BLUETOOTH BASED AGRICULTURE ROBOT

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Date of Submission: September 2023

Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhere else for the award of any degree.

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Certification

This is to certify that this project entitled "**Bluetooth based Agriculture robot**" is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfilment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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Acknowledgement

The report titled as on “Agriculture robot using Bluetooth based mobile apps controlled” has been prepared to fulfil the requirement of our practicum program. In the process of doing and preparing our practicum report, we would like to pay our gratitude to some persons for their enormous help and vast co-operation.

At first, we would like to show our gratitude to the University authority to permit us to do our practicum. Specially, we would like to thank to our honourable teacher **Rudaina Tasnuva,** Lecturer, Department of Electrical & Electronics Engineering, SU– Sonargaon University, Dhaka, for his valuable and patient advice, sympathetic assistance, co-operation, contribution of new idea. Deep theoretical and hardware knowledge & keen interest of our supervisor in this field influenced us to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project.

Finally, we would like to thanks again to the respected **Vice- Chancellor of SU, Professor Shamim Ara Hassan also thanks to Head of Department of SU, Electrical & Electronics Engineering, Professor Mr. Md. Rais Uddin Mollah** because they are designated such an environment for learning through which we got the opportunity to acquire knowledge under BSc in EEE program, and that will be very helpful for our prospective career.

We are, indeed, grateful toa all those from whom we got sincere cooperation and help for the preparation of this report.

Abstract

In this project, we are developing an agricultural-based robot this robot should helpful for farmer. In this robot, automatic seed placing and pumping the water to seed and we are using pick and place set up to remove the dry plant and sowing the seeds in that same place. We are using the sensor to find the conditions of agriculture land. If any obstacle is dedicated means the robot will stop that place and soil moisture sensor is using to find the day or wet condition in the plant if the plant is dry means the pump motor should be on and water will supply to plant. This function is operated by Bluetooth. We are sending instructions through android mobile app using the voice controlling method.

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Chapter I

Introduction

1.1 Introduction

Robotics is playing a significant role in agricultural production and management. There is a need for autonomous and time saving technology in agriculture to have efficient farm management. The researchers are now focusing towards different farming operational parameters to design autonomous agricultural vehicles as the conventional farm machineries are crop and topological dependent. Till date the agricultural robots have been researched and developed principally for harvesting, chemical spraying, picking fruits and monitoring of crops. Robots like these are perfect substitute for manpower to a great extent as they deploy unmanned sensing and machinery systems. The prime benefits of development of autonomous and intelligent agricultural robots are to improve repeatable precision, efficacy, reliability and minimization of soil compaction and drudgery. The robots have potential for multitasking, sensory acuity, operational consistency as well as suitability to odd operating conditions. The study on agricultural robotic system had been done using model structure design mingled with different precision farming machineries. The rapid growth of agricultural crop robotics in the last decade results from, (a) the convergence of maturing mechatronics technology, making such automation technically feasible and, (b) the demand for alternatives to human labour in crop production. Worldwide, agricultural workers are difficult to hire and retain. Increasing environmental and food safety concerns push agriculture to manage and apply inputs more precisely (Finger et al. 2019). The engineering side of agricultural robotics has advanced rapidly (Duckett et al. 2018; Shamshir et al. 2018), but understanding of the economic implications has lagged. The objective of this study is to review the publicly available research on the economics of crop robotics and identify research needs and gaps. The results of this study will be of interest to agricultural researchers, agribusinesses, farmers and agricultural policy makers. The characteristics

of agricultural robots have been described by several authors (e.g., Duckett et al. 2018; Blackmore 2007), but there is no widely agreed definition. Because the focus of this study is on the economics of robotics for crop production in open fields, the working definition of a “field crop robot “for this study was: a mobile, autonomous, decision making, mechatronic device that accomplishes crop production tasks (e.g., soil preparation, seeding, transplanting, weeding, pest control and harvesting) under human supervision, but without direct human labour. Mobility is an essential part of the definition because field crops are typically geographically dispersed in the landscape. Autonomy is also essential because the field environment is not entirely controllable. Among the decisions that a field crop robot might make are distinguishing a crop plant from awed, identifying an insect to choose the appropriate pesticide for micro dosing, choosing ripe fruits or vegetables, and stopping when it encounters an unknown obstacle.

1.2 Objective

The main objective of this project is various protection system of an industrial ac motor such as

- Cultivating the land
- Watering system
- Bluetooth control robot
- Easy way to agriculture
- Education & Training

1.3 Motivation

This paper consists of an agricultural-based robot. In this robot, we are using the sensor to find the conditions of agriculture land and L293D IC is using to operate the robot forward, backward, right side and left side the ultrasonic sensor is using find an obstacle in way of

moving time and soil moisture sensor is using to find the dry and wet conditions in agriculture land. If we find any dry plant pick and place is help to remove the day plant and we sowing the seed in that place after that supply the water to the seed in this method this all process is controlled by Arduino Uno. All the instructions are given through Bluetooth form android application.

1.4 Background Study

Digital farming is the practice of modern technologies such as sensors, robotics, and data analysis for shifting from tedious operations to continuously automated processes. This paper reviews some of the latest achievements in agricultural robotics, specifically those that are used for autonomous weed control, field scouting, and harvesting. Object identification, task planning algorithms, digitalization and optimization of sensors are highlighted as some of the facing challenges in the context of digital farming. The concepts of multi-robots, human-robot collaboration, and environment reconstruction from aerial images and ground-based sensors for the creation of virtual farms were highlighted as some of the gateways of digital farming. It was shown that one of the trends and research focuses in agricultural field robotics is towards building a swarm of small-scale robots and drones that collaborate together to optimize farming inputs and reveal denied or concealed information. For the case of robotic harvesting, an autonomous framework with several simple axis manipulators can be faster and more efficient than the currently adapted professional expensive manipulators. While robots are becoming the inseparable parts of the modern farms, our conclusion is that it is not realistic to expect an entirely automated farming system in the future.

1.5 Literature Review

The paper number [4] presents a streamlined approach to future Precision Autonomous Farming (PAF). It focuses on the preferred specification of the farming systems including the farming system layout, sensing systems and actuation units such as tractor-implement combinations. The authors propose the development of the Precision Farming Data Set (PFDS) which is formed off-line before the commencement of the crop cultivation and

discusses its use in accomplishing reliable, cost effective and efficient farming systems. The work currently is in progress towards the development of autonomous farming vehicles and the results obtained through detailed mathematical analysis of example actuation units. The reference paper [5] addresses the advanced weed control system which improves agriculture processes like weed control, based on robotic platform. They have developed a robotic vehicle having four wheels and steered by dc motor. The machine controls the weed in the firm by considering particular rows per column at fixed distance depending on crop. The obstacle detection problem has also been considered, sensed by sensors. the whole algorithm, calculation, processing, monitoring was designed with motors & sensors.

Chapter II

Guiding Principle

2.1 Working Principle

Here is an Arduino nano to control all the system a display is using for showing the result of your full projects output.2 servo motor is used for control as like 2 hand one is controlling seed processing and another is used for another hand a pump is included for supply water all the command received by hc 05 bt controller through mobile application and here uses a programmable software to control Arduino.

2.2 Acknowledgement

A research work of this magnitude has been a journey with various ups and downs. We would like to extend our sincere & heartfelt obligation towards all the personages who have helped us in this endeavour. Without their active guidance, help, co-operation & encouragement, we would not have made headway in the research paper preparation. With a deep sense of reverence, we acknowledge our gratitude towards the sponsors for our research work, Shreeji Pesticides a unit of wildwood Private Ltd. Also, we are ineffably indebted to Sunil Malival Assistant Professor, ITM Universe, for his conscientious guidance and encouragement to accomplish this work. Last but not the least; we would like to thank Department of Electrical Engineering of our institute and all our colleagues who have been our moral support in the completion of our work.

2.3 Methodology

1. The scope of this project is to design, develop, and prototype a Bluetooth-based agriculture robot capable of performing specific tasks related to precision agriculture. The robot will use Bluetooth technology for remote control, monitoring, and data communication

2. The methodology of this project design can be divided into two sections; hardware and software implementations.

3. Information's were collected from references books and websites to find out the possible improvement.

4. Required components have been purchased from local market.

Chapter III

Design constraint

3.1 Introduction

The robot developed has an electric motor system, two prime wheels and two omni wheels, a control unit mounted on top of it, and it can move in-between rows without touching them, turn at the end of the row and enter the next one. Figure 1 shows all the components of Tractus. Chassis is made of lightweight material, fiberglass 5 mm in thickness. Likened to a box, the chassis system has a round front where sensors can sit at different angles. All the components are secured to each other with bolts. Assembly holes are drilled so that components could be put together. Moreover, holes were drilled on top of the chassis for cables. The electronic unit is mounted inside. A covering is used to protect the electronic units from external conditions

3.2 Motor driver

Overview: L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC). [19]

3.3 Operating Voltage of L293D Motor driver

In order for Tractus to move, two DC motors with a 75:1 drive wheel are used. The robot has a front wheel drive. Each front wheel is controlled separately and this makes it possible to drive the robot. Technical features of DC motors are: - 6V operating voltage - 130 RPM

maximum turn speed - 130 oz-in torque - Maximum load capacity 6 A voltage - 450 mA current

3.4 Servo motor

Servo Motor SG90 A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing. SG90 1.2kgCm 180 Degree Rotation Servo Motor rotates 90° in each direction making it 180° servo motor. It is a Digital Servo Motor which receives and processes PWM signal faster and better. The Tower Pro SG90 9g Mini Servo is 180° rotation servo. Itis a Digital Servo Motor which receives and processes PWM signal faster and better. It equips sophisticated internal circuitry that provides good torque, holding power, and faster updates in response to external forces. A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft. The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops. The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models. [18]



3.5 Wheel

Micromorts and Grippy Wheels Mobile wheeled or tracked robots have a minimum of two motors which are used to propel and steer the robot. Hobbyists tend to choose skid steering (like a tank) because of its simplicity to design, incorporate and control. A three wheeled robot‘s third (rear) wheel usually prevents the robot from falling over. Four wheeled robots have either two or four drive motors and use skid steering. Six wheeled robots most commonly have either two, four or six drive motors. Individuals who use an R/C car as a basis for their robot use rack and pinion steering where one motor is connected to a drive train and the other (usually a servo motor) is used for steering. Increasing the number of drive motors helps the robot to climb steeper inclines by increasing the torque. Adding ―idle‖ wheels (wheels not connected to a motor) often has the unfortunate consequence of removing weight from the drive wheels resulting in slip and loss of traction. In the image below, the centre wheel, chosen mistakenly as the driven wheel, often loses contact with the ground. The way around this is to add suspension. [20]

3.6 Liquid Crystal Display (LCD)

A liquid crystal display (LCD) is an electro-optical amplitude modulator realized as a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front

of a light source or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power.

LCDs have become very popular over recent years for information display in many „smart“ appliances. They are usually controlled by micro controllers. They make complicated equipment easier to operate.

LCDs come in many shapes and sizes but the most common is the 16character x 2 lines display. It requires only 11 connections –eight bits for data (which can be reduced to four if necessary) and three control lines. It runs with a supply voltage of 5v DC and only needs 1mA of current. the display contrast can be varied by changing the voltage into pin of the display, usually with a trim pot.

In recent years the LCD is finding widespread use replacing LEDs. This is due to following reasons:

1.The declining prices of LCDs

2.The ability to display numbers, characters, and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.

Chapter IV

Control Unit

4.1 Microcontroller/Arduino

This chapter gives an explanation on the method and step used in designing the humidity and temperature control system. It includes the description of the design flow, design architecture and detail explanations for the software development as well as hardware development.

4.2 Microcontroller chip/Arduino Nano

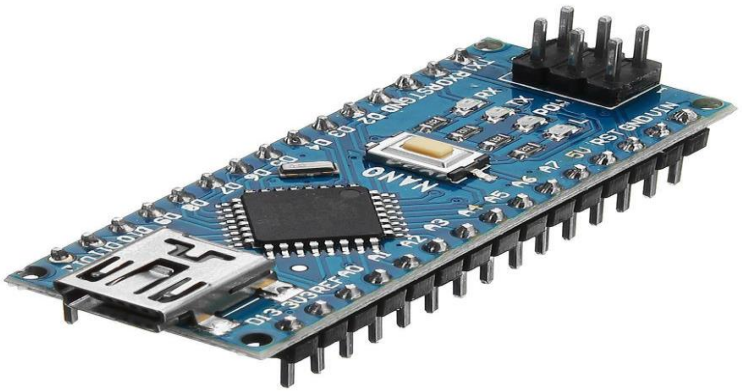


Figure: Arduino Nano

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does

not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.PIC microcontrollers are a family of specialized microcontroller chips produced by Microchip Technology in Chandler, Arizona. The acronym PIC stands for "peripheral interface controller," although that term is rarely used nowadays. A microcontroller is a compact microcomputer designed to govern the operation of embedded systems in motor vehicles, robots, office machines, medical devices, mobile radios, vending machines, home appliances, and various other devices. A typical microcontroller includes a processor, memory, and peripherals.

The PIC microcontrollers appeal to hobbyists and experimenters, especially in the fields of electronics and robotics. Key features include wide availability, low cost, ease of reprogramming with built-in EEPROM (Electrically Erasable Programmable Read-Only Memory), an extensive collection of free application notes, abundant development tools, and a great deal of information available on the Internet. The PIC microcontrollers often appear under the brand name PIC micro.

Every PIC microcontroller has a set of registers that also function as RAM (random access memory). Special purpose control registers for on-chip hardware resources are also mapped into the data space. Every PIC has a stack that 12 saves return addresses. The stack was not software-accessible on the earlier versions of the PIC, but this limitation was removed in later devices. To make wearable obstacle detection system for visually impaired people respond faster, it should be equipped with advanced microcontroller to decrease computational complexity. PIC 16F877A was chosen to detect any switch triggered and generate the audio sounds and vibrations.

The PIC does not have an operating system and simply runs the program in its memory when it is turned on. PIC microcontroller is a small computer on a single integrated circuit which stores a set of instructions. It consists of a processor core, memory, and programmable input/output peripherals. PIC is an important component in the proposed system which deals with a Micro C programming code which was installed in it.

The system is featured by its small size and low cost when it is compared with other systems that use separate microprocessor, input/output devices, and memory. Mixed signal

microcontrollers are common, integrating analog components needed to control non digital electronic systems. PIC microcontroller operates at +5 V which can be regulated using the voltage regulator (L7805) which conserves voltage at +5 V if the input voltage for it exceeds +5 V. Also, PIC cannot run without using its crystal oscillator which is used to execute the programming code. The PIC is used as a real-time processing element; therefore, a high frequency oscillator is used

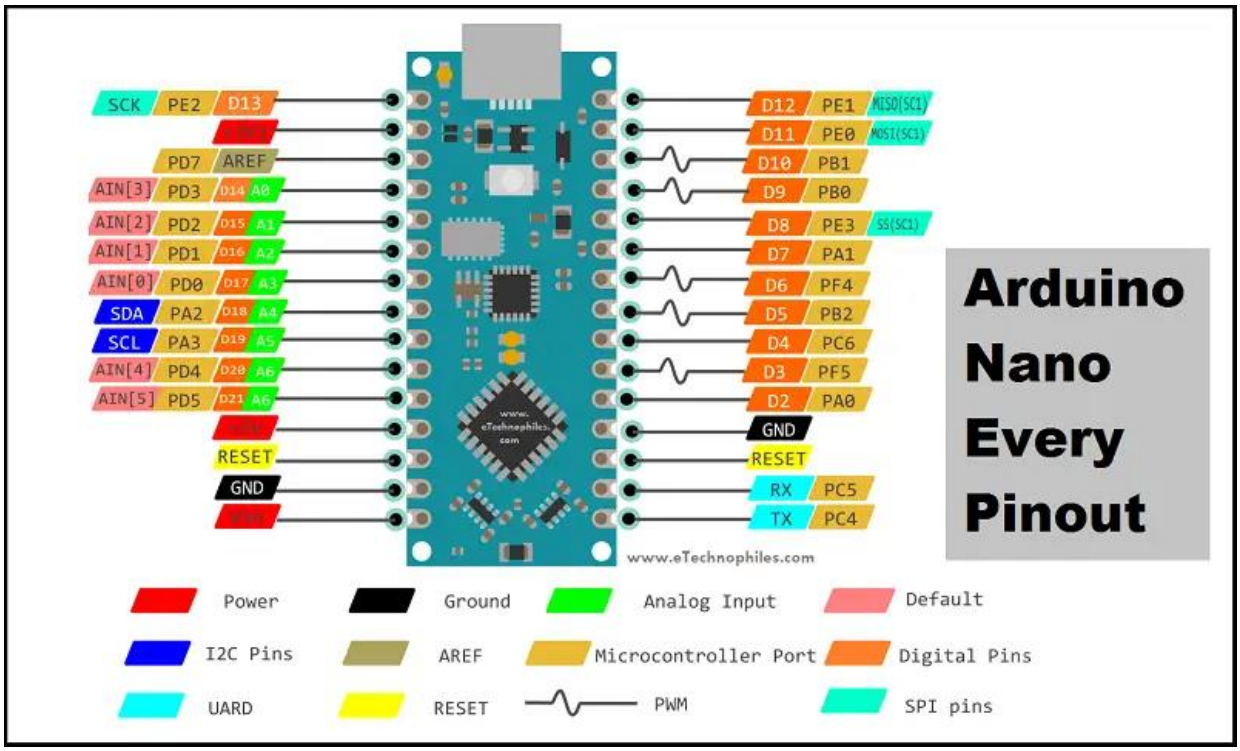


Figure: Arduino Nano Pin Diagram

4.3 Overview

The PIC16F72 belongs to the Mid-Range family of the PIC devices. A block diagram of the device is shown in Figure 1-1. The program memory contains 2K words, which translate to 2048 instructions, since each 14-bit program memory word is the same width as each device instruction. The data memory (RAM) contains 128 bytes. There are 22 I/O pins that are user configurable on a pin-to-pin basis. Some pins are multiplexed with other device functions. These functions include:

• External interrupt

• Change on PORTB interrupts

• Timer0 clock input

• Timer1 clock/oscillator

• Capture/Compare/PWM

• A/D converter

• SPI/I2C Table 1-1 details the pin out of the device with descriptions and details for each pin.

					PORTC is a bi-directional I/O port.
RC0/T1OSO/ T1CKI	11	8	I/O	ST	RC0 can also be the Timer1 oscillator output or Timer1 clock input.
RC1/T1OSI	12	9	I/O	ST	RC1 can also be the Timer1 oscillator input.
RC2/CCP1	13	10	I/O	ST	RC2 can also be the Capture1 input/Compare1 output/ PWM1 output.
RC3/SCK/SCL	14	11	I/O	ST	RC3 can also be the synchronous serial clock input/output for both SPI and I^2C modes.
RC4/SDI/SDA	15	12	I/O	ST	RC4 can also be the SPI Data In (SPI mode) or Data I/O (I^2C mode).
RC5/SDO	16	13	I/O	ST	RC5 can also be the SPI Data Out (SPI mode).
RC6	17	14	I/O	ST	
RC7	18	15	I/O	ST	
Vss	8, 19	5, 16	P	—	Ground reference for logic and I/O pins.
VDD	20	17	P	—	Positive supply for logic and I/O pins.

Legend: I = input O = output I/O = input/output P = power
— = Not used TTL = TTL input ST = Schmitt Trigger input

Note 1: This buffer is a Schmitt Trigger input when configured as the external interrupt.
2: This buffer is a Schmitt Trigger input when used in Serial Programming mode.
3: This buffer is a Schmitt Trigger input when configured in RC Oscillator mode and a CMOS input otherwise.

4.4 Memory Organization

There are two memory blocks in the PIC16F72 device. These are the program memory and the data memory. Each block has separate buses so that concurrent access can occur. Program memory and data memory are explained in this section. Program memory can be read internally by the user code (see Section 7.0). The data memory can further be broken down into the general-purpose RAM and the Special Function Registers (SFRs). The operation of the SFRs that control the “core” are described here. The SFRs used to control the peripheral modules are described in the section discussing each individual peripheral module.

Program Memory Organization

PIC16F72 devices have a 13-bit program counter capable of addressing an 8K x 14 program memory space. The address range for this program memory is 0000h - 07FFh. Accessing a location above the physically implemented address will cause a wraparound. The RESET Vector is at 0000h and the Interrupt Vector is at 0004h.

4.5 Liquid Crystal Display (LCD)

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs does not emit light directly. LCDs therefore need a light source and are classified as "passive" displays. Some types can use ambient light such as sunlight or room lighting. There are many types of LCDs that are designed for both special and general uses.

They can be optimized for static text, detailed still images, or dynamic, fast-changing, video content. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube (CRT) displays in most applications. They are usually more compact, lightweight, portable, and lower cost.

They are available in a wider range of screen sizes than CRT and other flat panel displays. There are two types of data bus a user can choose which are 8 bit and 4-bit data bus. For an 8-bit data bus, the display requires a +5V supply plus 11 I/O lines. For a 4-bit data bus it only requires the supply lines plus seven extra lines. The LCD also requires 3 control lines from the microcontroller. In this system, 8-bit data bus is used as this mode is much simpler to set up than 4-bit data bus.

Enable (E)	This line allows access to the display through R/W and RS lines. When this line is low, the LCD is disabled and ignores signals from R/W and RS. When (E) line is high, the LCD checks the state of the two control lines and responds accordingly.
Read/Write (R/W)	This line determines the direction of data between the LCD and microcontroller. When it is low, data is written to the LCD. When it is high, data is read from the LCD
Register selects (RS)	With the help of this line, the LCD interprets the type of data-on-data lines. When it is low, an instruction is being written to the LCD. When it is high, a character is being written to the LCD.

4.6 LCD Control Pins

LCDs are more energy efficient, and offer safer disposal, than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically-modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome.



Figure: LCD Display

4.7 L7805CV Linear Voltage Regulator



Figure: Voltage Regulator

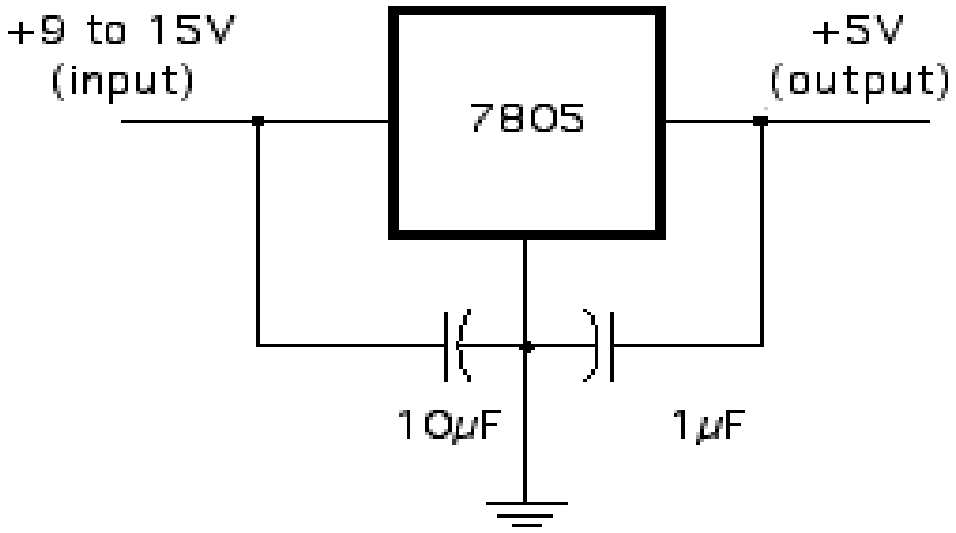


Figure: L7805CV Pin Diagram

4.8 L7805CV OPERATION

L78 Series of fixed output voltage regulators are useful in a wide range of applications within the electronics Industry. The three terminal positive linear voltage regulators can remove problems that are related with single point regulation by providing local on-card regulation.

The ST Regulator IC can deliver up to 1.5A at the fixed output voltage, which can range from 5 V to 24 V. The voltage regulator offers safe area protection with the addition of internal thermal shutdown and current limiting.

Chapter V

Equipment

5.1 Transformer

Every electrical and electronic device that we use in our day-to-day life will require a power supply. In general, we use an AC supply of 220V 50Hz, but this power has to be changed into the required form with required values or voltage range for providing power supply to different types of devices.

There are various types of power electronic converters such as step-down converter, step-up converter, voltage stabilizer, AC to DC converter, DC to DC converter, DC to AC converter, and so on. For example, consider the microcontrollers that are used frequently for developing many embedded system-based project and kits used in real-time applications.

These microcontrollers require a 5V DC supply, so the AC 220V needs to be converted into 5V DC using the step-down converter in their power supply circuit.

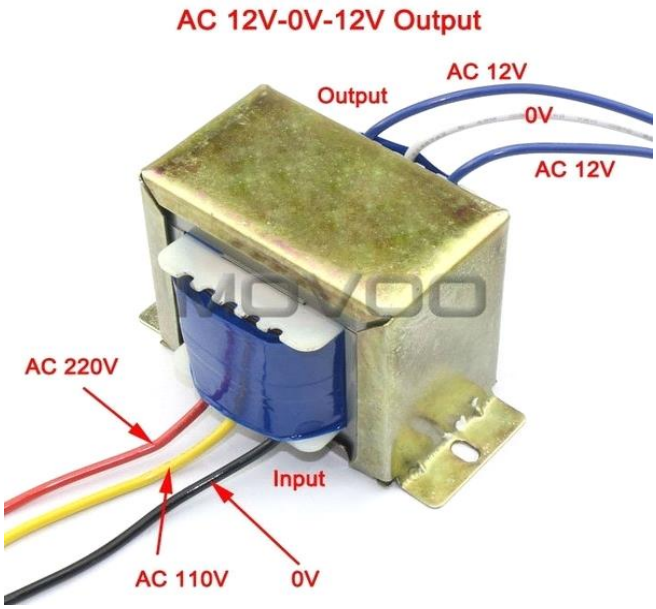


Figure: Transformer

5.2 Voltage regulator:

A voltage regulator generates a fixed output voltage of changes to its input voltage or load conditions. The voltage regulator must be stable with its condition. Here we use IC 7805 voltage Regulator. IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value.

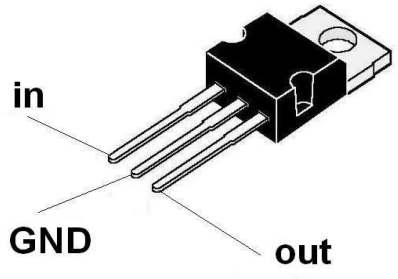


Figure: Voltage regulator

IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. It comes with provision to add heat sink. The maximum value for input to the voltage regulator is 35V. It can provide a fixed steady voltage flow of 5V for higher voltage input till the threshold limit of 35V. If the voltage is near to 7.5V then it does not produce any heat and hence no need for heat sink. If the voltage input is more, then excess electricity is liberated as heat from 7805.It regulates a steady output of 5V if the input voltage is in rage of 7.2V to 35V. Hence to avoid power loss try to maintain the input to 7.2V. In some circuitry voltage fluctuation is fatal (for e.g., Microcontroller), for such situation to ensure constant voltage IC 7805 Voltage Regulator is used. IC 7805 is a series of 78XX voltage regulators. The name the last two digits 05 denotes the amount of voltage that it regulates. Hence a 7805 would regulate 5v and 7806 would regulate6V and so on. The schematic given below shows how to use a 7805 IC, there are 3 pins in IC 7805, pin 1 takes the input voltage, GND of both input and out are given to pin 2, pin 3 produces the output voltage.

Pin Description:

Pin no.	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 5V (4.8V-5.2V)	Output

5.3 Resistor (1Kohm)

1k ohm Resistors are used for regulating current and they resist the current flow and 1k ohm the extent to which they do this is measured in ohms (Ω).

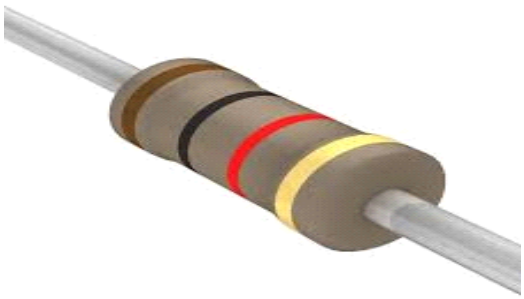


Figure: 1k ohm

5.4 Resistor (560k ohm)

560k ohm resistor work at display backlight**,** always control the backlight.



Figure: Resistor 560k ohm

5.5 Resistor (3K3 ohm)

3k3 ohm resistor work the contrast control, 3k3 ohm are control the contrast.

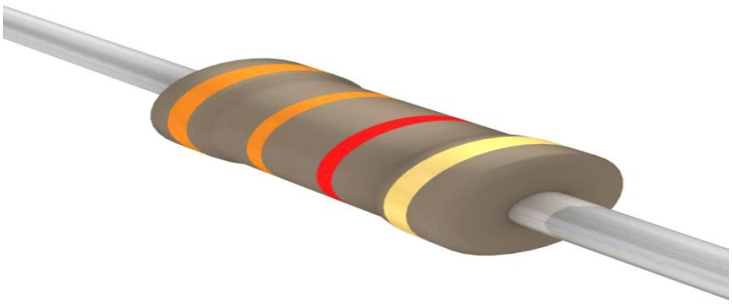


Figure: Resistor 3k3 ohm

5.6 Diode 1N4007

DIODE 1N4007- Convert to ac to dc and control of the ac to dc system.



Figure: Diode 1N4007-T

5.7 1000 uF/25V Electrolytic Decoupling Capacitor:

Capacitor is an essential component of our project. We can use the capacitor in different many applications. Using capacitor in a microcontroller its must because of the microcontroller is a digital device with fast switching edges which uses a large amount of current for a very short period of time at each transition. The capacitors supply the large amount of current needed so that the power supply doesn't sag during that time creating noise. The main function of a capacitor is storing electric charge. A charged capacitor could be used as a voltage source. It is always best to use a variety of capacitors on the power supply pins of the microcontroller to provide a low impedance wideband supply. In our work we used Electrolytic decoupling capacitors 1000 uF/25V. These capacitors are great transient/surge suppressors and work well in high-voltage and audio applications. High quality radial electrolytic capacitors. Capacitors are used for several purposes like timing, smoothing power supply, coupling, filtering, tuning for radio system, storing energy etc.



Figure: 1000 uF/25V Electrolytic Decoupling Capacitor

5.8 7Amps 250V AC or 10Amps 28V DC Relay

This is a Single pole double throw (SPDT) type relay with 5 pins in a cube type package and rated to work at 12VDC. Load Current Max.: 7Amps 250V AC or 10Amps 28V DC. Coil Resistance: 360-440 Ohms.



y

Figure: Relay

Chapter VI

Electronics Schematic

6.1 Block Diagram of Agricultural Robot

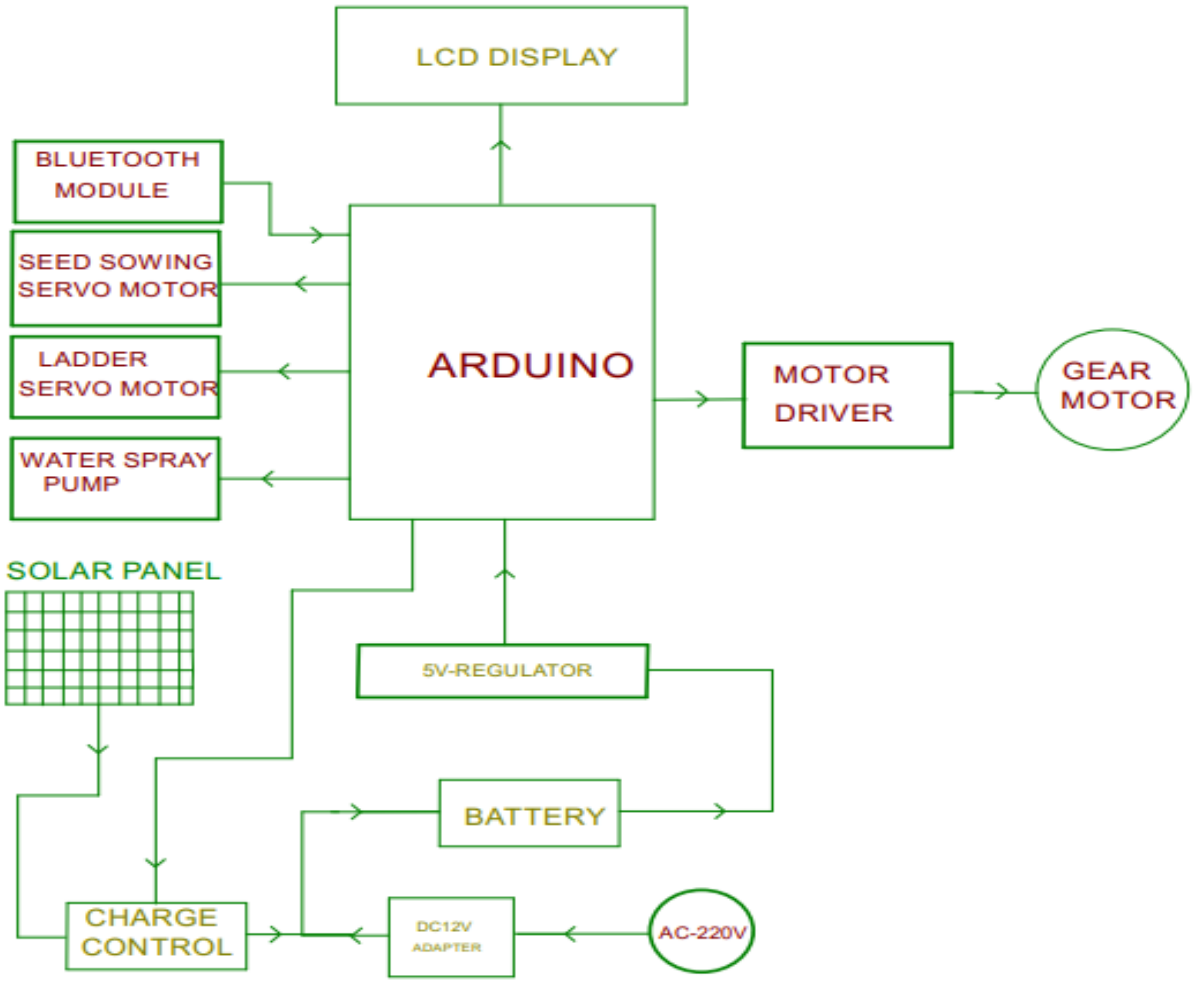


Figure: Block diagram

6.2 Circuit Diagram of Agricultural Robot using Bluetooth bashed mobile phone apps controlled:

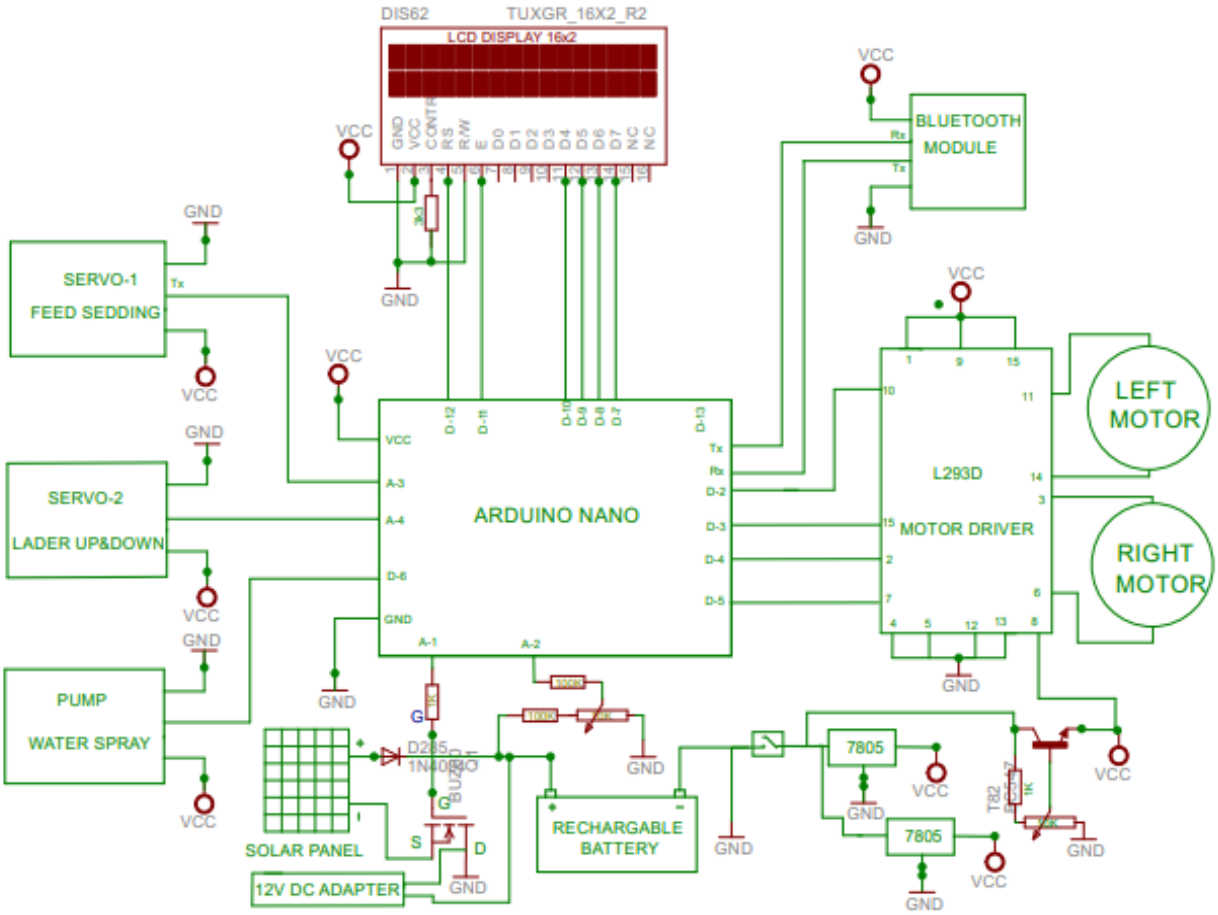


Figure: circuit diagram

Chapter VII

Result and Discussion

8.1 Future Scoop

Since the designed robot is used only for sowing of seeds and spraying of water with the help of moisture sensor controlled through IOT, in future we will try to work on pH meter can be in order to determine the pH of the soil which helps to identify the suitable pesticide/fertilizer to be employed Moisture level sensor can be employed to know about the moisture content present in the soil of the farmland and with the help of Cloud Computing and Solar Technology the robot has high efficiency and accuracy in fetching the live data of temperature and soil moisture in the future.

The majority of nations now do not have enough skilled labour, particularly in the agricultural sector, which has an impact on the development of developing nations. The manual method of sowing is the most common. Yet it takes more time, and there is always a manpower deficit. Hence, in order to solve this issue, the sector needs to be automated. Many industries, including defence, surveillance, medicine, and industry, use automation robots. To reduce the need for human labour, the robot system is employed to design the method of cultivating agricultural land. When compared to tractors or other agricultural equipment, this machine uses less energy.

8.2 Future work

The future of agricultural robots holds a promising array of advancements that can revolutionize the industry. Here are some potential areas of future work and development for agriculture robots:

1. *Precision Farming*: Agricultural robots will continue to play a critical role in precision farming by utilizing sensors, GPS, and machine learning to monitor and manage crops with high precision. This includes tasks like targeted pesticide and fertilizer application, planting, and irrigation.

2. *Autonomous Machinery*: Developments in AI and robotics will lead to the creation of more sophisticated autonomous machinery capable of performing a wider range of tasks. This could include autonomous tractors, harvesters, and other specialized equipment.

3. *Crop Monitoring and Management*: Advanced robotics equipped with cameras, multispectral and hyperspectral sensors, and AI algorithms can monitor crop health, identify diseases, pests, and nutrient deficiencies, allowing for timely interventions.

4. *Weeding and Pest Control*: Robots capable of identifying and removing weeds without harming crops will become more prevalent. Similarly, autonomous drones could be used for pest surveillance and targeted pesticide delivery.

5. *Harvesting*: Harvesting robots will become more efficient and adaptable, capable of handling delicate fruits and vegetables with care. These robots could operate day and night, increasing overall efficiency.

6. *Labor Shortage Solution*: As labor shortages become more pronounced in agriculture, robots can fill the gap by performing tasks that are labor-intensive or require repetitive actions. This can lead to increased productivity and reduced labor costs.

7. *Data-Driven Decision Making*: Agricultural robots will continue to generate vast amounts of data, which can be analyzed to make informed decisions about planting schedules, irrigation, fertilization, and more.

8. *Modularity and Customization*: Modular robots that can adapt to different tasks and environments will be developed. This could include robots that can be easily reconfigured for various types of crops and farm layouts.

9. *Sustainability and Environmental Impact*: Future agricultural robots will likely be designed with sustainability in mind, utilizing renewable energy sources, reducing chemical usage, and minimizing soil disturbance.

10. **Collaborative Robots (Cobots)**: Robots working alongside human farmers, known as cobots, will become more common. These robots can assist in tasks that require precision, strength, or endurance, enhancing overall productivity.

11. *Education and Training*: As robotic technology becomes more integral to agriculture, there will be a need for education and training programs to teach farmers how to operate and maintain these complex systems.

12. *Remote Monitoring and Control*: With the help of advanced sensors and connectivity technologies, farmers will be able to remotely monitor and control robots on their fields using smartphones or other devices.

13. *Swarm Robotics*: Teams of small, interconnected robots working together like a swarm could perform tasks more efficiently and cover larger areas, while also providing redundancy.

14. *Vertical Farming and Greenhouses*: Robots will play a significant role in vertical farming and greenhouse operations by automating tasks like seeding, harvesting, and climate control.

15. *Soil Management and Analysis*: Robots equipped with sensors can assess soil quality, moisture content, and nutrient levels, aiding in better land management practices.

The future of agriculture robots is a combination of increased automation, enhanced sensing and intelligence, and the ability to work seamlessly with human farmers to create more sustainable, productive, and efficient farming practices.

8.3 RESULTS AND DISCUSSIONS

In this project we have built a farming robot which can perform multiple functions such as ploughing, field levelling, seeding, pesticide spraying and watering. We have efficiently built the proposed robot to reduce man power and health hazards caused by chemicals during pesticides spraying. The seeding wheels reduces the time taken for sowing the seeds manually and outlets of water helps in spraying water in less time. Also, the automatic navigation implemented helps in doing all the farming operations without human intervention. Thus, the skill labor required is less and the health hazards to the farmers is reduced significantly

8.4 Advantages

- It is very easy to implement
- It is high reliability
- It shows digital output
- Speed operation

8.5 Disadvantage

- It has limited long term stability
- It is sensitive to dewing and certain aggressive substance
- It is difficult to use bellow zero temperature
- Long-term measurement is limited due to required water reserve and wick maintenance

8.6 Applications

- Heavy Agriculture
- Short time seed plant
- Speed and Efficiency
- Real-time Monitoring
- Adaptability to Terrain

Chapter VIII
Appendix

```
#include<LiquidCrystal.h>

LiquidCrystal lcd(12,11,10,9,8,7);


#define leftMotor1 2

#define leftMotor2 3

#define rightMotor1 4

#define rightMotor2 5


#define LCTR1 6

#define LCTR2 A3

#define LCTR3 A4


char str[15];

int state = 0;


void setup()

{

  lcd.begin(16,2);

  Serial.begin(9600);
```

```
  lcd.setCursor(0,0);
  lcd.print("    WELCOME     ");
  lcd.setCursor(0,1);
  lcd.print("                ");
  delay(1500);

  pinMode(LCTR1, OUTPUT);
  pinMode(LCTR2, OUTPUT);
  pinMode(LCTR3, OUTPUT);
  pinMode(rightMotor1, OUTPUT);
  pinMode(rightMotor2, OUTPUT);
  pinMode(leftMotor1, OUTPUT);
  pinMode(leftMotor2, OUTPUT);
}

void loop()
{

  if (Serial.available() > 0)
  {
    state = Serial.read();
  }
```

```
if (state == '1')
{
  Forward();
  lcd.setCursor(0,1);
  lcd.print("  FORWARD      ");
  delay(150);
  StopBot();
  state = 0;
}
else if (state == '2')
{
  Backward();
  lcd.setCursor(0,1);
  lcd.print("  BACKWARD      ");
  delay(150);
  StopBot();
  state = 0;
}
else if (state == '3')
{
  leftTurn();
  lcd.setCursor(0,1);
```

```
  lcd.print("  LEFT      ");
  delay(150);
  StopBot();
  state = 0;
}
else if (state == '4')
{
  rightTurn();
  lcd.setCursor(0,1);
  lcd.print("   RIGHT      ");
  delay(150);
  StopBot();
  state = 0;
}
else if (state == '5')
{
  digitalWrite(LCTR1, HIGH);
  lcd.setCursor(0,1);
  lcd.print(" LADDER/PLOW    ");
}
else if (state == '7')
{
  digitalWrite(LCTR3, HIGH);
```

```
    lcd.setCursor(0,1);
    lcd.print("   PUMP ON      ");
   }
   else if (state == '8')
   {
    digitalWrite(LCTR1, LOW);digitalWrite(LCTR2, LOW);digitalWrite(LCTR3, LOW);
    lcd.setCursor(0,1);
    lcd.print("    STOP        ");
   }
 ////////////////////////////////
   lcd.setCursor(0,0);
   lcd.print("DIRECTION:    ");
   //lcd.print(BV);
   //lcd.print("V");
 ////////////////////////////////
}

void forward(int LeftMotor1, int LeftMotor2, int RightMotor1, int RightMotor2)
{
  analogWrite(leftMotor1, LeftMotor1);
  analogWrite(leftMotor2, LeftMotor2);
  analogWrite(rightMotor1, RightMotor1);
  analogWrite(rightMotor2, RightMotor2);
```

```
}
void Forward()
{
  forward(0, 200, 200, 0);
}
void Backward()
{
  forward(200, 0, 0, 200);
}
void StopBot()
{
  forward(0, 0, 0, 0);
}
void rightTurn()
{
  forward(0, 200, 0, 200);
}
void leftTurn()
{
  forward(200, 0, 200, 0);
}
```

Images of our projects

Image 1:

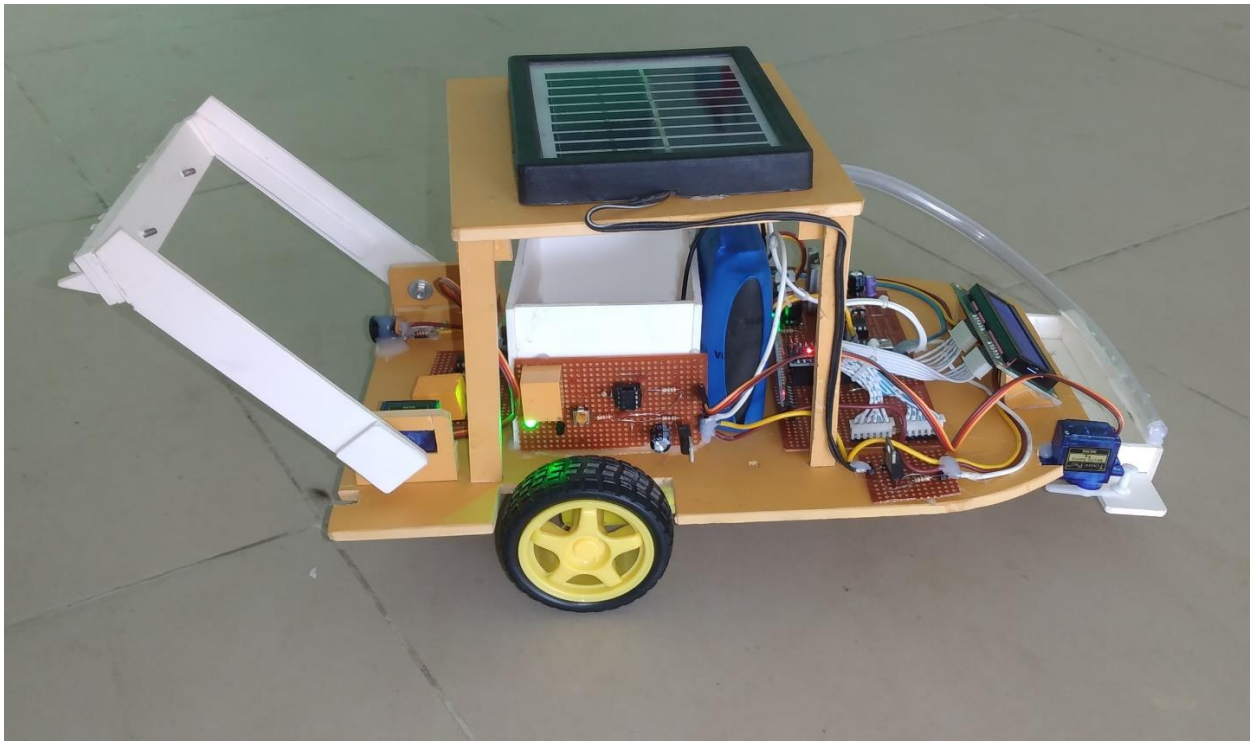


Image 2:

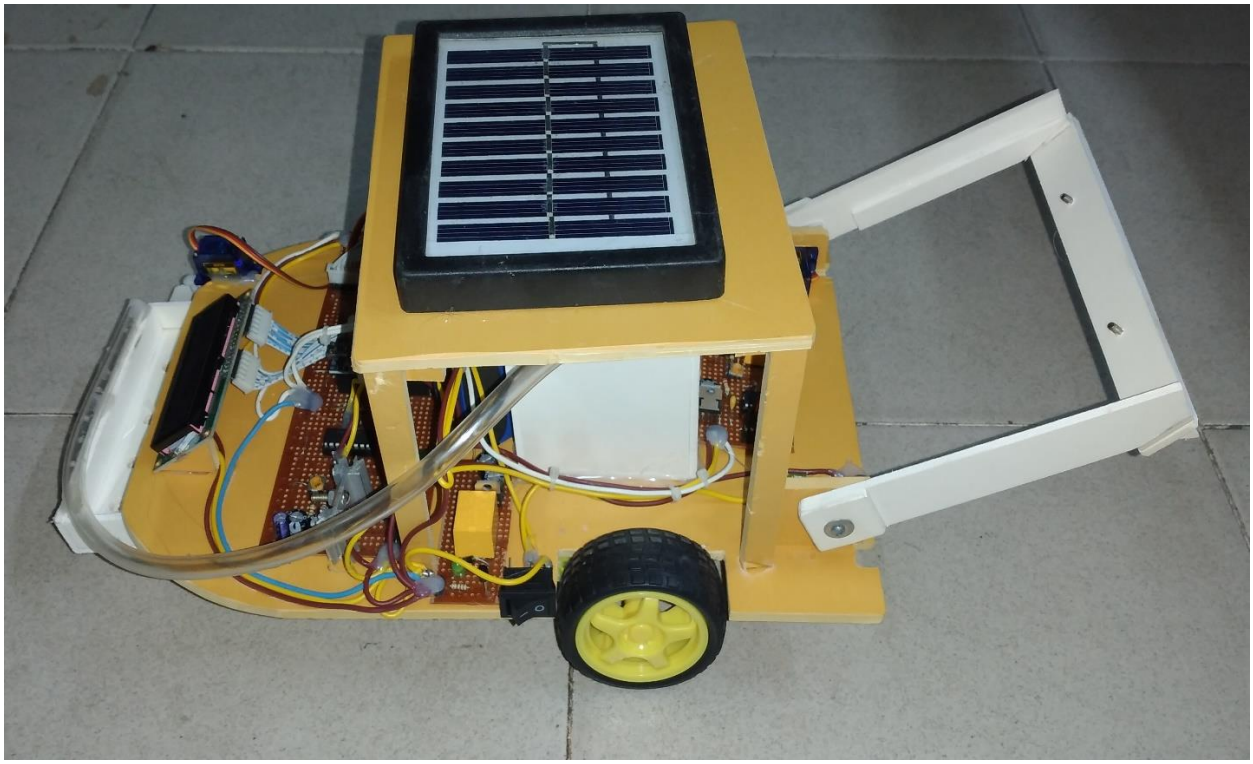


Image 3:

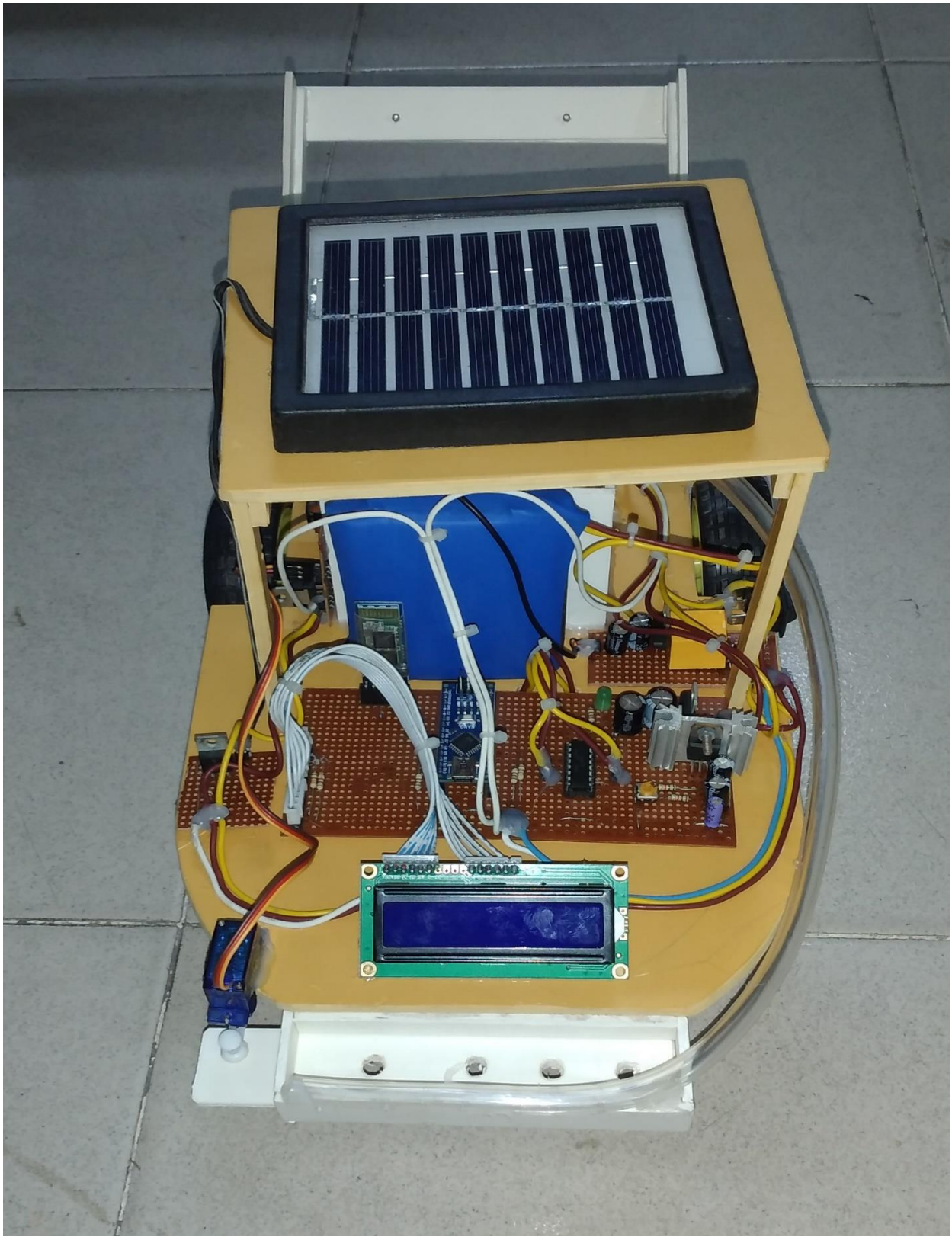


Image 4:



Conclusion

We have developed an Agricultural Automation Robot using Arduino. An initial outcome of this study indicates that most of these systems that which work autonomously are more flexible than traditional systems. The benefits of reduction in labor costs and restrictions on the number of daily working hours significantly improved. Thus it has made possible to automate the most significant working routines. The project presents a low cost, low power & simple system for device control. This system will have high application in farming, gardening and Agri university. The chassis handles the complete weight of solar panel, battery and the hardware mounted on Agrirobo which is able to perform each and every operation skillfully and successfully.

References

[1] B. Reddy, N. Uttam Reddy, N. Akhl, and D. Pravsta V. Serena Rajam, Nellore Kapileswar, and SAI TEJA. (2020), "A smartphone controlled garduino for feeding and watering plants." Electronics and Computers: An International Journal of Applied Mathematics, 8, 4, 173–178.

[2] A. Hassan et al., " Robot-based Smart Irrigation System with Wireless Control Using Arduino," JRC, 2, 1, 129–34.

[3] Ilayaraja, T., Kumar, A. V., and Sugadev, M. (2022). a wirelessly operated seed-planting robot built on an Arduino board. Technology and Artificial Intelligence (pp. 323-333).

[4] Raj, S.; Sharma, V.; Jaiswal, V.; and Srivastava, R. (2020). IRJET, 7(07), 2708–2710, published a study on smart agriculture utilising IoT.

[5] Balasubramani, S., Kavisankar, L., & Dhanalakshmi, R. (2021). A New Method for Smart Farming Using IoT-Based Automatic Irrigation System. 25(4), 641-648, Journal of Applied Science and Engineering.

[6] Rahaman, S. (2020). Arduino closed loop system used in farming for many parameters. 9(4), 1373- 1378, Bulletin of Electrical Engineering and Informatics.

[7] Narasimha Reddy, S., Pitta, and Dorthi, K. (2022). Internet of Things-based Smart Water Management System in Agricultural. Uses of Smart Intelligent Computing, 2 (pp. 235-241).

[8] Reddy, E. M. K., Rashmi, M. R., and Narayanavaram, B. (2020). Agriculture automation using Arduino is a step towards modernising agriculture, according to the statement. The fourth ICECA will take place in 2020. (pp. 1184-1189). IEEE.

[9] Chandana, R. et al (2020). " a multipurpose agricultural robot for self-sufficient sowing, ploughs, and plant health monitoring ". IJERT, 8 (11).

[10] Akhund, T. et al., (2020, May). Self-powered, Internet of Things-based design for flexible, intelligent poultry farm. Information and communication technologies for intelligent systems were discussed during the international conference (pp. 43-51).