series form of the microcontroller has been used for this project is from. In RISC based microcontroller PIC controller is first fabricated CMOS (complementary metal oxide semiconductor) whichuses separate bus for instruction and data

allowance and simultaneous access of data memory and program.

PIC (16F877):

Various memories offered by different kinds of microcontroller. Some of the memories are EEPROM, EPROM, FLASH etc. ofwhich FLASH is the recent invention developed and this technology is used in pic16F877, so that data is retained even when the power is switched off. Erasing and Easy Programming are other features of PIC 16F877.

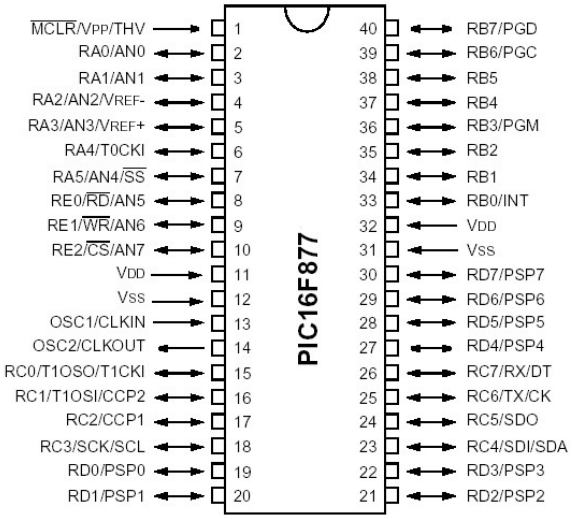

Fig 1 Pin Configuration of PIC

V. RELAY SWITCHES

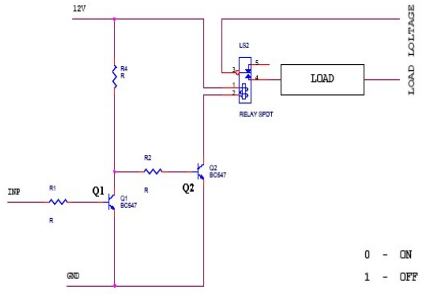

Fig.2 Relay switch circuit

Electrically operated switch is named as relay. In Relay the current flowing via the coil creates a magnetic field which changes the switch contactand attracts a lever. The current from the coil can be on or off and so that relays have two switch positions and they are called as doublethrow (changeover) switches. Relays allow the one circuit to switch a second circuit which is completely separated from the first circuit. For example, a low voltage battery circuit uses a relay to switch 230V AC mains circuit where there is no electrical connection between the two circuits in the relay.

Large current is passed through the coil of a relay, typically 30mA for a 12V relay, but it can be 100mA for the relays designed to operate from lower voltages. Most ICs (chips) cannot provide this large amount of current and this problem can be rectified by a transistor which amplifies the small IC current to the larger value required for the relay coil.

Fig.3 Relay module

Relays are usually SPDT or DPDTswitches, but they can have several sets of switch contacts, for example relays with 4 sets of changeover contacts are are in use. Most of the relays are designed for PCB mounting but it can solder wires directly to the pins to avoid melting the plastic cases of the relay. The picture shows a working relay with its coil and switch contacts. In this a lever on the left being attracted by magnet when the coil is switched on and the lever moves the switch contacts. A set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

VI. SENSORS

Temperature sensor

Special type of resistor called temperature sensor, whose resistance varies more significantly with temperature than in standard resistors.Generally, the resistance increases with the temperature for most metals but there is a negative response in the thermistori.e. the resistance of the thermistors

decreases with the increase in temperature. This is the main principle behind thermistor. As the resistance of thermistors depends on the temperature, they can be connected in the electrical circuit to measure the temperature of the body.

Thermistors are mainly used as temperature sensors, current limiters, self-resetting overcurrent protectors and self-regulating heating elements. A thermistor is made up of semiconductor material. Several shapes are available they are a disc, a rod or a bead. Bead thermistors are only a few millimeters in diameter. Some bead thermistors are bead enclosed glass capsule.

Humidity Sensor

Humidity can be described as the amount of water vapor content in an air. The three different ways of measuring humidity are absolute humidity, relative humidity, and specific humidity. It that Relative humidity is the most frequently found in the measurement of humidity because of it it is regularly used in weather forecasting. It is an essential part of weather reports because it indicates the precipitation, dew, or fog. In the summerhigher relative humidity also makes it feel hotter outside because it reduces the effectiveness of sweating which is used to cool the body by preventing the evaporation of perspiration from the skin. This effect is calculated in a heat indication table. Warm air has more thermal energy than cool air; thus more water content molecules can evaporate and stay in air in a vapor state than in a liquid state. This may be viewed as that warmer air "holds" more moisture. In warm air, there is enough amount of energy for more water molecules to hold themselves in the air (and overcome hydrogen bonds which helps to pull water molecules together).

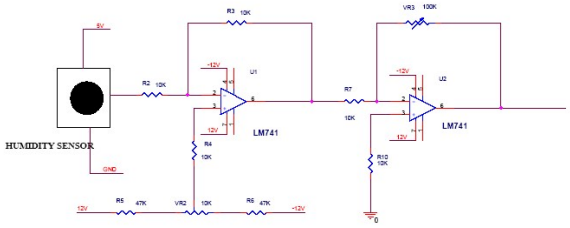

Fig.4 Humidity sensor

This circuit is to measure the humidity level in the atmosphere air. The humidity sensor is used in the measurement device. Astablemulitivibrator in the humidity sensor vary it's the capacitance depending on the humidity level. And there by the mulitivibrator produce the varying pulse signal which is converted into corresponding voltage signal.

The voltage signal is fed to inverting input terminal of the comparator and the reference voltage is given to non-inverting input terminal. The comparator is designed by the LM 741 Op-AMP. The comparator is compared with reference humidity level and obtained result is given to the corresponding error voltage at its output and then it is given to next stage of gain amplifier where the variable resistor is connected in the feedback path. By adjusting the resistor we can get the desired gain as output. Then the final voltage is fed to microcontroller or other circuit in order to find the humidity level in the atmosphere.

PH Sensor/Measurement

The PH electrode is used to measure the PH level. Based on the PH level in the water it generates the corresponding voltage signal. The obtained voltage signal is in the range of mV so that it is amplified by the operational amplifier. The amplifier is constructed by the OP07 operational amplifier. Then the amplified signal is fed to inverting input terminal of the Op-AMP. The amplifier is designed by LF356 operational amplifier. Then the +12v to -12v reference signal is produced by the pair of diodes D1 and D2 which is given to non-inverting input terminal.

Then the output signal is given to filter section in which the noise signal in the output is filtered. The filter section is developed by the LM324 operational amplifier and the capacitor C1 and C2. Then the noise free signal is given to comparator in which the PH level is compared with reference level then the final voltage given to gain amplifier, in the feedback path the variable resistor is connected. Then final gain voltage is given to related circuit in order to find the PH level in the water.

VII. LOAD CONTROL USING MOSFET DRIVE

This circuit is proposed for controlling the load. The load may be motor load or any other load. The load is turned ON and OFF via relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547 & BC 557). The Mosfet is connected in the Q2 transistor collector terminal. A Mosfet is nothing but a switching device which consists of three pins.

The Mosfet drain pin is connected to supply voltage. The source pin connected to load. When high (5 Volt) pulse signal is connected to base of the Q1 transistors and performs its conduction and shorts the collector and emitter terminal. Zero (0 Volt) signals is given to base of the Q2 transistor and thereby theMosfet is turned ON.

When low pulse is fed to the base of transistor Q1 transistor and the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is OFF and Mosfet is turned OFF.

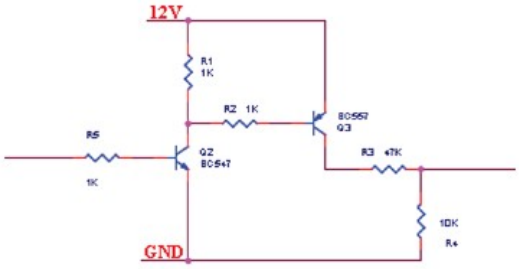

Fig.5. MOSFET Drive Circuit

VIII. WIRELESS COMMUNICATION

The processed data is being transferred to the cloud server by using ESP8266 Wi-Fi module. NODE MCU connected to external display to show the temperature and humidity. BLYNK app has been enabled to connect to IOT for both displaying the data as in the display and also to control the agribot remotely through the control buttons.

IX. RESULTS AND DISCUSSION

Table 1.Parameters and Values

S.NO	PARAMETERS	VALUES
1	PH	6
2	HUMIDITY	20
3	TEMPERATURE	22
4	SOILMOISTURE	15

Fig.6. Output

X. CONCLUSION

Internet of Things (IOT) has been enabled for the agriculture crop monitoring purpose in easy and efficient manner which is used to enhance the productivity of the crop and hence profits for the farmer enhanced. The Wireless sensor network and sensors of various types are used to extract the information of crop conditions and environmental changes. And thisinformationis transmitted via network to the farmer. This initiates corrective actions for the enhancement. Farmers are connected to the field where the awareness of the conditions of the agricultural field at anytime and anywhere in the world can be observed. Some of the disadvantages inCommunication must be overcome by advancing theTechnological usage to consume less energy and also by making user interface ease of use.

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