VISHVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI – 590018, KARNATAKA

PROJECT REPORT

on

"MOBILE VEHICLE FOR CROP NOURISHING FRAMEWORK USING ARDUINO"

Submitted in partial fulfillment of the requirement for the award of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

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ABSTRACT

Agricultural activities requires a regular and adequate supply of water, manure, fertilizers. The history of the farmer started with intensive cultivation of early-maturing, high yielding varieties but without paying much attention to the soil-nutrient status and soil-health continuous cultivation with inefficient management of fertilizers has resulted in effect on the consumers malnutrition, environmental concerns and decrease in fields quantitative and qualitative. Therefore, these problems can be overcome with the implementation of modern agricultural technology.

There is a need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology, it has become necessary to increase the annual crop production output entirely agro-centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. This could be done with the implementation of Arduino UNO in this project which is the heart interfacing between hardware and software.

The method of modernized agricultural system is called 'smart irrigation system' which allows to maximize the field using minimum resources such as water, fertilizers and pesticides. By deploying sensors and mapping fields, farmers can begin to understand their crops at a micro scale, conserve resources and reduce impacts on the environment. The automation which also involves improving the speed of production, reduction of cost, effective use of resources.

ACKNOWLEDGEMENT

In performing our project, we had to take the help and guidelines of some respected persons, who deserve our greatest gratitude. The completion of the project gives us much pleasure.

We consider it is a privilege to express our respect to all those who guided us in completion of the project phase-2 report-2, without whom our efforts would not have led to success.

By seeking the blessings, we submit our humble pranams to his holiness of **Sri Sri Sri Dr. Nirmalanandanatha Mahaswamiji and Sri Sri Mangalanatha Swamiji** for their blessings**.**

We would like to thank the management and Principal **Dr. G T Raju** for providing us with all the required facilities and mainly the academic environment.

It is a great privilege to place on the record of expressing our deepest sense of gratitude to our HOD Department of Electronics and Communication

Dr. B N Shobha, who patronised throughout our career and for facilities provided to carry out the work successfully.

We also express our deep sense of thanks to **Prof. Ravi M V,** the coordinator for their constant support.

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We also thank the **teaching, non-teaching** and **staff members** who have helped us directly or indirectly during the project phase-2 work.

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ACRONYMS

DC	-	Direct Current
IDE	-	Integrated Development Environment
LCD	-	Liquid Crystal Display
IOT	-	Internet of Things
PLC	-	Programmable Logic Controller
PH	-	Potential of Hydrogen

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CHAPTER-1

PREAMBLE

1.1 INTRODUCTION

By using the concept of a modern irrigation system, a farmer can save water up to 50%. This concept depends on two irrigation methods, those are conventional irrigation methods like overhead sprinklers, flood type feeding systems i.e., wetting the lower leaves and stem of the plants. The area between the crop rows become dry as a large amount of water is consumed by the flood type methods, in case if the farmer depends only on the incidental rainfalls. The crops are being infected by the leaf mold fungi as the soil surface often stays wet and is saturated after irrigationis completed[1].

The history of the farmer started with intensive cultivation of early-maturing, high yielding varieties without paying much attention to the soil nutrient status and soil health. Continuous cultivation with inefficient management of fertilizers inputs has resulted in an effect on consumer malnutrition, environmental concerns and a decrease in yields-qualitative and quantitative. The delivery of fertilizers in the field using irrigation water is known as 'Fertigation'. Its efficiency in nutrient management has greater control over crop performance and environmental effects. An Optimum range of nutrients is critical for plant growth is provided by fertigation. Optimum nutritional conditions can vary for different crops and the same crops at different times of their life cycle. Today's agricultural modernized technologies are brought up through automation with help of low-cost electronic boards and programmable logic circuits[2].

Irrigation is the most important cultural practice and major labour task in the daily agriculture sector. To do this automatically, various methods are available using suitable sensors to determine when plants may need water. Automation involves improving the speed of production, reduction of cost, effective use of resources. This method of modernized agricultural system is called 'smart irrigation system' which allows to maximizing the field using minimum resources such as water, fertilizers and pesticides. By deploying sensors and mapping fields, farmers can understand their crops at micro scale, conserve resources reduce impacts on the environment[3].

To minimize the wastage of fertilizer and water, the automatic controller of the feeding system came into existence using programmable logic circuits where the integration of fertilizer and water feeding system through the operation of valve based on the big data and IOT. The ultimate goal of intelligent water saving irrigation is producing the most output with the least amount of water, in other words, irrigating crops "timely" and "appropriately"[4-5].

The food and agricultural organization of the United Nations estimates that agriculture accounts for 70% of all water consumption compared to 20% for industry and 10% for domestic needs. Critical need for water conservation is required, hence with the smart irrigation system the automatic mobility of the model is introduced[6].

Direct current motor operated by the electrical energy stored in the battery attached to the unit of pesticides and water irrigation system. The battery can be charged by a solar panels in the presence of the sun. The advent of photovoltaic modules and arrays or simply solar panels corroborates this progress. The photovoltaic (PV) or solar cells crafted from silicon semiconductors are configured to trap and convert the sun's energy into useful energy which is then used to perform work such as Dehydration of Agriculture products, irrigation pumps, pesticide Duster etc[7].

1.1 OBJECTIVES

The main objective of this project is to design a portable vehicle where it can feed prerequisites to the plants on time to time basis based on crop requirements. Below are the steps to achieve our objective:

1. Construction of model which makes use of solar panel to generate electricity.
2. Building up the electrical part results in supply of water, pesticides, manure separately via solenoid values using relay module.
3. Motor driver used in this model helps in the movement of vehicle automatically from one plant to another based on the crop requirement and fixed time delay.
4. Encoding the program with appropriate software results in the detection of all parameters.

Particulars: This project prototype is applicable for normal climate conditions.

1.2 PROBLEM STATEMENT

The traditional agriculture and allied sector cannot meet the requirements of modern agriculture which requires high-yield, high quality and efficient output. Thus, it is very important to turn towards modernization of existing methods and using the information technology and data over a certain period to predict the best possible productivity and crop suitable on the very particular land. Some of the sample problem statements related to Agriculture & allied sectors where IoT application will be beneficial are given below.

Overuse of pesticides and fertilizers in agricultural fields leads to destruction of the crop as well as reduces the efficiency of the field increasing the soil vulnerability toward pest. Exported / supplied stocks are rejected by the customers due to undesired quality.

1.3 METHODOLOGY

The Arduino is controlling the relay operation through switching 4 channel relay module connected between solenoid valves and Arduino. The controller switching circuit of relay module is powered by battery, which is get charge by solar panel. The relay operation is automatic, based on the information given in program with time delay.

The time is delay uploaded in the program based on requirement of the plant with respect to their water, manure and pesticides requirements per day are collected and programmed into Arduino using C.

The valve operation of water is also based on the requirement, but during rainy season the rain sensor used to avoid water being fed from the valve. The information (analog data of rain sensor) from rain sensor is fed back to the Arduino to stop excess feeding of water to plant. IR Sensor is an electronic device used to measure the heat as well as detects the obstacle.

After the process of feeding of water, manure and pesticide the vehicle will move automatically to the next plant through the motor driver and the above process will repeat for further plants aligned the same line.

1.4 LITERATURE SURVEY

Baljithkaur, et.al[1] in this paper proposed their work on Nutrition maintenance of the plant based on soil PH and electrical conductivity of the fertilizer and soil. The system comprises oftwo sensors of PH sensor and Electrical conductivity (EC) sensor which sense those parametersand give feedback to Arduino. Based on the desired PH and EC of the fertilizer solution and soil the microcontroller will have turned on and off the particular solenoid valve to pour the fertilizers into mixed tank. LCD is used to display the result.

D. Dhar Raja, et.al[2] in this paper proposed their work on Irrigation and Fertilizer Sprinkling on the application of PLC. They proposed the work on automatic irrigation through PH and moisture sensors in which the PLC controls water pump through the relay and solenoid valve. They used LOGO PLC platform and it produced automatic irrigation system and minimized the cost.

Manali Hat, et.al[3] in this paper proposed their work on Smart Irrigation based on IOT technique to reduce the cost and improved efficiency. They aimed to smart wireless sensor Network to monitor an agricultural environment in the field of soil moisture, water control, humidity and temperature with their respective sensors are used.

Peng zhang, et.al[4] in this paper proposed their work on Smart Irrigation with integration of both water and fertilizer with smart water saving system based on Big Data. They collected the data regarding the growth of crops in the fields and uploaded in the Shandong agricultural university, big data central target data base which predicts and forecast the water requirement of crops in different growth periods and that can take the decision for automatic irrigation and fertilization realized timely and proper irrigation of crops.

J. Balakrishna, et.al[5] in this paper proposed their work based on Power status of motor and ground water availability in agricultural field. They contributed the solution for these problems using Raspberry pi 3. An android application is developed to monitor the motor based on underground water and predefined time in farm.

Based on the literature review, it is observed several studies and contribution on the automatic agricultural system to feed water and fertilizers for the efficient growth of the plant. By the above information the automatic agricultural system is existed through the use several sensors such as pH sensors and electrical conductivity sensors of soil. Thus, motivation for the present project is to add rain sensor that can operate like pH sensor to stop the flow of water to plant by closing the valve pertaining to water at the rainfall time, as well the manures and pesticides are actuated as given time delay. Also, the present project work is done through independent power supply by the means of solar power and battery.

CHAPTER 2

2.1 BLOCK DIAGRAM

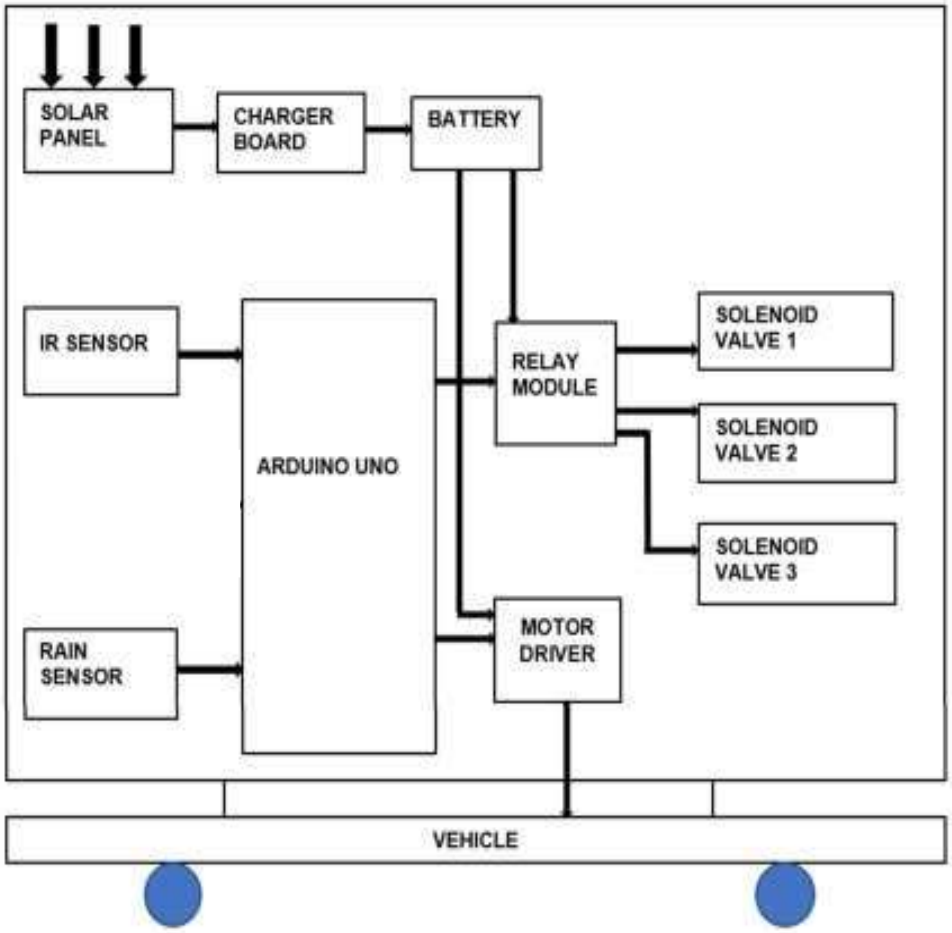

Fig2.1. Block diagram

In the Fig 2.1 shows that the complete set of model. The Arduino is controlling the relay operation through switching 4 channel relay module connected between valves and Arduino. Portable vehicle is used in order to move automatically from one plant to another. Solar power is used to run this prototype.

CHAPTER 3

HARDWARE AND SOFTWARE REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

3.1.1 ARDUINO UNO

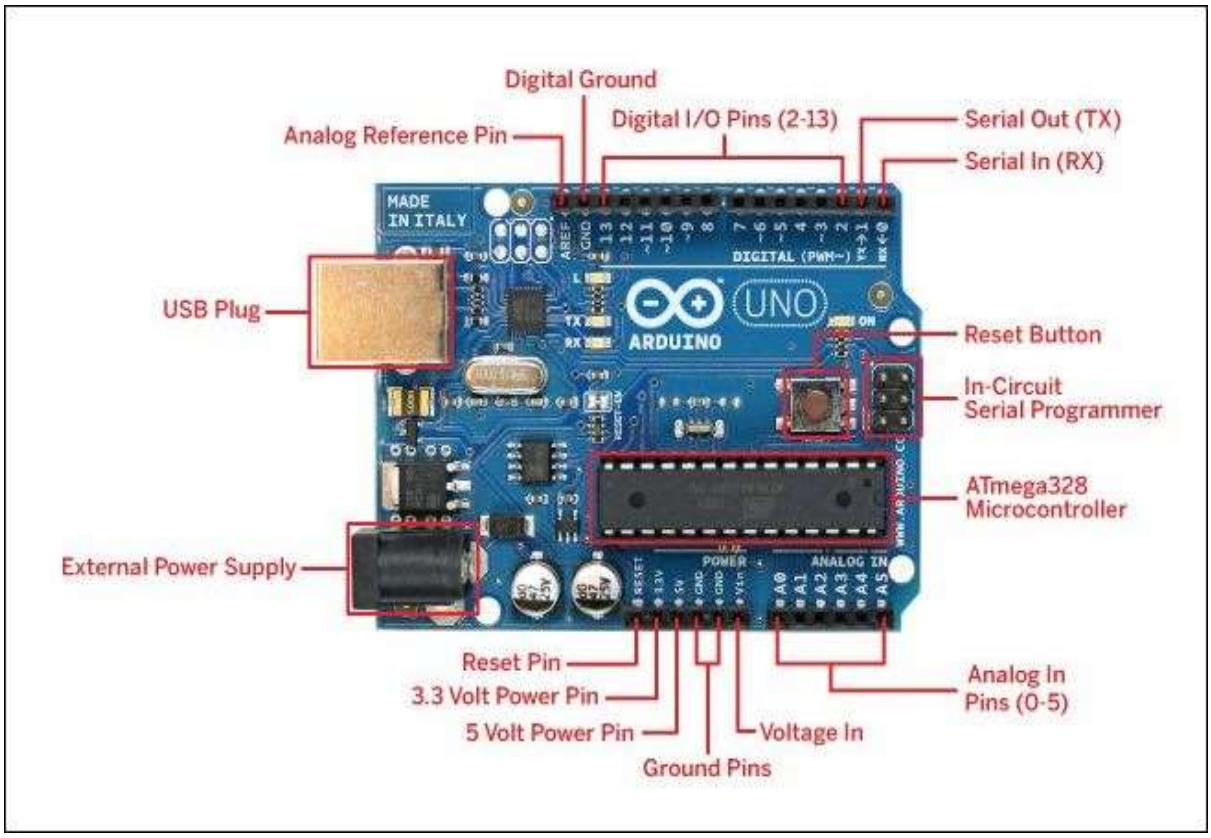

Fig 3.1: Arduino UNO R3 [12]

In Fig 3.1 shows that, when the Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB Cable. It can be powered by the USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. This board can be instructed

what to do by sending a set of instructions to the microcontroller on the board. To do so the Arduino programming language (based on wiring) and the Arduino Software (IDE) based on Processing are used. The Arduino Uno can be powered via the USB connection or with an external power supply. The power sourceis selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug intothe board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of thePOWER connector. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7V to 12V.

Vin: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.

5V: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard components.

3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board

GND: This pin of the board is used to ground the Arduino board.

Reset: This pin of the board is used to reset the microcontroller. It is used to Resets the microcontroller.

Analog Pins: The pins A0 to A5 are used as an analog input and it is in the range of 0-5V.

Digital Pins: The pins 0 to 13 are used as a digital input or output for the Arduino board.

Serial Pins: These pins are also known as a UART pin. It is used for communication between the Arduino board and a computer or other devices. The transmitter pin number 1 and receiver pin number 0 is used to transmit and receive the data resp.

External Interrupt Pins: This pin of the Arduino board is used to produce the External interrupt and it is done by pin numbers 2 and 3.

PWM Pins: This pins of the board is used to convert the digital signal into an analog by varying the width of the Pulse. The pin numbers 3,5,6,9,10 and 11 are used as a PWM pin.

LED Pin: The board has an inbuilt LED using digital pin-13. The LED glows only when the digital pin becomes high.

AREF Pin: This is an analog reference pin of the Arduino board. It is used to provide a reference voltage from an external power supply.

Specifications:

Microcontroller: ATmega328

DC Current: 40-50mA

Input Voltage: 7-12V

Clock Speed: 16MHz

3.1.2 MOTOR DRIVER

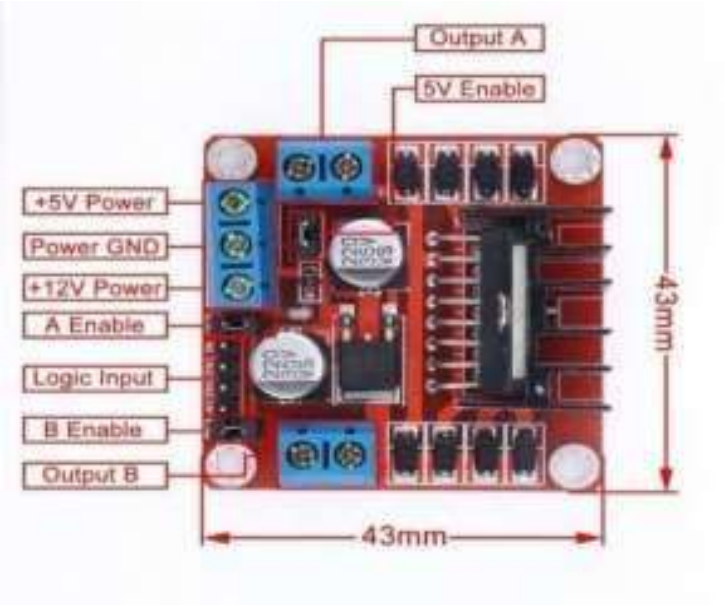

Fig 3.2: L298 Motor Driver [12]

In Fig 3.2 shows that, motor driver is used to control the speed and direction of DC motor, which is used for momentary of vehicle in our project. Here we used the L298 motor driver. L298 is an integrated circuit, which has 2 enable input to control any device by enabling or disabling it. L298 IC is most commonly used to make motor drivers or motor controlled by microcontroller (ex: Arduino). It is able to control two different DC motors simultaneously. L298 driver also has PWM pins to control the speed of the motor.

Table 3.1: L298 Pin controller description[12]

L298 Pins Description	
Pin Name	**Pin Functions**
OUT 1	Stepper motor A+ or DC motor 1 (+)
OUT 2	Stepper motor A- or DC motor 1 (-)
12V Jumper	Enables power to on board 5V regulator
12V	Voltage supply
GND	Ground (0V)
5V	Voltage supply
ENA	DC motor 1 enable
IN 1	Input from Arduino
IN 2	Input from Arduino
IN 3	Input from Arduino
IN 4	Input from Arduino
ENB	DC motor 2 enable
OUT 3	Stepper motor B+ or DC motor 2 (+)
OUT 4	Stepper motor B- or DC motor 2 (-)

3.1.3 RELAY MODULE

Fig 3.3: Relay Module [12]

In Fig 3.3 shows that, Relay is an electromagnetic switch that is used to turn on and turn off a circuit by a lowpower signal or where several circuits must be controlled by one signal. Here, we used 4channel relay module to give the required delay operated open and closing of valve for water, manure and pesticides. The relay is used to electrically isolate two circuits and connect them magnetically. Allow a circuit to change another while they are separate. They are often used to connect an electronic circuit (low voltage) to an electrical circuit that operates at a very high voltage. A relay switch can be divided into two parts: input and output.

The input section has a generator coil magnetic field when a small voltage is applied by an electronic circuit. This voltage is called operating voltage. Common relays are available in different operating voltage configurations such as 6V, 9V, 12V, 24V and so on. The output section is relays connected mechanically or unplugged. Three relay contacts normally open (NO), normally closed (NC) and common (COM) are present in the relay base. When no voltage is applied through the relay, NC is connected to COM. When the operating voltage is applied, the relay coil energizes and changes the NO-COM contact

Specifications:

4-Channel Relay interface board, and each one needs 15-20mA Driver Current.
Both controlled by 12V and 5V input Voltage.
Equipped with high-current relay, AC250V 10A; DC30V 10A.
Standard interface that can be controlled directly by microcontroller (Arduino, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic active low)Opto- isolated inputs.
Indication LED’s for Relay output status.

3.1.4 DC Motor

Fig 3.4: DC Motor [12]

In Fig 3.4 shows that, a DC Motor whose poles are made of Permanent Magnets is known as Permanent Magnet DC (PMDC) Motor. The magnets are radially magnetized and are mounted on the inner periphery of the cylindrical steel stator. The stator of the motor serves as a return path for the magnetic flux. The rotor has a DC armature with commutator segments and brushes. The Permanent Magnet DC motor generally operates on 6 V, 12V or 24- Volts DC supply obtained from the batteries or rectifiers. The basic working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motors work under this principle. The motor that drives these toys is nothing but a permanent magnet DC motor or PMDC motor. These types of motors are simple in construction. They are commonly used as a starter motor in automobiles, windshield wipers, washers, for blowers used in heaters and air conditioners, to raise and lower windows and they are extensively used in toys like robotic vehicle or as we used here, the automatic vehicle.

Specifications:

DC supply: 4 to 12V

RPM: 300 at 12V

Total length: 46mm

Motor diameter: 36mm

Motor length: 25mm

Brush type: Precious metal Gear head

diameter: 37mm

Gear head length: 21mm

3.1.5 SOLAR PANEL

Fig 3.5: Solar Panel [12]

In Fig 3.5 shows that the Solar panels are active solar devices that convert sunlight into electricity. They come in a variety of rectangular shapes and are usually installed in combination to produce electricity. A solar panel or module is a series of interconnected silicon cells joined together to form a circuit. In greater numbers the amount of power produced by these interconnected cells can be increased and used as an electricity production system. At the present time about 80% of all solar panels are made from crystalline silicon (i.e. monocrystalline, polycrystalline, amorphous silicon or hybrids) solar cells. Typically, the solar cells are laid out in a grid pattern – with perhaps as many as 72 different solar cells. The solar panels after being hermetically sealed to protect them, are covered in a non-reflective glass to protect the solar cells from environmental damage and placed into a rigid frame.

Specifications:

20 (2x10) Polycrystalline Solar Cells

Peak Power (Wp): 10W ± 5%

Voltage at maximum power (Vmp): 17.5V

Current at maximum power (Imp): 0.57A

Open circuit voltage (Voc): 21.0V

Short circuit current (Isc): 0.63A

Power allowance range: ± 5%

Dimensions: 300 * 330 * 25m

3.1.6 WATER PUMP

Fig 3.6: Water Pump [12]

In Fig 3.6 shows that the water pump is machine that delivers or pressurizes a liquid. It transfers the mechanical energy of the prime mover or other external to the liquid, increasing the energy of the liquid. By mini motor pump is mini type of transfer water from lower place to higherplace or to for place. Here, in our project we utilized the pump as relay operation and to pressurize the pesticides to sprayer block.

Specifications:

Self-priming pump Optimal

for Voltage: 12V

Working Voltage: 4V-1

3.1.7 RAIN SENSOR

Fig 3.7: Rain Sensor [12]

In Fig 3.7 shows that the rain sensor module is an easy tool for rain detection. It can be used as switch when rain drop falls through the raining board and also for measuring rainfall intensity. The analog output is used to detect the amount of rain fall. It is connected to the 5V power supply

in the Arduino board, the LED will turn on when the induction board has no rain drop, and D0 output is high, when dropping a little water, D0 output is low, the switch indicator will turn on. The rain sensor module/board is shown below. Basically, this board includes nickel coated lines and it works on the resistance principle. This sensor module permits to gauge moisture through analog output pins & it gives a digital output while moisture threshold surpasses. This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier. This sensor is a resistive dipole, and based on the moisture only it shows the resistance. For example, it shows more resistance when it is dry and shows less resistance when it is wet.

The pin configuration of this sensor is shown below. This sensor includes four pins which include the following.

- Pin1 (VCC): It is a 5V DC pin
- Pin2 (GND): it is a GND (ground) pin
- Pin3 (DO): It is a low/ high output pin
- Pin4 (AO): It is an analog output pin

Specification:

- Adopts high quality of RF-04 double sided material
  Area: 5cm*4cm nickel plate on side
- Anti-oxidation, anti-conductivity, with long use time;
  Working voltage: 5V
- Output format: Digital switching output (0 and 1) and analog voltage output A0;
- This sensor module uses good quality of double-sided material.
- Anti-conductivity & oxidation with long time use
- The area of this sensor includes 5cm x 4cm and can be built with a nickel plate on the side
- The sensitivity can be adjusted by a potentiometer
- The required voltage is 5V
- The size of the small PCB is 3.2cm x 1.4cm
- For easy installation, it uses bolt holes
- It uses an LM393 comparator with wide voltage
- The output of the comparator is a clean waveform and driving capacity is above 15mA

3.1.8 IR SENSOR

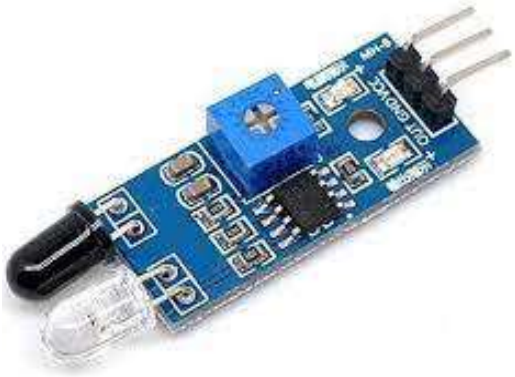

Fig 3.8: IR Sensor [12]

In Fig 3.8 shows that the active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Passive infrared (PIR) sensors only detect infrared radiation and do not emit it from an LED. The wavelengths of these regions and their applications are shown below. An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation.

Specifications:

Near infrared region — 700 nm to 1400 nm — IR sensors

Far infrared region — 3000 nm to 1 mm — Thermal imaging Main Chip - LM393

Operating Voltage - (VDC) 3.6 ~ 5

Distance Measuring Range - (CM) 2 ~ 30 Dimensions - 48 x 14 x 8 mm

3.2 SOFTWARE REQUIREMENTS

Language Platform:

- C
- Arduino IDE

Fig 3.9: Arduino Software[25]

In Fig 3.9 shows that the open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and another open-source software. This software can be used with any Arduino board. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students with or without a background in electronics and programming. Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a message and turn it into a output - activating a motor, turning on an LED, publishing something online and many more. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

CHAPTER 4

FLOWCHARTS

4.1 FLOWCHART OF PROTOTYPE

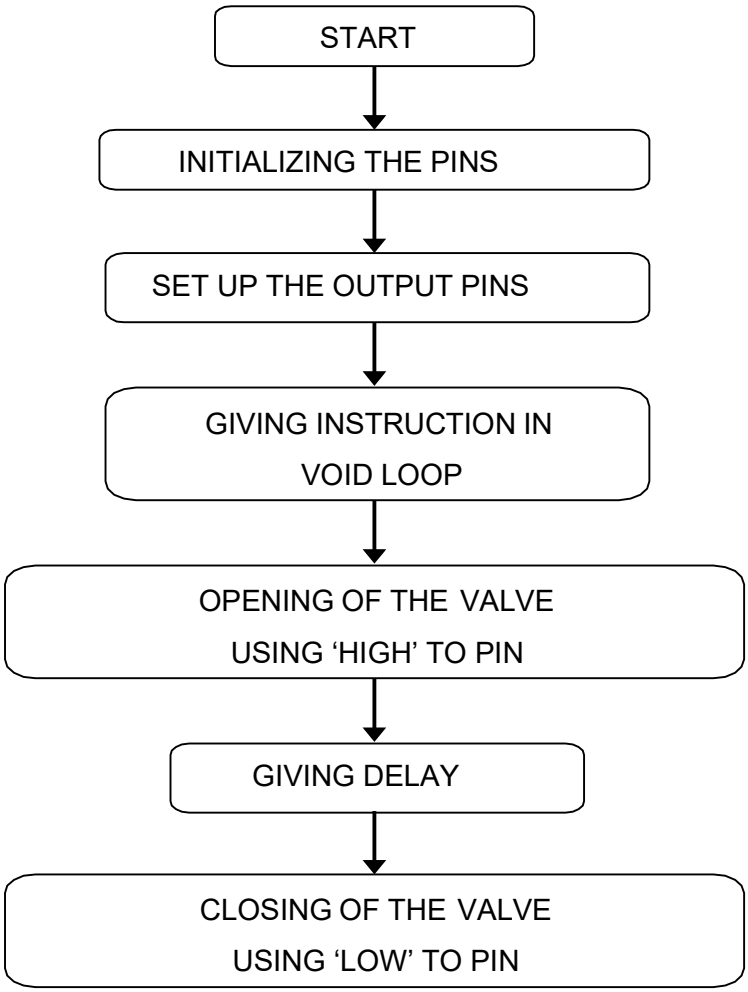

Fig 4.10: Flowchart for prototype

In Fig 4.10 shows the connections are done only by looking at the circuit diagram starting with the intializing the pins from one component to the other and later on the output pins are also connected. Looking at the relay module which is interfaced with the Arduino mainly having the 12V. As tested so far having threshold Voltage of 7V. Arduino pins of 6,7,8 are connected to the relay. In which 6 pin forwater supply, 7 for pesticides, 8 for manure. Finally, water, manure, pesticides pumps out by giving'High' to pin. Further delay will be provided for around 1-2 sec. Stoppage of water flows only by giving 'Low' to pin.

CHAPTER 5

RESULTS AND DISCUSSION

Based on the experiment done, selected sample plants are potato and tomato plants for which water and manure requirement per day are calculated based on which time delay required to flow that quantity of water and manure are also estimated. The pesticide requirement for the plants is common to all the plants. Also, experimented the analog response of rain sensor and working of system at rainy conditions. Along with this the power usage by the valves and pump and the power from the solar when it is exposed to the sunlight and consumption by the components are discussed in following sections.

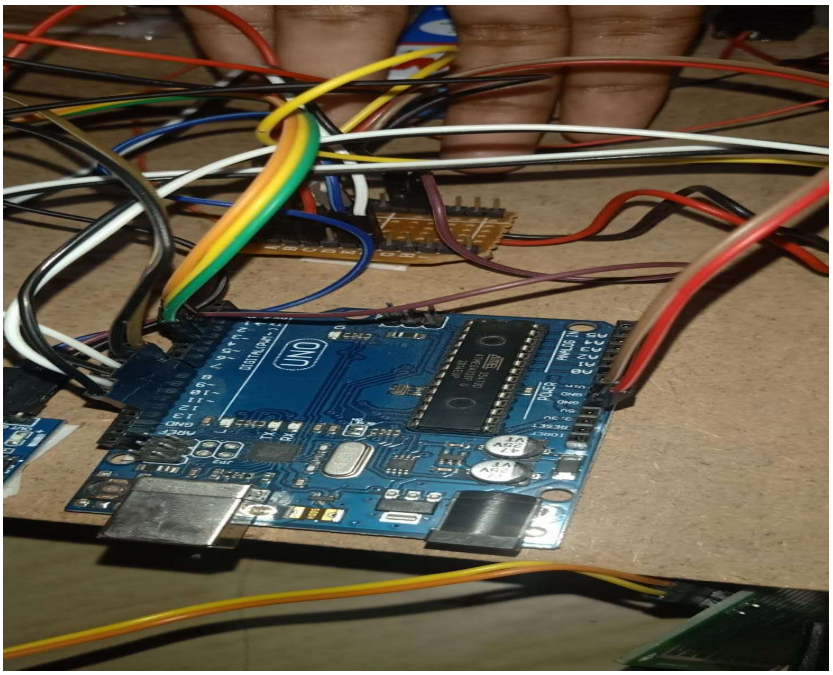

Fig 5.11: Arduino Interface

In Fig 5.11 shows that the Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message and turn it into an output functions like activating a motor, turning on an LED, publishing something online. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. In this prototype all the components are connected to certain pin numbers of ardunio board and VCC , gnd are connected using uno board.

Fig 5.12: Functionality of motor driver

In Fig 5.12 shows that the motor driver consisting of two enables of which each enable having two inputs for the clockwise and anticlockwise rotation of motor which is connected to the wheels in order to move the vehicle forward.

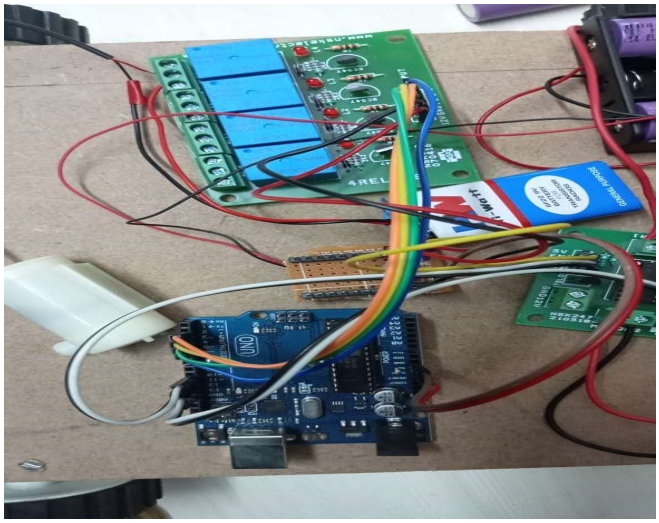

Fig 5.13: Functionality of water pump

In Fig 5.13 shows the water pump connected to four channel relay which pumps out the water to the plants based on the delay uploaded in the program. Solar panel traps the suns rays and stores the energy into the rechargeable lithium batteries. This energy is used as power.

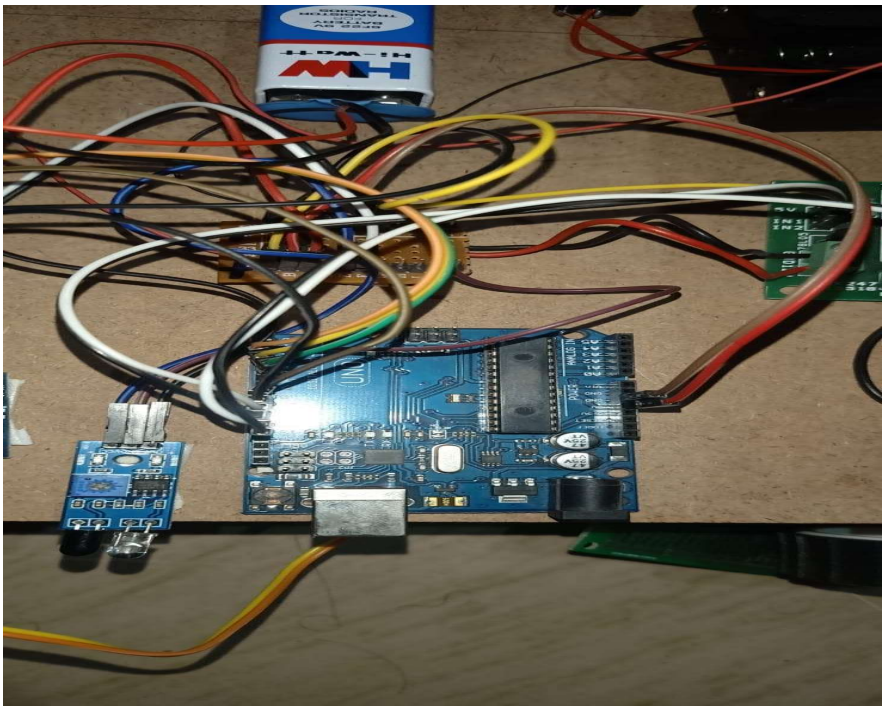

Fig 5.14: Functionality of IR Sensor

In Fig 5.14 shows that the infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests. In a defined angle range, the sensor elements detect the heat radiation (infrared radiation) that changes over time and space due to the movement of people. Such infrared sensors only have to meet relatively low requirements and are low-cost mass-produced items. Infra Tec does not supply such products, Infra Tec develops, produces and sells pyroelectric detectors.

Depending on the basic physical principle, an IR sensor can work in a wide temperature range without cooling (so-called thermal infrared sensor) or must be cooled or at least thermally stabilized (semiconductor resistor or semiconductor diode) to achieve a good signal-to-noise ratio (detectivity).

IR sensor consists of VCC, Ground and Output pins. The VCC and Ground pin is connected to Arduino Board, which contains two VCC and Two Ground pins. The VCC of IR Sensor is connected to the VCC of Arduino and the Ground of IR Sensor is connected to the Ground of Arduino. IR Sensor which is having output pin is connected to Arduino board pin 9. The Arduino will the output from the IR Sensor and do the necessary actions.

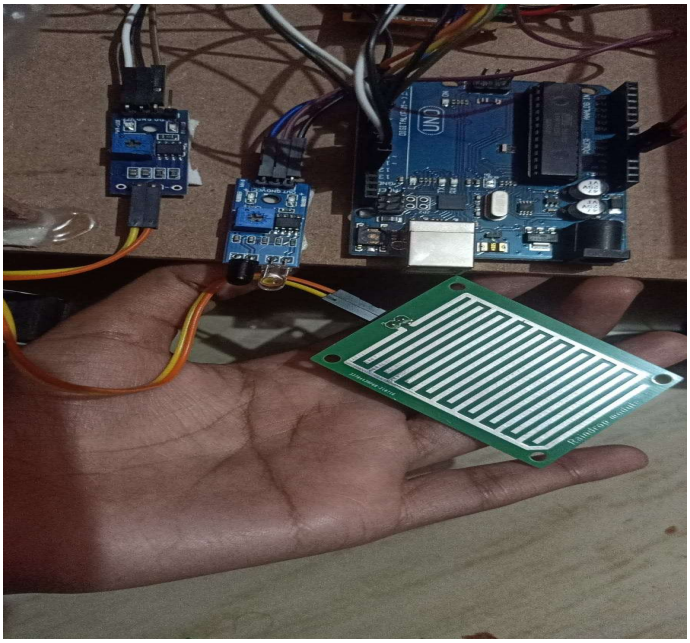

Fig 5.15: Functionality of Rain Sensor

In Fig 5.15 shows the working of the rain sensor is pretty straightforward. The sensing pad with series of exposed copper traces, together acts as a variable resistor (just like a potentiometer) whose resistance varies according to the amount of water on its surface.This resistance is inversely proportional to the amount of water:The more water on the surface means better conductivity and will result in a lower resistance. The less water on the surface means poor conductivity and will result in a higher resistance.

The sensor produces an output voltage according to the resistance, which by measuring we can determine whether it's raining or not. Rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall.It can be used a switch,when a rain drop falls through the raining board.It is connected to the 5v power supply in the Arduino board. Q comaparator circuit is fixed to the rain drop module which has 4 pins A0,D0,VCC,GND. where VCC is connected to VCC of Arduino and ground is connected to ground of arduino.Rain sensor which has output pin that is digital out is connected to Arduino Uno pin 8. Rain sensor has two terminals,when a rain drop falls on it both the terminals will gets short and it will be sensed by the comaparator circuit,and sends the signal to microcontroller.the LED will turn on when the induction board has no rain drop, and D0 output is high, when dropping a little water, D0 output is low, the switch indicator will turn on.

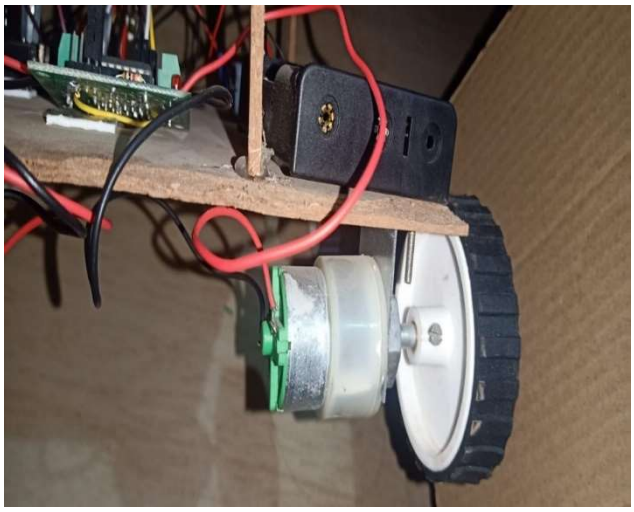

Fig 5.16: Fuctionality of DC motor

In Fig 5.16 shows the working of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. The direction of the mechanical force is given by Fleming's Left-hand Rule and its magnitude is given by F = BIL Newton.

The working of the AC motor (Induction motor and Synchronous Motor) is different from the DC motor. There is no basic difference in the construction of a DC generator and a DC motor. In fact, the same DC machine can be used interchangeably as a generator or as a motor. Like generators, there are different types of DC motors which are also classified into shunt-wound, series-wound and compound-wound dc motors. DC motors are seldom used in ordinary applications because all electric supply companies furnish alternating current. However, for special applications such as in steel mills, mines, and electric trains, it is advantageous to convert alternating current into direct current in order to use dc motors. The reason is that the speed/torque characteristics of DC motors are much more superior to that of AC motors.

Therefore, it is not surprising to note that for industrial drives, DC motors are as popular as three-phase induction motors. DC motor works on 4 configurations it consists of two motors that is motor 1 and motor 2 which consists of seperate enables of itself.motor 1 consists of input IN1 and IN2,motor 2 consists of IN3 and IN4 .when IN1 in motor 1 is high it rotates in clockwise direction and when IN2 is high it rotates in anticlock wise direction similar function works with IN3 and IN4 For the vehicle to move forward IN1 and IN3 is kept high while to move backward IN2 and IN4 is kept high(in this prototype we are showing only forward functionality)to stop the vehicle's movement all the 4 pins are kept low.

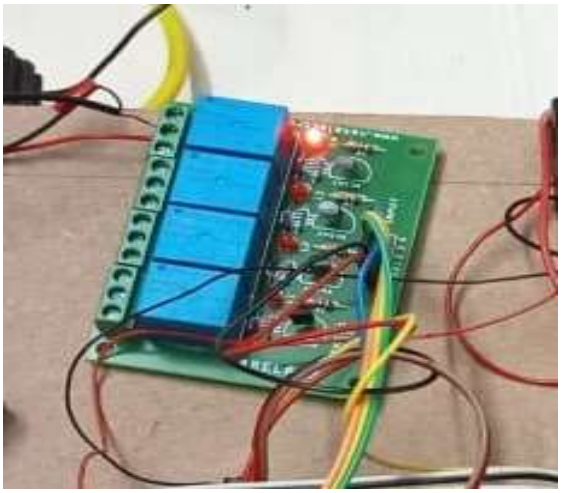

Fig 5.17: Fuctionality of Relay module

In Fig 5.17 shows the relay works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field.This magnetic field moves the relay armature for opening or closing the connections. The small power relay has only one contacts, and the high power relay has two contacts for opening the switch. It has an iron core which is wound by a control coil. The power supply is given to the coil through the contacts of the load and the control switch.

The current flows through the coil produces the magnetic field around it. Due to this magnetic field, the upper arm of the magnet attracts the lower arm. Hence close the circuit, which makes the current flow through the load. If the contact is already closed, then it moves oppositely and hence open the contacts.

In this prototype we made use of four channeled relay in which only 3 channels are used. pins 1 ,2, 3 of relay is connected to pins of Arduino 5, 4 ,3 each relay module consists of 3 switches namely normally open, common and common close.Normally open switch of first relay is connected to first pump, Normally open switch of second relay is connected to 2nd pump and normal open of 3rd relay is connected to 3rd pump. Common switch of all the relays are shorted and connected to positive side of 9v battery. When it switches to relay1 pump 1 pumps out the water. Similarly when it switches to second relay second pump pumps out the manure ,when it switches to relay 3 pump 3 pumps out the pesticide. A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circ

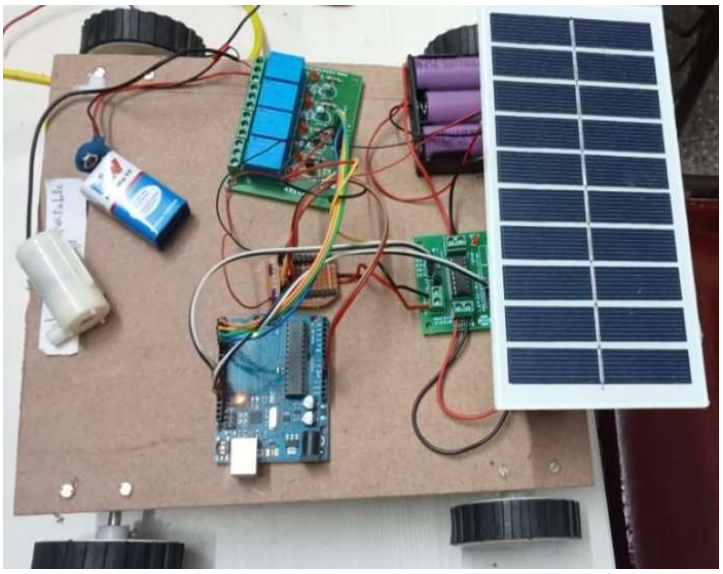

Fig 5.18: Connection of components

In Fig 5.18 shows the automatic crop feeding system with independent power supply plays a very vital role in today's forwarding agricultural technologies. By using the automatic crop feeding vehicle system, which reduces the formers manual handling power and using the supply from the solar will reduce the power from the supply. So, farmers cannot wait for the power in agricultural land.

The function of rain sensor is to identify the rain and stop the flow of water required for irrigation; PLC then controls the water solenoid valve based on threshold value of the rain sensor.

Also, the time delay of each valves of manure, pesticide and water given to the system. The time delay given to the vehicle motor to move certain distance of the next plant then stop.

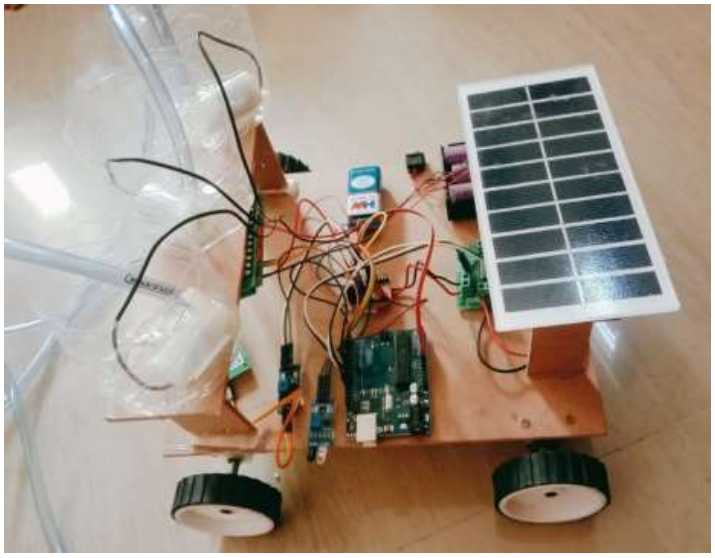

Fig 5.19: Complete model

In Fig 5.19 shows that the automatic crop feeding system with independent power supply plays a very vital role in today's forwarding agricultural technologies. By using the automatic crop feeding vehicle system, which reduces the formers manual handling power and using the supply from the solar will reduce the power from the supply. So, farmers cannot wait for the power in agricultural land. This prototype is designed in such a way that it feeds water, pesticides, manure automaticallyin the required amount to the plants(choose ones). Solar panel used here is used to trap the sunlightwhich in turn is stored as an electrical energy in the battery. This electrical energy is used to powerup the entire module. A four channel relay is used in this module in which the first channel is usedfor the functionality of water supply, the second for the pesticides and the third one for the manure.

The IR sensor used in this module is used to detect the obstacle which comes on its way. Whenthe IR sensor senses the obstacle which is termed as plants in this prototype, the vehicle stops it's movement and starts its functionalities like pumping of water, pesticides and manure to the plants based on the set time delay.

CHAPTER 6

PLAN OF ACTION AND EXECUTION

Table 6.3: Plan of Action and Execution

SL. NO	DATES	PLAN OF ACTION	STATUS
01	01/10/2021 to 31/10/2021	1.Identifying the problem statement. 2.Preparing the objectives. 3. Analysing the methodology. 4. Referring the IEEE papers.	Completed
02	01/11/2021 to 30 /11/2021	1. Preparing the literature survey. 2.Designing of block diagram. 3.Analysing the advantages of project. 4.Analysing the application of project.	Completed
03	01/12/2021 to 31/12/2021	1. Identifying for hardware components. 2. Identifying software required. 3.Analysing the specification of required components.	Completed
04	01/01/2022 to 31/01/2022	1.Purchasing of hardware components. 2.Adding few more hardware components (if required).	Completed
05	01/2/2022 to 28/02/2022	1.Software installation. 2.Identifying the required library. 3.Installation of library.	Completed

06	1/3/2022 to 31/3/2022	1.PPT preparation for phase 1 review. 2.Preparation for phase 1 review. 3.Phase 1 review presentation.	Completed
07	1/4/2022 to 15/4/2022	1.Testing of each components. 2.Testing it with different voltages.	Completed
08	16/4/2022 to 30/4/2022	1.Assembling of components. 2.Fulfilled two objective.	Completed
09	01/5/2022 to 15/5/2022	1.Remaining objectives fulfilled. 2.Encoding the program has been done.	Completed
10	16/5/2022 to 2/6/2022	1.Testing and functioning of prototype is required components.	Completed

CHAPTER 7

7.1 APPLICATIONS

Agriculture land Home

garden

Indoor Farming

Green city buildings and lawn

Irrigation in fields

Very Efficient for tomato plant

7.2 ADVANTAGES

Water conservation

Low operation cost

Increasing yield and productivity

Complete elimination of man power

Works according to soil condition

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Department of Electronics and Communication Engineering

CERTIFICATE

This is to certify that the technical seminar entitled "MOBILE VEHICLE FOR CROP NOURISHING FRAMEWORK USING ARDUINO" carried out by Ms. RUCHITHA G (1SJ18EC134), Ms. SHARANYA R (1SJ18EC146), Ms. SIRISHA K N (1SJ18EC149), Ms. SNEHA Y S (1SJ18EC151) are bonafide students of S.J.C Institute of Technology in partial fulfillment for the award of the degree of Bachelor in Eighth Semester of Engineering in Electronics and Communication Engineering of the Visvesvaraya Technological University, Belagavi during the year 2021-22. It is certified that all corrections or suggestions indicated for internal assessment have been incorporated and deposited to department library. The project report has been approved as it satisfied academic requirements in respect of project work prescribed for Bachelor of Engineering.

Signature of Guide	**Signature of Coordinator**	**Signature of HOD**	**Signature of Principal**
Prof. Anil Kumar R	**Prof. Ravi M V**	**Dr. B N Shobha**	**Dr. G T Raju**
Assistant Professor	Assistant Professor	HOD	Principal
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EXTERNAL VIVA

Name of the Examiners: Signature of the Examiners:

1.

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CHAPTER 01

PREAMBLE

CHAPTER 02

BLOCK DIAGRAM

CHAPTER 03

HARDWARE AND SOFTWARE REQIREMENTS

CHAPTER 04

FLOWCHART

CHAPTER 05

RESULTS AND DISCUSSION

CHAPTER 07

APPLICATIONS AND ADVANTAGES

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CHAPTER 06

PLAN OF ACTION AND EXECUTION

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MOBILE VEHICLE FOR CROP NOURISHING FRAMEWORK USING ARDUINO

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ABSTRACT

Agricultural activities requires a regular and adequate supply of water, manure, fertilizers. The history of the farmer started with intensive cultivation of early-maturing, high yielding varieties but without paying much attention to the soil-nutrient status and soil-health continuous cultivation with inefficient management of fertilizers has resulted in effect on the consumers malnutrition, environmental concerns and decrease in fields quantitative and qualitative. Therefore, these problems can be overcome with the implementation of modern agricultural technology. There is a need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology, it has become necessary to increase the annual crop production output entirely agro-centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. This could be done with the implementation of Arduino UNO in this project which is the heart interfacing between hardware and software. The method of modernized agricultural system is called 'smart irrigation system' which allows to maximize the field using minimum resources such as water, fertilizers and pesticides. By deploying sensors and mapping fields, farmers can begin to understand their crops at a micro scale, conserve resources and reduce impacts on the environment. The automation which also involves improving the speed of production, reduction of cost, effective use of resources.

Keywords: Arduino UNO, Agriculture, Smart Irrigation, Sensors, Mapping Fields, High Yielding.

I. INTRODUCTION

By using the concept of a modern irrigation system, a farmer can save water up to 50%. This concept depends on two irrigation methods, those are conventional irrigation methods like overhead sprinklers, flood type feeding systems i.e., wetting the lower leaves and stem of the plants. The area between the crop rows become dry as a large amount of water is consumed by the flood type methods, in case if the farmer depends only on the incidental rainfalls. The crops are being infected by the leaf mould fungi as the soil surface often stays wet and is saturated after irrigation is completed. Irrigation is the most important cultural practice and major labour task in the daily agriculture sector. To do this automatically, various methods are available using suitable sensors to determine when plants may need water. Automation involves improving the speed of production, reduction of cost, effective use of resources. This method of modernized agricultural system is called 'smart irrigation system' which allows to maximizing the field using minimum resources such as water, fertilizers and pesticides. By deploying sensors and mapping fields, farmers can understand their crops at micro scale, conserve resources reduce impacts on the environment. To minimize the wastage of fertilizer and water, the automatic controller of the feeding system came into existence using programmable logic circuits where the integration of fertilizer and water feeding system through the operation of valve based on the big data and IOT. The ultimate goal of intelligent water saving

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irrigation is producing the most output with the least amount of water, in other words, irrigating crops "timely" and "appropriately".

II. METHODOLOGY

The Arduino is controlling the relay operation through switching 4 channel relay module connected between solenoid valves and Arduino. The controller switching circuit of relay module is powered by battery, which is get charge by solar panel. The relay operation is automatic, based on the information given in program with time delay. The time is delay uploaded in the program based on requirement of the plant with respect to their water, manure and pesticides requirements per day are collected and programmed into Arduino using C. The valve operation of water is also based on the requirement, but during rainy season the rain sensor used to avoid water being fed from the valve. The information (analog data of rain sensor) from rain sensor is fed back to the Arduino to stop excess feeding of water to plant. IR Sensor is an electronic device used to measure the heat as well as detects the obstacle. After the process of feeding of water, manure and pesticide the vehicle will move automatically to the next plant through the motor driver and the above process will repeat for further plants aligned the same line.

III. MODELING AND ANALYSIS

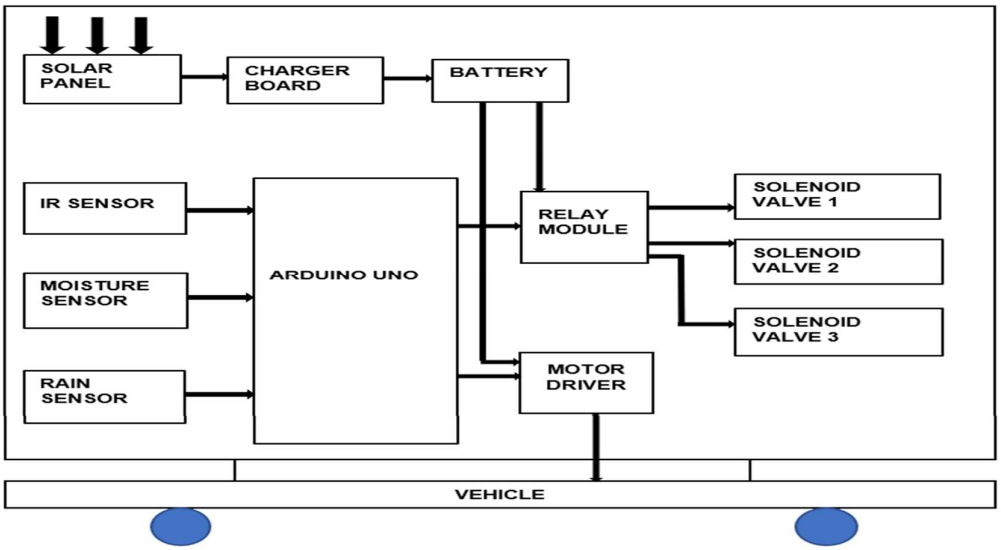

Figure 1: Block Diagram of the prototype

Figure 2.1 shows the complete set of model. The Arduino is controlling the relay operation through switching 4 channel relay module connected between valves and Arduino. Portable vehicle is used in order to move automatically from one plant to another. Solar power is used to run this prototype.

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IV. RESULTS AND DISCUSSION

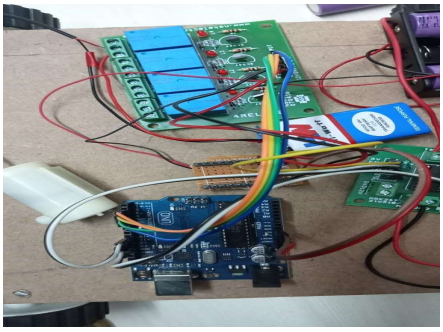

Figure 2: Collecting and testing of components

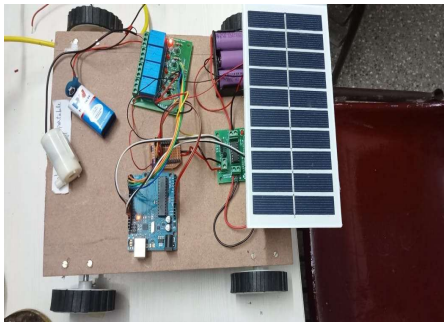

Figure 3: Assembling of components

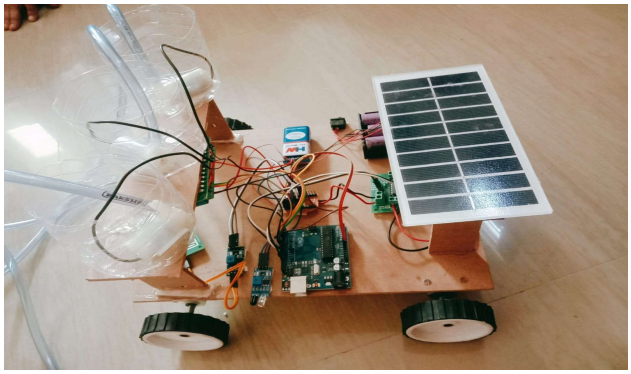

Figure 4: Testing the working of model

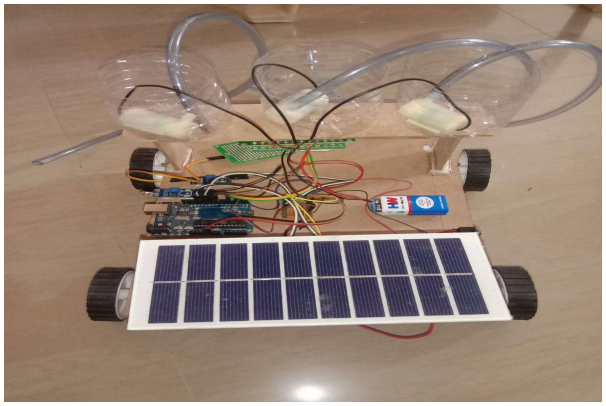

Figure 5: Complete Model

Above figure shows that the automatic crop feeding system with independent power supply plays a very vital role in today's forwarding agricultural technologies. By using the automatic crop feeding vehicle system, which reduces the formers manual handling power and using the supply from the solar will reduce the power from the supply. So, farmers cannot wait for the power in agricultural land. This prototype is designed in such a way that it feeds water, pesticides, manure automatically in the required amount to the plants(choose ones). Solar panel used here is used to trap the sunlight which in turn is stored as an electrical energy in the battery. This electrical energy is used to power up the entire module. A four channel relay is used in this module in which the first

channel is used for the functionality of water supply, the second for the pesticides and the third one for the manure. The IR sensor used in this module is used to detect the obstacle which comes on its way. When the IR sensor senses the obstacle which is termed as plants in this prototype, the vehicle stops it's movement and starts its functionalities like pumping of water, pesticides and manure to the plants based on the set time delay.

V. CONCLUSION

In the coming days, this project will be enhanced and improved much more as the technologies are developing in a vast manner. Further more developments in the area of irrigation system can be done. Also GSM module implementation along with the notification to the owner can be performed.

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