

# Automatic Watering System Model

Supawud Nedphokaew  
Member,IEEE  
Department of Electrical Engineering  
Faculty of Engineering  
Rajamangala University of Technology  
Phra Nakhon.Bangkok,Thailand  
supawud@ieee.org

Sakhon Woothipatanapan  
Member,IEEE  
Department of Electrical Engineering  
Faculty of Engineering  
Rajamangala University of Technology  
Phra Nakhon.Bangkok,Thailand  
sakhon.w@rmutp.ac.th

Poonsri Wannakarn  
Department of Electrical Engineering  
Faculty of Engineering  
Rajamangala University of Technology  
Phra Nakhon.Bangkok,Thailand  
poonsri.w@rmutp.ac.th

Nathachote Rugthaicharoencheep  
Senior Member,IEEE  
Department of Electrical Engineering  
Faculty of Engineering  
Rajamangala University of Technology  
Phra Nakhon.Bangkok,Thailand  
nattachote.r@rmutp.ac.th

**Abstract**— This paper presents the design and construction of an automatic watering system simulator using an Arduino UNO R3 as an automatic watering controller, which takes the values from the Raindrops Sensor and the Soil Moisture Sensor as the numerical input transmitter to use the values. To control the solenoid valve on-off and when the Arduino is in trouble, the remote switch can be operated manually or with a digital timer as a watering controller.

**Keywords**— Aduno Uno R3, Rain Sensor, Soil Moisture Sensor, Timer, Solenoid Valve

## I. INTRODUCTION

Arduino reads aloud in Italian as “Ah-du-i-no” Arduino is a ready-made board that runs with an ATMEL AVR microcontroller IC designed by Italian Due to the use of the old microcontroller It is quite difficult to use. Because in addition to buying the IC microcontroller already And even if a computer program is written, but to bring the program that was written Put into the IC Must convert the written command to The language of the computer first It is called compile and when converting or compiling it will get a .bin or .hex file, but to put that file into the IC is called burning. Or programming (Programmer) must have a program or burner. Is the transport of that file Out of the computer to the IC by connecting it via Parallel port or Serial Port RS2 3 2 .Or USB to save the information into the memory of the IC. Then will work according to the program that we write to work order When there is power supply to the circuit The price of the tool is also expensive. And program each camp will be used with IC microcontroller Of the company only And even with a program that will bring the IC to use it It must have circuit design and PCB design In conclusion, people who will use the microcontroller to work. It has to be knowledgeable and capable of doing all of the above. Its main purpose is aimed at anyone who is creative. Who want to create anything that requires a microcontroller to control Able to create a work that he has figured out without that person having much knowledge in this area. There is no need to design an electronic circuit. PCB It does not require

deep microcontroller knowledge. You do not need to know a register, just have basic knowledge of electronics. Then use a computer and study write C programming only in the basics Can easily use an Arduino finished board to build things

The Arduino Uno R3 is the most popular Arduino board due to its affordable price. Most of the projects and libraries developed in Support are referenced mainly on this board as it is The perfect size for beginners to learn Arduino, and offers more shields than any other Arduino board, more specifically designed, the Uno board has been in development since R2 R3 and its sub-chip replacements. The IC is a SMD type and another advantage is that in the event that the MCU is broken, the user can easily buy and replace it by themselves.

## II. PROCEDURE ACCORDING TO IEEE STANDARD

### 2. Design and build a simulation of automatic watering system

2.1 Arduino IDE The working principle of Arduino has two main functions which are

1. The Setup function is the main function for operation. It will run only once after it has run. Program and will go to work in the next function is the Loop function

2. Loop function is a function of a loop function that will continue to loop, called infinite loop. An infinite loop, before programming, must set the port correctly as shown in Figure 1.

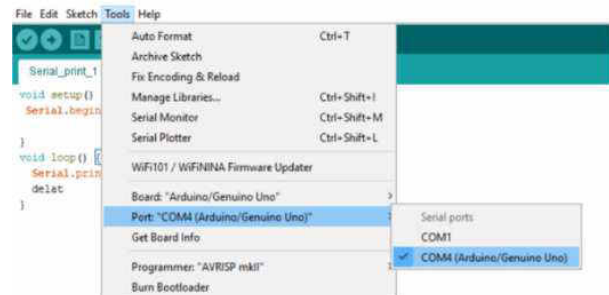


Fig.1 Setting to Port

Select Board to be Arduino / Genuino Uno when using Arduino Board. Uno R3 set as shown in Figure 2.

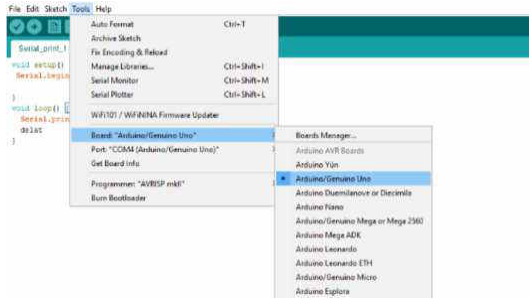


Fig.2 Select Board

When finished programming Notice the red circle at point 1 and point at 2

- Point 1 is to check whether the programming is correct or not. If not correct, the program will receive an error notification.
- Point 2 is uploading the code that we wrote to the Arduino Board if nothing goes wrong. The system will send a notification as in Figure 3

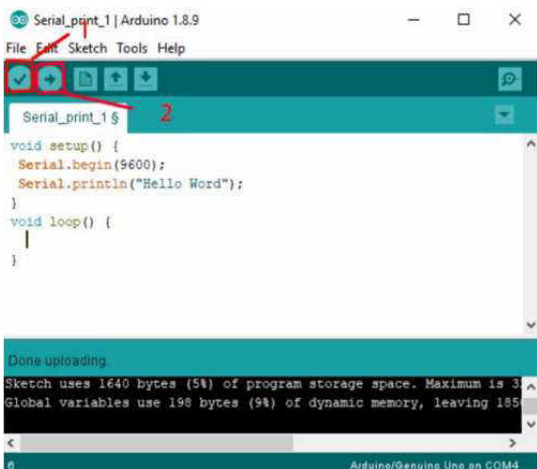


Fig.3 Shows code verification and up

2.3 Raindrops Detection Sensor Rain sensor Or water dripping down on the print Use the principle of electrolysis of water. When there is water dripping on the detection plate Will cause an electric current to flow through the water And then into the voltage comparison circuit to make the signal output digital When detecting rainwater will output the signal as HIGH

2.4 Soil Moisture Sensor Serves to measure soil moisture Or use it as a water sensor Can be connected to a microcontroller. Using analog input to read the humidity values Or choose to use the digital signal sent from the module Sensitivity can be adjusted with Trimpot adjustments

2.5 Timer is an electrical device used to control the working time of certain devices. To meet the needs of the user, for example, we want to set the time for the electrical system in the house to work at 6:00 pm, etc. Most of which Timer will be used in industrial applications in factories. As a component in a machine Which is a very important component In the machine, there is not just one timer. Some machines may have hundreds of timers. Timer is a device to set the time and control the output to work according to the conditions and time set. Which has many types and many brands Each brand will have different properties and names

2.6 Solenoid valve working principle of solenoid valve (Solenoid valve). Solenoid (Solenoid) is a type of electromagnetic device. The principle of operation is similar to the Relay (Relay). Inside the structure of the solenoid consists of a coil wrapped around a steel rod, the inside of which consists of a magnet, the upper and the lower. When an electric current flows through a coil wrapped around a steel bar. Causing the lower iron bars to have magnetic power, pull the upper iron bars down to touch each other, making the work cycle When the circuit is cut, the electricity causes the lower iron rod to lose magnetism. The spring will then push the upper bar back to its normal position. As a rule of thumb, the solenoid is used to move the valves of the pneumatic system. To shut-down the supply of water or other liquids The structure of the solenoid is generally divided into two types: slide the valve with the solenoid valve with spring (Single Solenoid Valve) and the valve with the solenoid valve back with the solenoid valve (Double Solenoid Valve) here is used as Slide the valve with a spring return solenoid valve (Single Solenoid Valve)

2.7 Water Pump A device for delivering water or transferring liquids from one place to another. Or circulating water or liquid to mix in a confined area

2.8 DS3231 clock module is a high accuracy RTC (Real Time Clock) clock module. Because inside there is a temperature measuring circuit To take the temperature from the environment to calculate Compensate for Crystal frequency disturbed by outside temperature. Comes with a battery Usable even without external power supply Can set the date and time, the library is ready to use. You can choose to display the time in 24 hours or 12 hours. In addition to displaying the date and time precisely. This module can also Can show outside temperature Is like a digital clock that can tell the temperature as well

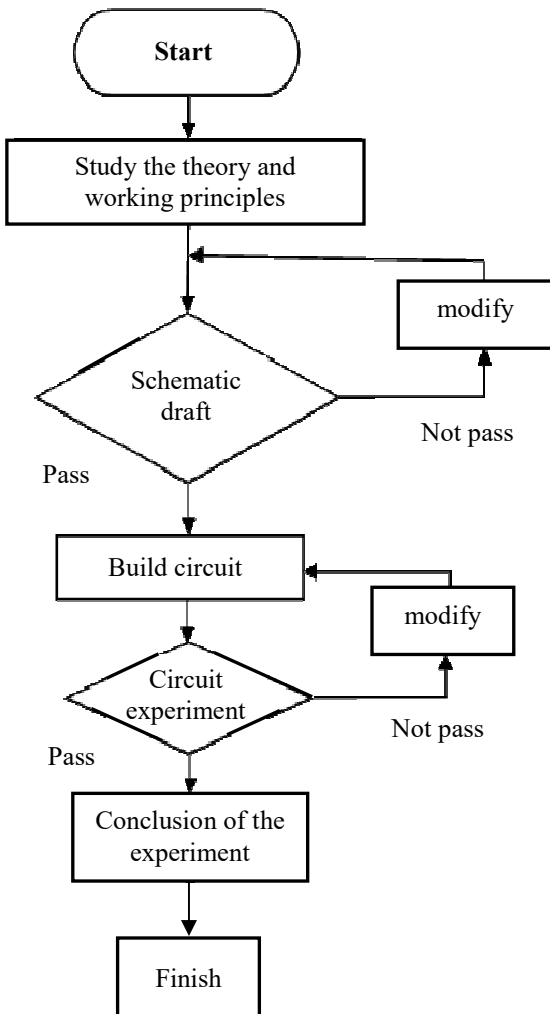
2.9 Relay (Relay) is an electronic device that acts as a switch to cut - connect the circuit using electromagnetic. And in order for it to work, it must supply power to it as required Because when supplying power to the relay, it will make contact with each other. Turn off And the opposite, as soon as power is not supplied to it It becomes an open circuit. The light that we use to feed the relay will be the power coming from the power. Of our machine, so as soon as you turn it on Will make the relay work

### III. STUDY PROCESS DESIRED PROCESS

3.1 In designing and constructing a simulation of an automatic watering system Information and theory about power electronic circuits related to this project must be studied. To be used in building and designing Therefore, it is necessary to plan the work to have clear and appropriate procedures. As well as putting a lot of emphasis on planning In order to create a simulation of an automatic watering system It can be used effectively.

3.2 Creating an automatic watering system simulator The design was made by using a direct current (DC) circuit and various devices that the organizer could study for further application. And used together with an input voltage of 5 V is used to supply the Arduino and the voltage 12 V is used to feed the remote control, water pump and solenoid to operate.

3.3 Planning of Operations To create and design all functions Operations are planned to guide the operations. Can be displayed as a schematic diagram as follows



### 3.4 The process of making parts



Fig.4 Process of laying out the workpiece layout



Fig.5 Connect the cable to the device



Fig.6 Finished workpiece.

### 3.5 Conduct a sensor measurement test

At this stage, after the measurements of the two sensors used are

1. Raindrops Detection Sensor
2. Soil Moisture Sensor

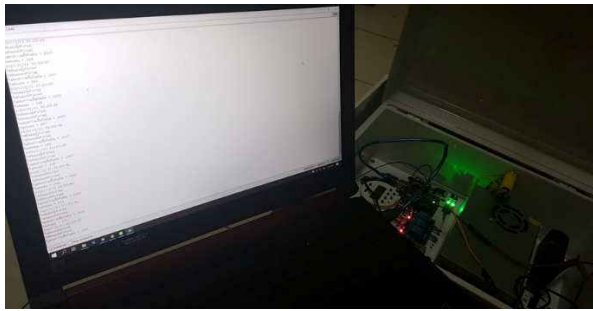


Fig.7 Measuring sensor value

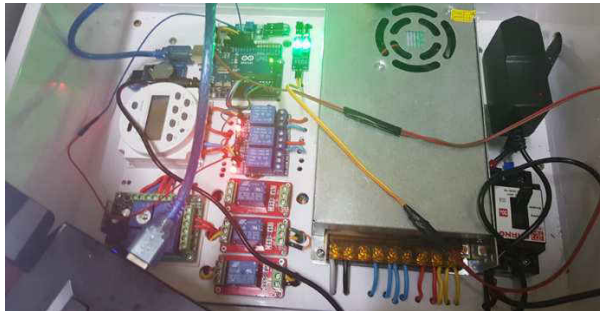


Fig.8 Measuring sensor values

### 3.6 Functional circuit design

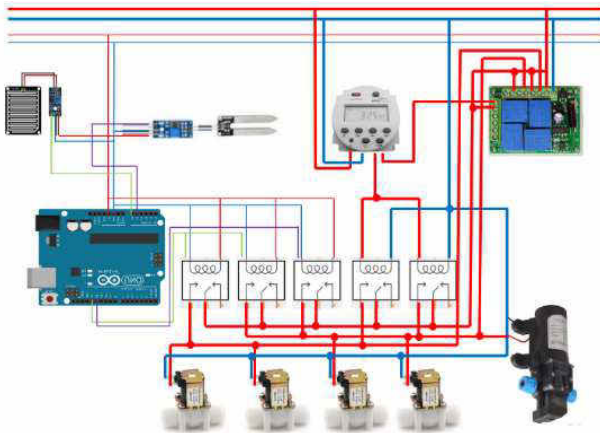


Fig.9 Functional circuit design

Table 1. Rainfall input analog measurements

Trial date	Normal (dry) detection panel	Water detection panel (wet)
8 / 11 / 2020	200	48
9 / 11 / 2020	288	48
10 / 11 / 2020	258	49
11 / 11 / 2020	310	50

Table 2. Input analog measurements of soil moisture

Trial date	Normal (dry) soil	Moist / wet soil
8 / 11 / 2020	1000	670
9 / 11 / 2020	1005	675
10 / 11 / 2020	1008	672
11 / 11 / 2020	1001	673

Table 3 Solenoid valve operation

Detail	Valve opens when the value	Valve closes when the value
Soil moisture value	> 700	<700
Rainfall	> 100	< 100

### IV. CONCLUSION

Summary of research results The test results showed that Rainfall input analog measurement During the normal (dry) detecting panel, the experimental values were 200-310, while the panel was exposed to water (wet) the values were 48-50 and the soil moisture analog input was measured. During normal (dry) soil, the experimental value is 1000-1008, while the soil is wet or wet, the value is 670-675 and the solenoid valve will open only when. The soil moisture is greater than 700 and the rainfall is greater than 100, and is turned off when Soil moisture is less than 700 and rainfall is less than 100

### REFERENCES

- [1] Cheechongruay. (2017). Agriculture Thailand 4.0! "Smart Farm Kit" Intelligent Watering System. Retrieved 29 October 2020, from <https://smartsme.co.th>
- [2] Myarduino. (2019). Arduino UNO R3. Retrieved 29 October 2020, from <https://myarduino.net>
- [3] IOXhop. (2018). Raindrops Detection Sensor. Retrieved October 29, 2020, from <https://www.ioxhop.com>
- [4] Myarduino. (2019). Soil moisture sensor. Retrieved 29 October 2020, from <https://myarduino.net>
- [5] Myarduino. (2019). Working principle of water pump. Retrieved 29 October 2020, <https://www.myarduino.net>