A

Technical Report

On

AUTOMATIC PLANT IRRIGATION SYSTEM

Submitted to CMR Institute of Technology in the partial fulfillment of the requirement of

Social Innovation Lab

Of

II B.Tech II- Semester

In

CSE(AI&ML) DEPARTMENT

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Certificate

This is to certify that the technical report entitled "**AUTOMATIC PLANT IRRIGATION SYSTEM**" is the bonafide work done and submitted by

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towards the partial fulfillment of the requirement of Social Innovation (SIL) Laboratory of **II B. Tech II-Semester** in **CSE(AI&ML)** is a record of bonafide work carried out by them during the period **feb 2022 to June 2022.**

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INTRODUCTION

As we know that, plants are the most important thing on the earth. So we have to survive it and should spread greenery as much as we can. People potted plants for gardening and decorated their house by many plants. But in their absence plants are not getting sufficient of water. Generally in the summer and winter season, the humidity of atmosphere get reduced, as a result water level of the soil get reduced and also lack of rain is one of the vital cause of ill plantation. From different survey as we came to know, drying a soil to constant weight 105℃ (sometimes 50-80℃ for plant tissue) is the traditional method of arriving at a “dry” sample weight. This temperature is somewhat arbitrary, and clay minerals in particular may contain 10-15% water (dry basis) at 400℃ (Gardner 1986). As temperature grows up more, first water in soil pores evaporates, then water accumulate to mineral surfaces, followed by water between lattice layers and that which forms part of the mineral lattice itself. Irrigation helps to harvest crops, protecting plants against frost, suppressed the weed growth in grain fields, prevent the dust suppression, disposal of sewage and preventing soil consolidation. In earlier, we used watering cans, water channels which are opened and closed manually or backpack sprinklers for irrigation. So, large amount of the water wasted due to that process. So now, we should require improving on the existing or earlier forms of plant irrigation. An automated power plant system needs to be developed to improve efficiency of water use for agricultural crops. So

we introduced an intelligent system that has autonomously monitor and control the level of water existing to the plants without any failure or human effort.

Here the system will check continuously the amount of water present in the soil and find out if watering is required for the plants and how much amount is required based on the information acquired from monitoring the soil water content. The system will automatically shut down the motor when sufficient amount of water supplied to the soil. System response tests will determine how much time will take for the system to irrigate potted samples of different soil types, that comes down the dryness level and soil moisture level reaches to the threshold level 1000 to certain value. So there are the advantages of automatic power plant system to the plants include saving money, water, maintenance of human effort and overall convenience.

Our friends proposed the design of pumping water for all the plants equally without human need by using pipes or sprinkers. In this we no need to stand for minutes and water the fields, it waters all the plants equally and some proposed the alarm after certain time so that it will gives us a alert that we have to off the motor. One of our friend proposed of watering plants automatically i.e., motor will be on automatically when water are required and off when the water levels are enough. So that there is no wastage of water.

EMPATHIZE

Empathize—Research your User's Needs

Empathy is crucial to a human-centered design process such as design thinking because it allows you to set aside your own assumptions about the world & gain real insight into users and their needs.

During this stage we did a task on finding or defining any 10 problem statements from surroundings. And after that we tried to understand the problem statements completely. After that we tried to find the possible solutions for the above problem statements. And then we discussed among ourselves and also with our fellow students. Everyone shared their ideas. And then we took 2 of the most crucial problems and we discussed. We have collected positive and negative comments from the students.

And we came out with possible outcomes for the above problem statements and tried to find a proper solutions. Firstly we collected the ideas shared with our friends and faculty.

Secondly collected information regarding to the problem statement and a possible report on it.

And finally we have surveyed the people about the above discussed problems. We got their reviews and opinions which helped us to move further and define more problems like related to accidents,

Traffic, water filtration, production of re-cyclable masks, cylinder blasts etc.

By the end of this stage we came to know about empathy stage. That it’s all about our observation and understanding of the problem. As it’s the first step of design thinking process we can come out with many solutions.

DEFINE

Define—State our user's needs and problems

The Define stage is about pausing to consider and identify what problems to tackle before jumping straight into development. This requires the team to pull together and make sense of the research findings from the empathise stage.

During the Define stage, we put together the information we have created and gathered during the Empathise stage. This is where we analysed our observations and synthesized them in order to define the core problems that we and our team have identified up to this point. We should seek to define the problem as a problem statement in a human-centred manner.

The Define stage will helped the designers in our team gathered great ideas to establish features, functions, and any other elements that allowed us to solve the problems or, at the very least, allow us to resolve issues ourselves with the minimum of difficulty. In the Define stage you will start to progress to the third stage, Ideate, by asking questions which can help us look for ideas for solutions by asking: "How might we…helps to encourage our product"

During this stage we defined the problems completely and studied about them. We kept group discussions on the selected problem statement and tried to find the possible solutions to it. And we discussed about the solutions with friends and faculty. We collected more details

about our problem statement and it’s advantages, disadvantages. We also discussed how it would work and how it would change the lives of users.

IDEATE

During the third stage of the Design Thinking process, designers are ready to start generating ideas. You've grown to understand your users and their needs in the Empathise stage, and you've analysed and synthesised your observations in the Define stage, and ended up with a human-centered problem statement. With this solid background, you and your team members can start to "think outside the box" to identify new solutions to the problem statement you've created, and you can start to look for alternative ways of viewing the problem. There are hundreds of Ideation techniques such as Brainstorm, Brainwrite, worst possible idea and Scamper. Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase. You should pick some other Ideation techniques by the end of the Ideation phase to help you investigate and test your ideas so you can find the best way to either solve a problem or provide the elements required to circumvent it.

During this stage we discussed about problem statement and it's modifications. We also got reviews and comments from students. We have done the research of design of the topic we have chosen.

We did a process of synthesis on what we saw and heard insights that lead to some solutions and opportunities for a change.

We have got ideas through brainstorming for the creation of product. Our mentors cleared the doubts. we have done group ideation and discussed the first idea we got.

PROTOTYPE

The design team will now produce a number of inexpensive, scaled down versions of the product or specific features found within the product, so they can investigate the problem solutions generated in the previous stage. Prototypes may be shared and tested within the team itself, in other departments, or on a small group of people outside the design team. This is an experimental phase, and the aim is to identify the best possible solution for each of the problems identified during the first three stages.

The solutions are implemented within the prototypes, and, one by one, they are investigated and either accepted, improved and re-examined, or rejected on the basis of the users' experiences. By the end of this stage, the design team will have a better idea of the constraints inherent to the product and the problems that are present, and have a clearer view of how real users would behave, think, and feel when interacting with the end product.

So, the next step is making a prototype, that is for making a prototype we require components like

EQUIPMENTS	QUANTITY
Arduino UNO	1
L293D Motor Drive	1
Servo motor	1
Soil Moisture Sensor	2
Motor pump	1
Jumper wires	10
9V Battery	1
Connectors	1

Before starting prototype we will first understand about the components

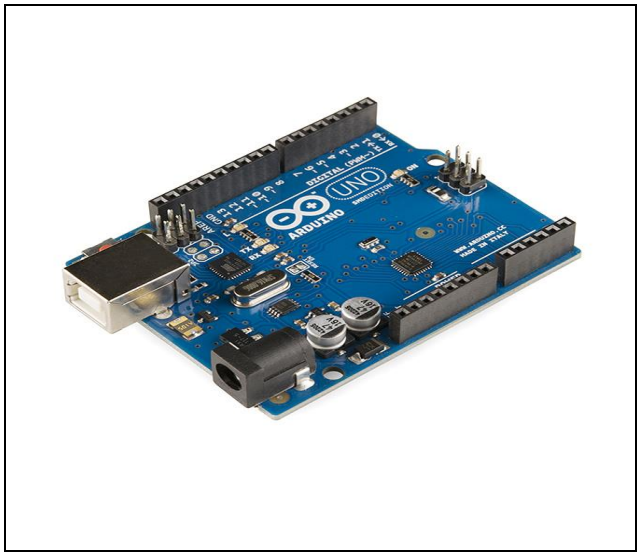
DESCRIPTION OF COMPONENTS:

ARDUINO UNO:

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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. You can

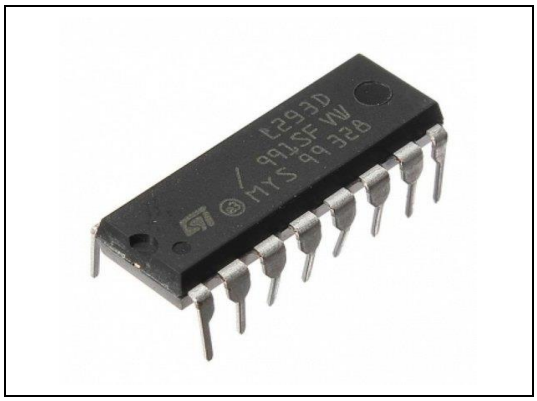
tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.



L293D MOTOR DRIVER:

L293D is a basic motor driver integrated chip (IC) that enables us to drive a DC motor in either direction and also control the speed of the motor. The L293D is a 16 pin IC, with 8 pins on each side, allowing us to control the motor. It means that we can use a single L293D to run up to two DC motors. L293D consist of two H-bridge circuit. H-bridge is the simplest circuit for changing polarity across the load connected to it.

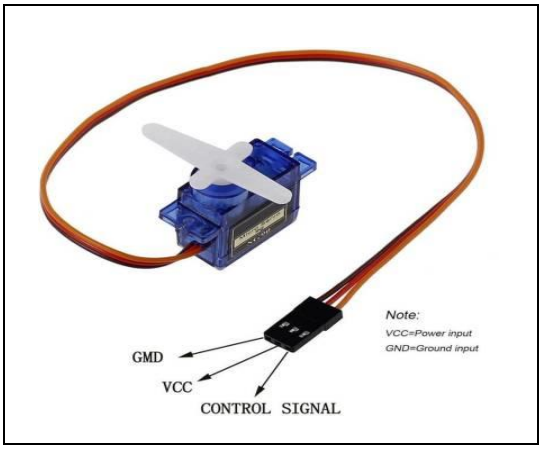


There are 2 OUTPUT pins, 2 INPUT pins, and 1 ENABLE pin for driving each motor. It is designed to drive inductive loads such as solenoids, relays, DC motors, and bipolar stepper motors, as well as other high-current/high-voltage loads.

SERVO MOTOR:

A servo motor is a rotary actuator that allows for precise control of angular position. It consists of a motor coupled to a sensor for position feedback. It also requires a servo drive to complete the system. The drive uses the feedback sensor to precisely control the rotary position

of the motor.

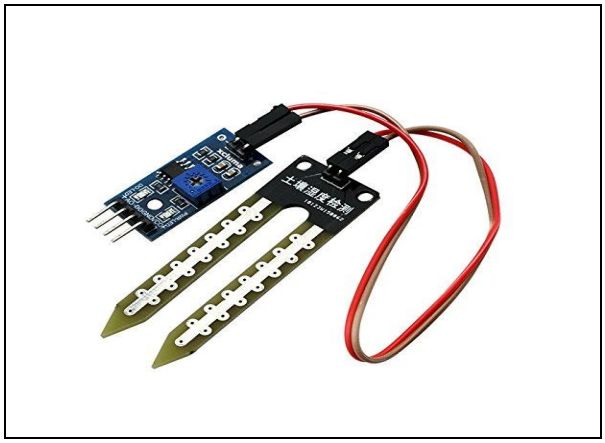


The main reason behind using a servo is that it provides angular precision, i.e. it will only rotate as much we want and then stop and wait for the next signal to take further action.

SOIL MOISTURE SENSOR:

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content.

These sensors normally used to check volumetric water content, and another group of sensors calculates a new property of moisture within soils named water potential. Generally, these sensors are named as soil water potential sensors which include gypsum blocks and tensiometer.



MOTOR PUMP:

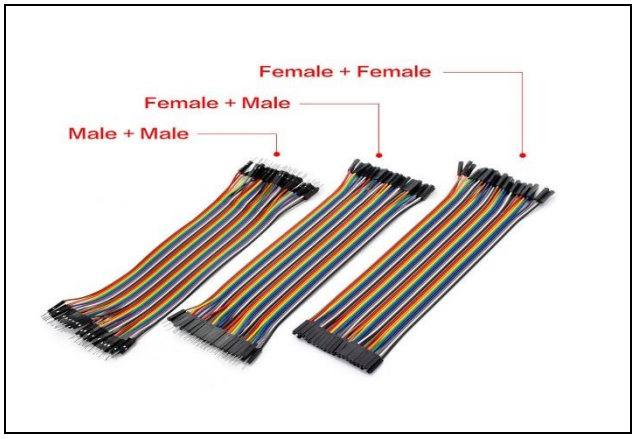
A submersible pump, also called an electric submersible pump, is a pump that can be fully submerged in water. The motor is hermetically sealed and close-coupled to the body of the pump.

A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy. This is done by the water being pulled into the pump: first in the intake, where the rotation of the impeller pushes the water through the diffuser. From there, it goes to the surface.

The major advantage to a submersible pump is that it never has to be primed, because it is already submerged in the fluid. Submersible pumps are also very efficient because they don't really have to spend a lot of energy moving water into the pump. Water pressure pushes the water into a submersible pump, thus "saving" a lot of the pump's energy.

JUMPER WIRES:

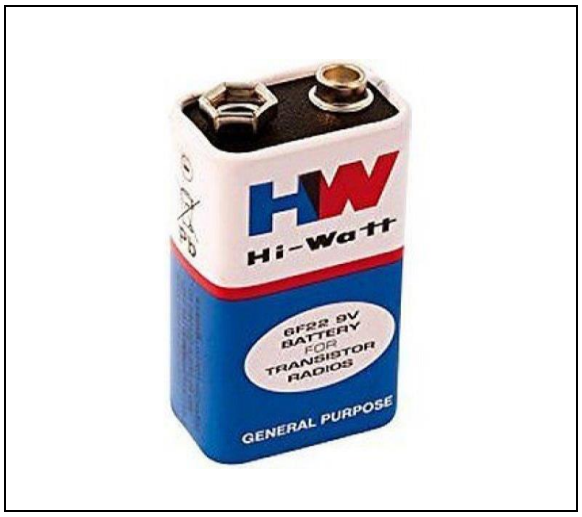
Jumper wires are electrical wires with connector pins at each end. They are used to connect two points in a circuit without soldering.You can use jumper wires to modify a circuit or diagnose problems in a circuit. Further, they are best used to bypass a part of the circuit that does not contain a resistor and is suspected to be bad.



Jumper wires come in three versions. The difference between each is in the endpoint of the wire. Male ends have a pin protruding and can plug into things, while female ends do not but are also used for plugging.

9V BATTERY:

The 9V battery is an extremely common battery that was first used in transistor radios. It features a rectangular prism shape that utilizes a pair of snap connectors which are located at the top of the battery. A wide array of both large and small battery manufacturers produce versions of the 9V battery.



CONNECTOR:

This simple cable has so many uses! Plug the battery clip onto a standard 9V battery and connect the other end to any device that needs 9V. The Connector leads are polarity color coded, Red and Black.

The smaller circular (male) terminal is positive, and the larger hexagonal or octagonal (female) terminal is the negative contact. The connectors on the battery are the same as on the load device; the smaller one connects to the larger one and vice versa.

By using these components we have constructed our prototype. And we have collected logical and practical ideas which helped us to design our prototype in a proper way after the further modifications.

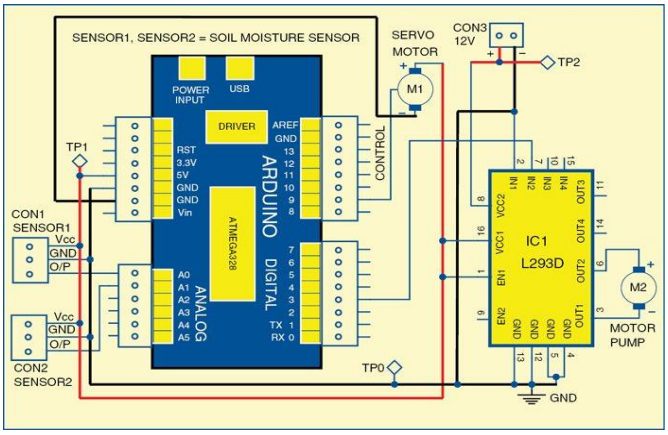
TEST

We have tested the AUTOMATIC PLANT IRRIGATION SYSTEM per the convenience and the usage and we have changed the working models as per the requirement and made a final model.

And code that works more efficiently than any other we have debugged a few errors and we have solved all the problems which are frequently occurring. We have found many solutions which made me easy to solve and debug the things which made us trouble. And the thing here is that the connections should be very appropriate if fails to put the connections properly he can't go further in the project every connection has its own function. And also check the connections twice or thrice whether the VCC is and the ground is properly fixed or not. We have also connected two soil moisture sensors to our prototype such that it will help us to detect whether the moisture level is matching with threshold value. The connections should be connected according to the code that we have given to the Arduino otherwise the code doesn't work.

We have tested our prototype n number of times so that it will make us clear all the loopholes which are in it. And the final product is efficient and its performance is good and considerable. And while uploading the code make sure you are connected to the port and upload it.

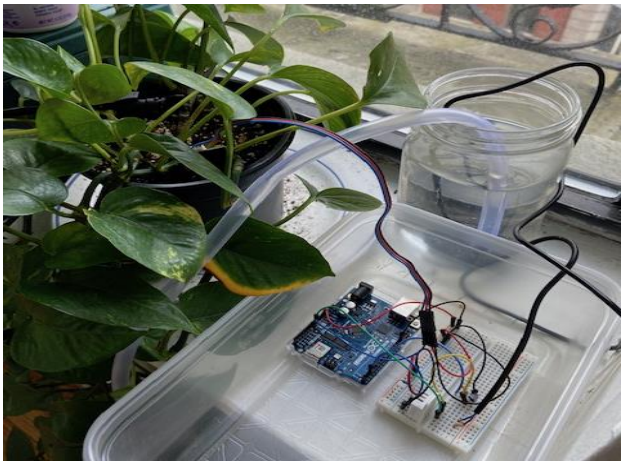
Our prototype worked perfectly. When the soil moisture is less than threshold level the water will be pumped automatically for few seconds and stops when it reaches threshold level.



WORKING PRINCIPLE:

The program in the Arduino reads the moisture value from the sensor every 20 seconds. If the value reaches the threshold value, the program does the following three things:

1. It moves the servo motor horn, along with the water pipe fixed on it, toward potted plant, whose moisture level is less than the predetermined/ threshold level.
2. It starts the motor pump to supply water to the plant for a fixed period of time and then stops the water pump.
3. It brings back the servo motor horn to its initial position.



We Place the flower pots where the pipe from the servo motor horn can easily reach them. When the moisture level dips below 600, servo horn rotates at an angle of 70 degrees. That is, after servo motor horn moves 70 degrees toward the first pot, the motor pump will be on for five seconds and then stop automatically. Then, the servo returns to its original position. Similarly, if you are using a second sensor, the servo motor horn will move to 145 degrees to the second biggest pot, motor pump will be on for eight seconds and then stop automatically. The servo returns to its original position.

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