IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AUTOMATIC WEED REMOVING ROBOT USING IOT TECHNOLOGY

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ABSTRACT

Today's automated tilling machines are mainly categorized planting and irrigation equipment, plant nursery often include weeding spreading of fertilizer and water as taken. at present many studies focus on the design and experiment of smart weeding machines. This robot is used to remove weed from cultivation field. The main purpose of the robot is to remove the weed. Now-a-days there are around 20-25 members are required to remove the weed for one acre. For rectifying this problem we are innovate this type of robot. The working of the robot is done by the basis of arduino uno every motion controlled by the program feed into the arduino. This robot is only applicable for the corping fields which have distance between each corps, we have to place the robot in between the corps and robot is moved in path and cuts the weed. If the robot change the direction from the path it will automatically corrects it's pathway by the help of IR sensors. robot have IR sensors on both side, if the robot is move right side sensor detects the object and send the signal to Arduino, then robot is change the direction, So the main corp is not affected. The robot is also works based on the distance i.e, In the arduino programm we feed the distance to robot, if the distance is reached robot will automatically change the direction to the next path, this process is continuously repeated until we turn off robot.

Keywords : Removing robot, IR sensors & IOT Technology

1. Introduction

Traditional agriculture models utilize inefficient & intensive human labour. When automation & machinization technology matured. tractors replaced moving forming machines in place life lives pock. Now-a-days there are around 20-25 members are required to remove the weed for one acre. The wages for the workers is Rs.150 per head, nearly Rs.4000 is needed for one acre of land. there are many times of weed removal is needed based on the corp in field, So the existing process is costly, because lot manpower is used. If Less manpower is used it takes more time for removal of unwanted weed. If high amount weed is surrounded by the crops it can be easily by this robot. Traditional agriculture models utilize inefficient & intensive human labour. When automation & machinization technology matured. Tractors replaced moving forming machines in place life lives pock. Today's, automated tilling machines are mainly categorized planting and irrigation equipment, plant nursery often include weeding spreding of fertilizer and water as taken. at present many studies focus on the design and experiment of smart weeding machines. Using fertilizer to remove the weed is little harmful, because the fertilizer is spred on the weed and we take that corp some health issues came to us, so it is little dangerous process. So we have to remove the permanently without any issues. To achieve this need we have to cuts weed and pulled off from land by cutter and cultivator. By this robot one time investment is enough for weed removal process.

2. LITERATURE SURVEY

2.1 ECOROBOTIX

The robot works without being controlled by a human operator. It covers the ground just by getting its bearings and positioning itself with the help of its camera, GPS RTK and sensors. Its system of vision enables it to follow crop rows, and to detect the presence and position of weeds in and between the rows. Two robotic arms then apply a microdose of herbicide, systematically targeting the weeds that have been detected.Reliance on solar power makes the robot completely autonomous in terms of energy, even when the weather is overcast. As it adapts its speed to the concentration of weeds, it is most suitable for use in fields where the level of concentration is low to moderate, in order to cover the ground at a reasonable speed. We recommend using the machine after an initial standard application of herbicide, in order to replace subsequent applications and thus save an important amount of herbicide. The machine can be completely controlled and configured by means of a Smartphone app.

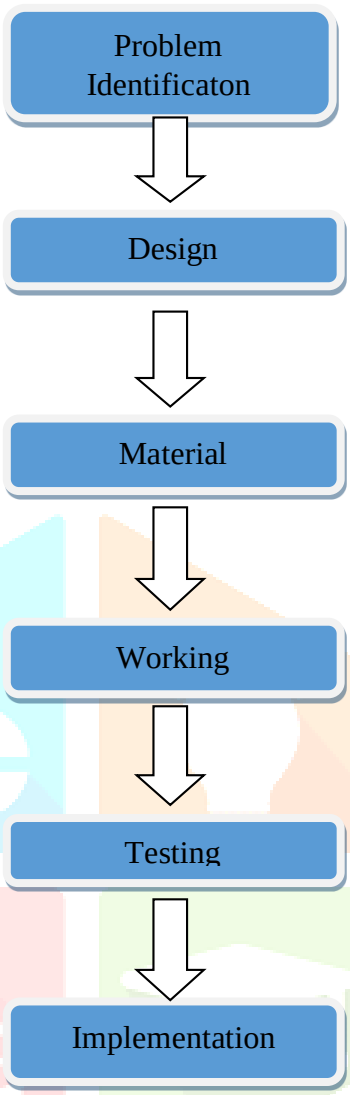
2.2 FRANKLIN ROBOT

Tertill is able to maintain up to a ten by twenty-foot garden by carefully managing how it uses the power it collects from the sun. It then uses this power to drive around the garden, avoid plants and obstacles taller than an inch. While it's doing this, it's looking for weeds it can cut with its string trimmer. Some days are sunnier than others, but little by little, day by day, Tertill helps maintain a more beautiful, productive, and less-weedy garden. Tertill detects objects the same way most touch screens sense your finger. Both detect small changes in capacitance when a conductive object is near. Sensor plates mounted just inside Tertill's shell on the front left and front right detect tall plants and conductive boundaries. A smaller plate mounted on the bottom front of the robot is used to detect weeds short enough to slide under the robot. When Tertill detects an object with its side-mounted sensors it spins right or left to avoid the object. But if the bottom mounted sensor detects an object Tertill turns on its weed whacker. In this way the robot avoids tall crops but attacks short weeds.

2.3 RESEARCHERS FROM WASHINGTON STATE UNIVERSITY (WSU), UNIVERSITY OF CALIFORNIA-DAVIS

With labor coming at a high cost and being in short supply, the agriculture industry is looking for new ways to get the job done. Currently, researchers from Washington State University (WSU), University of California-Davis and University of Arizona are collaborating to develop robotic weeding technology. This would help growers reduce manual weeding, which is one of the most labor-intensive operations on many vegetable crop farms. It would also improve sustainability, according to Manoj Karkee, an associate professor with WSU's Center for Precision and Automated Agricultural Systems. Karkee expects labor availability to become an even greater challenge in the future due to increasing economic activities in Mexico and other countries. Automating tasks such as weeding is necessary to minimize labor costs and keep the industry viable in the long term.The research team is working on a novel concept of using cameras and other sensors to differentiate crop plants from unwanted plants and weeds.

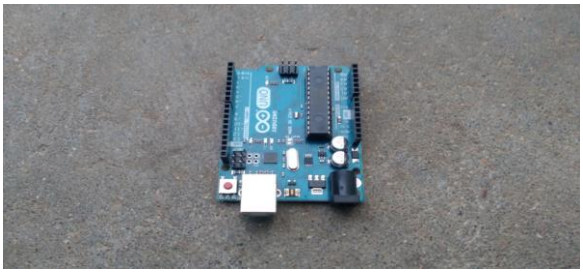
3.METHODOLOGY



4. COMPONENTS

Arduino Uno
Cultivator
IOT Module
Relay Unit
IR Sensor
Application for IOT

4.1 ARDUINO UNO

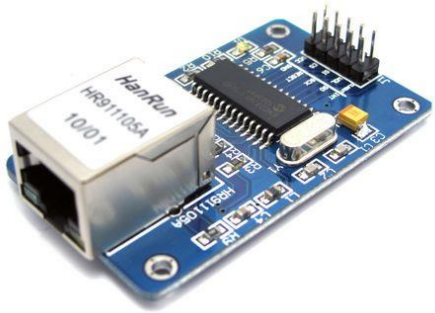


Arduino boards are able to read inputs light on a sensor, a finger on a button and turn it into an output activating a motor, turning on an LED. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

4.2 CULTIVATOR

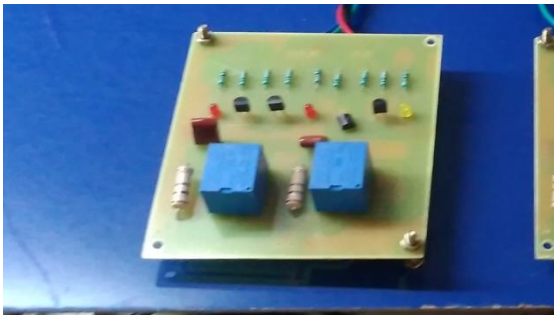
Cultivators stir and pulverize the soil, either before planting to aerate the soil and prepare a smooth, loose or after the crop has begun growing to kill weeds controlled disturbance of the topsoil close to the crop plants kills the surrounding weeds by uprooting them, burying their leaves to disrupt their photosynthesis, or a combination of both. Unlike a harrow which disturbs the entire surface of the soil.

4.3 IOT MODULE



This internet module is used to connect the arduino with internet. Then the details are send to the mobile phone through this device. This device is connected with application.

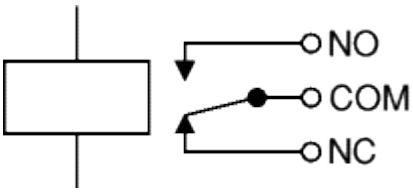
4.4 RELAY UNIT



A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first.

For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.



The relay's switch connections are usually labeled COM, NC and NO:

- **COM** = Common, always connect to this, it is the moving part of the switch.
- **NC** = Normally Closed, COM is connected to this when the relay coil is **off**.
- **NO** = Normally Open, COM is connected to this when the relay coil is **on**.

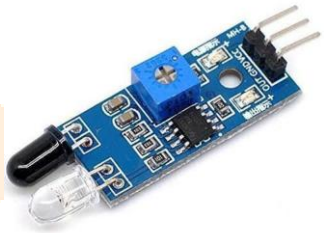
Circuit description:

This circuit is designed to control the load. The load may be motor or any other load. The load is turned ON and OFF through relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547). The relay is connected in the Q2 transistor collector terminal. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and Normally open (NO).

The relay common pin is connected to supply voltage. The normally open (NO) pin connected to load. When high pulse signal is given to base of the Q1 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero signals is given to base of the Q2 transistor. So the relay is turned OFF state.

When low pulse is given to base of transistor Q1 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the supply voltage through relay.

4.5 IR SENSOR

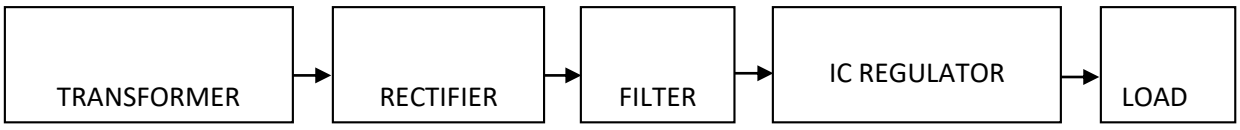


IR sensor is an electronic instrument It can be done by emitting or detecting infrared radiations. There are two types of infrared sensors active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts one is light emitting diode (LED) and another one is receiver. When an object comes close to the sensor infrared light from the LED reflects off of the object and is detected by the receiver.

5. BLOCK DIAGRAM

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.



6. WORKING PRINCIPLE

6.1 TRANSFORMER

Transformer is a static device, which transfers electrical energy from one alternating current circuit to another without change in frequency. The working principle behind its operation is faraday laws of electromagnetic induction, which states that, "whenever current carrying conductor is moved in a magnetic field, flux linked with the conductor changes and emf is induced in the conductor".

Transformer is used in step down mode of operation in the sense it provides an output, which is reduced in form compared to input. It depends upon number of turns in the winding i.e., turns ratio.

Primary winding is fed with a supply of 230v, 50Hz a.c, which appears as an voltage approximately 15v across secondary winding. This voltage is fed into the rectifier circuit for the purpose of rectification i.e., converting a.c. input to D.C. output.The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC, rest of the circuits will give only RMS output.

TYPES OF TRANSFORMERS

Mains transformers are used at ac mains frequency (50Hz Britain), their primary coil being connected to the 240V ac supply. Their secondary windings may be step up or step down or they may have on or more of each. Thy have laminated iron cores and are used in power supply units. Sometimes the secondary has a center tap sec units 20.2.Step down tropical types are becoming popular. They have virtually no external magnetic field and a screen between primary and secondary windings gives safety and electrostatic screening. Their pin connections are brought out to a 0.1 inch grid, which makes them ideal for printed circuit board (PCB) mounting.Isolating transformers have a one-to-one turns ratio (ins/np=1/1) and are safety devices for separating a piece of equipment from the mains supply. They do not change the voltage.

Audio Frequency

Audio frequency transformers, as illustrated in also have laminated iron cores and are used as output matching transformers to ensure the maximum transfer of power from the audio frequency output stage to the loudspeaker in, for a radio set or amplifier.

Radio Frequency

Radio frequency transformers usually have adjustable iron-dust cores and form part of the tuning circuits in a radio. They are enclosed in a small aluminium screening can to stop them radiating energy to other parts of the circuit.

6.2 BRIDGE RECTIFIER

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.

The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3.

One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4)

can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits.

In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts.The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 v0lts, as result of the small voltage drop across the diode. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage, which is 1000 volts. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit.

7. WORKING

The arduino board is extended by relay circuit and the relay circuit will control all the motors of the robot. There are 6 motors are connected with 4 wheels amd one of the motor is connected with cutter another motor is connected with the weeder. Each motor connected to the relay unit, the robot is placed in the field for removing the weed and is move straightly.Then battery is connected for the power supply and output is 12v lead acid battery is used for this robot.Power supply unit is placed in the robot which can be used to distribute the power from the battery to arduino. Relay unit and motors are also connected to the supply.Arduino can operates only in 5v so the power supply unit is needed to convert 12v into 5v.The motor is connected to the cutter,then the motor starts to rotate and then the weed is cut by using the cutter. They are of two types of relay unit where used in these robots, single and double relay. Single relay is used for control the on/off function of the cutter and the weeder, where the double relay is used for control the forward and backward motion of the motor which is connected with the wheels. Sensors, IOT modules are connected to the arduino. The output signals which has beed comes out from the arduino reaches the relay circuit. IOT module is used to transmit and receive the signal from the IOT application. The program can be feed into the arduino and IOT module for the operation performed by the robot. Gear motors can be used to carry the load compare to normal motors. The high speed moto can be used for cutting operation. The robot will move based on the distance which had been already feed into the arduino, after moving certain distance the robot will automaticaly turn left/right side which has been already feed into the arduino.

The IR sensor can be used to detect the crops on the following path of the robot. IOT application can be used to connect the IOT module and mobile phone. Temperature, moisture, battery levels are also monitored by using the mobile phones. Instead of using normal people we can use these such robot for the cultivation purpose where lots and lots of time manage and money which we can spend in this can be reduced On such condition the IOT sensors such as arduino board, IR sensors, temperature sensor, moisture sensor are also used for this kind of robot for the higher performance which can be used for the weed removing operation. The weed removing robot is function mainly using of an arduino board, where all of the major function are controlled by these board. The speed of the robot is controlled by using the relay unit such function are preprogrammed in the arduino so it can be easy to operate the robot. The speed of the robot and the cutter is also maintained frequently using those relay unit. The major unit of the robot is the cutter, it is made by using the mildsteel. The speed of the cutter is high so it can be cut the weed at a second. The cultivator is attached on the back side of the robot, which is used to remove the weed from the root. Where the plant which is not grown again. So we used these cultivator for these operation. The battery which stood for a long time performance and it is rechargeable battery we can restore after the work is done. The wheel is higher valuable range of source which is used to move along with all suitable directions which is used for the robot.

8. REFERENCES

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2.Automatic weed removal system using machine vision- Dr.Pusphavalli, R.Chandraleka, this robot is applied in the agriculture land thus robot uses the machine vision using camers so it can easily identify the weed and it removed off**.**

3.smart weed killing robot- ecorobotics(2013), this robot is mainly designed for killing the weed using the chemical and also use the sensors for detecting the weed.