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PENDIDIKAN
MALAYSIA**



SEBERANG PERAI POLYTECHNIC

PROJECT (EE601)

TITLE: AUTOMATED PLANT WATERING SYSTEM

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APPROVAL SHEET

This project report titled Electrical and Electronic Appliance using Automated Plant Watering System was prepared and submitted by Noor Syazwani Binti Azami (Matrix Number: 10DTK13F2020) and Nurul Nadhira Binti Meerasa Sahib (Matrix Number: 10DTK13F2016) and has been found satisfactory in term of scope, quality and presentation as partial fulfillment of the requirement for the Diploma in Computer Electronic Engineering in Seberang Perai Polytechnic (PSP)

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Project Supervisor

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SESSION JUNE 2016

DECLARATION

This project report titled “AUTOMATED PLANT WATERING SYSTEM” has been submitted, reviewed and confirmed as meeting the conditions and requirements of writing project as required.

Reviewed and approved by:

Name of supervisor: Puan Liang Yuan Shin



Signature of supervisor:

Date:

“We declare that this is the result of our own except for each of which we have explained the source”

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ABSTRACT

This project aims to make everyday life more convenient and efficient for the working people. As the number of garden appliances increases drastically in the markets, watering cans should become a thing of the past. Automated plants watering system is an upcoming technology which could simplify daily routines in every way which allow people with hectic schedule to have a fertile plant too and to support and help disabled or elderly people and watering plants. However, This system uses a simple moisture sensors to detect the moisture levels in the soil and a Arduino Uno which is programmed to determine when to water the plants using a simple pump mechanism. The future will not stop progressing and things will just get better and better.

ABSTRAK

Projek ini bertujuan untuk membuat kehidupan lebih mudah dan cekap untuk orang yang bekerja. Oleh kerana bilangan peralatan taman meningkatkan secara drastik dalam pasaran, air tin harus menjadi satu perkara yang telah lalu. tumbuhan automatik sistem menyiram adalah teknologi yang akan datang yang boleh memudahkan rutin harian dalam setiap cara yang membolehkan orang dengan jadual sibuk untuk mempunyai sebuah kilang yang subur juga dan untuk menyokong dan membantu orang kurang upaya atau warga tua dan tumbuh-tumbuhan air. Walau bagaimanapun, sistem ini menggunakan sensor kelembapan mudah untuk mengesan tahap kelembapan di dalam tanah dan Arduino Uno yang diprogramkan untuk menentukan bila untuk air tumbuh-tumbuhan menggunakan mekanisme pam yang mudah pada masa akan datang tidak akan berhenti berjalan dan perkara yang hanya akan menjadi lebih baik.

ACKNOWLEDGEMENT

Firstly, In the Name of Allah, most Gracious, most merciful whom with His willing giving me the opportunity to complete this Final Year Project which is title Electrical and Electronic Appliance using Automated plant watering system. This final year project report was prepared basically for student in final year to complete the undergraduate program that leads to the diploma of Engineering in Electronic (Computer). This report is based on the methods given by the polytechnic.

I would like to express my very great appreciation to Puan Liang Yuan Shin a lecturer at Seberang Perai Polytechnic (PSP) and also assign, as my supervisor who had guided be a lot of task during two semesters session December2015/ June 2016. I also want to thanks the lecturers and staffs of Electrical Department for their cooperation during I complete the final year project that had given valuable information, suggestions and guidance in the compilation and preparation this final year project report.

Deepest thanks and appreciation to my parents, family, special mate of mine, and others for their cooperation, encouragement, constructive suggestion and full of support for the report completion, from the beginning till the end. Also thanks to all of my friends and everyone, that have been contributed by supporting my work and help myself during the final year project progress till it is fully completed.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In this advanced time of modernization, men have further created and brought different cutting edge electronic gadgets to a larger amount and made more refined contraptions to make regular life more helpful for the benefit of humanity. Dreams that were just dreams back in the 1980's and 2000's are currently being acknowledged and is really even always advancing. One of the simplest everyday technology that were constantly being utilized unconsciously are the automated plants watering system.

Major companies producing electrical appliances have been making huge profit and are always competing among each other to innovative great ideas and market the latest products to meet the increasing demands. Current electronic appliances that have are much needed in basically 80% in every home in every cities and countries. Therefore, if one is able to create more efficient or innovative idea to seize and control the current market demands, they would be capable of controlling majority of civilization.

Modern world and technology is taking over the world now. Gardening is the people's favourite hobby in the urban areas which tend to release their stress through gardening in the evening. A lot of people who work in offices enjoy having potted plants around because the windows don't open so they bring a little of the "untouchable outdoors" inside. Technology has evolved so many different types of gardening appliances. For an instance, people used to

use watering can to water the plants. A watering can or watering pot is a portable container, usually with a handle and a spout, used to water plants by hand. It has been in use, from, at least the 17th century and has since seen many improvements in design. Apart from watering plants, it has varied uses, as it is a fairly versatile tool.

The capacity of the container can be anywhere from 0.5 litres for indoor household plants to 10 litres for general garden use. It is usually made of metal, ceramic or plastic. At the end of the spout, a "rose" which is a device, like a cap, with small holes can be placed to break up the stream of water into droplets, to avoid excessive water pressure on the soil or on delicate plants. Nowadays, we are in an area where you just have turn the tap to activate the water pump which is connected with a hose. We have come from the era of caveman to the era of robots that helps us in our daily life.

Right now, one of the presumably most current technology in the gardening field is automated plants watering system. Water is essential for the plants thus is should be supplied at proper moment with appropriate amount of water. This system uses a simple moisture sensors to detect the moisture levels in the soil and a Arduino Uno which is programmed to determine when to water the plants using a simple pump mechanism. The future will not stop progressing and things will just get better and better.

1.2 PROBLEM OF STATEMENT

Technology is essential for humans nowadays. Without it, we do not know where we might be. The discovery of electricity has brought brightness to the dark world. This would not be possible if without the help of technology. Technology has taken the world to a total different dimension. Things that were impossible 100 years ago are coming to life now. Everything and anything can be operated with only the tip of your finger. That is how much technology has evolved.

Even though existing gardening appliances are helpful to human life but we need a more advanced technology for the people with hectic schedules where they need to manage their precious time. Time is gold for everyone thus many people rather not have plants in their garden. Besides that, garden is important too because it is a suitable place for everyone to release tension. There are few problems we may face without this invention. For example:

1. Inconvenient for elderly people which love to do gardening.

Every family in each home in every civilization is sure to have at least a pair of elderly people for example, the typical grandparents. It would be a back-aching task for them to do gardening because they cannot be in the bending posture for a long period of time. Therefore, this invention seems to be easier and more convenient for them. It would make life improve for not only them but the entire family. Furthermore, it lowers the danger risks posed for elderly people to slip, fall down or get infected because of dirt. Just a simple glance at the garden all it takes to ensure everything is fine.

2. Hard to maintain the garden when we are busy or out for vacation.

Imagine if one is busy after work, or have multiple task to do, or went out for a vacation with whole family. The garden would be destroyed in matter of days because insufficient of care for the plants. Wouldn't it be just perfectly awesome if they can carry out all the task and go for a vacation ensuring the garden will be automatically maintain. Daily life and chores would be easy and convenient in a home. In addition, this would save more time and people would have more time to increase productivity.

3. Plants do not need excessive water and it will be wasted

The reason for plants affected by too much water is that plants need to breathe. They breathe through their roots and when there is too much water, the roots cannot take in gases. It is actually slowly suffocating when there is too much water for a plant. Sometimes too much love towards plants could end up with wilted plants. Normally this happens when a plant owner is too attentive to their plants and keep watering them always and too much.

1.3 OBJECTIVES

- To reduce the water wastage by using the water efficiently depending on the moisture level.
- To save time by not having to water the plants.
- To increase the growth rate of the plant

1.4 SCOPE

Scope of project is divided into two sections. The first one is focusing on hardware and second one is software development.

For hardware section, the focusing area is:

Using a vase with enough water volume to detect soil moisture sensor.

For software development, the focusing area is:

- a) Program the Arduino Uno by using c language
- b) Build sample of program to burn the program in Arduino Uno

1.5 SIGNIFICANT PROJECT

The significant of this final year project is “Electrical and Electronic Application” using “Automated Plant Watering System”. In Addition, to make everyday life more convenient and efficient for the working people. As the number of garden appliances increases drastically in the markets, watering cans should become a thing of the past. Automated plants watering system is an upcoming technology which could simplify daily routines in every way which allow people with hectic schedule to have a fertile plant too and to support and help disabled or elderly people and watering plants.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

After being researched and analysed from the internet can be compared to a similar existing product which is automatic plant watering device using air flow through soil developed by Crane W. Based on (W, 1973). The main purpose of the inventors are to create a plant watering device responsive to the plant's need for water is disclosed.

2.2 STUDIES ON DESIGN

What this project does is that it water plants in a home garden automatically according to the moisture of the soil. The reason why we came up with this innovative idea is basically to help the disabled people, elderly and busy people. As for the disabled people and elderly, with this invention it will be able to help them to supply their plants basic need in the garden. They do not have to move in order to water the plants in the garden. In other words, this will ensure safety for them as they will not have to carry heavy load of watering cans to water. As for busy people, they could just continue doing their overtime at work without worrying about their plants in the garden.

Basically our project, recognizes the moisture of the soil, processes the input data or better the soil moisture level, and triggers the output in e, the user will start by setting the appropriate moisture depending of the plants and the angle of the plant pots placed. After that, the use has to refill the water supply and that is all the user has to do for his plants. At the

point onwards, the Automated Plant Watering System will take over the responsibility of the use to water the plants.

The program in the Arduino reads the moisture value from the sensor every 120 minutes. If the value reaches the threshold value, the program does the following as it starts the water pump to supply water to the plant for a fixed period of time and then stops the water pump. Besides that, there are two types of soil moisture sensors are available in the market currently which is a contact and non-contact sensors.

In this system, a contact soil sensor is used in this project because it has to check soil moisture to measure the electrical conductivity. The moisture sensor provides an analogue output, which can easily be interfaced with Arduino.

After hours of browsing through the internet and doing some research, we have come out that the moisture threshold should be set in the range of 100 to 400 would be appropriate for most of the plants in Malaysia.

2.3 FEATURES

2.3.1 ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, 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 an AC-to-DC adapter or battery to get started.

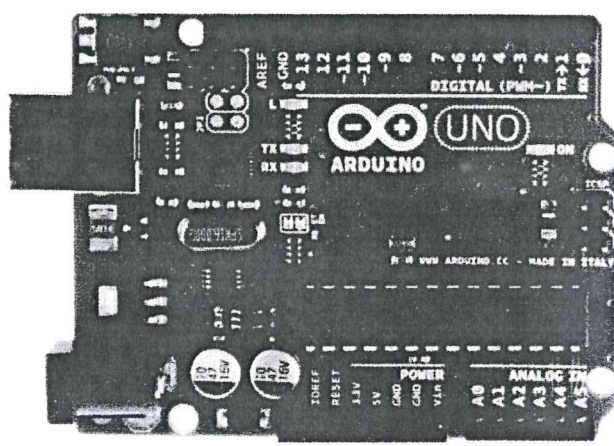


Figure 2.3.1: Arduino Uno

2.3.2 MOISTURE SENSOR

YL-69 soil moisture sensor connection to Arduino

YL-69 soil moisture sensor was interfaced to the Arduino through a digital a PCB drive. The PCB drive has a digital potentiometer and a LM393 comparator. The LM393 comparator is used to compare the voltages across the sensor probes and the set VCC voltage. The digital port is used to alter the sensitivity of the sensor when connected in digital mode. The out of the PCB drive has four connections pins as shown in the table below.

Table 4: YL-69 PCB pins

VCC	Connected to 5VDC
GND	Connected to ground
A0	Analog value output connector
D0	Digital value output connector (0 or 1)

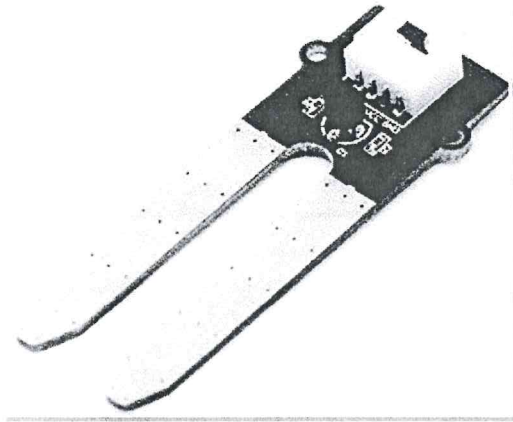


Figure 2.3.2 : Soil moisture sensor (YL-69)

2.3.3 WATER PUMP

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. There are many varieties of water pumps used. This project employs the use of a small water pump which is connected to a relay.

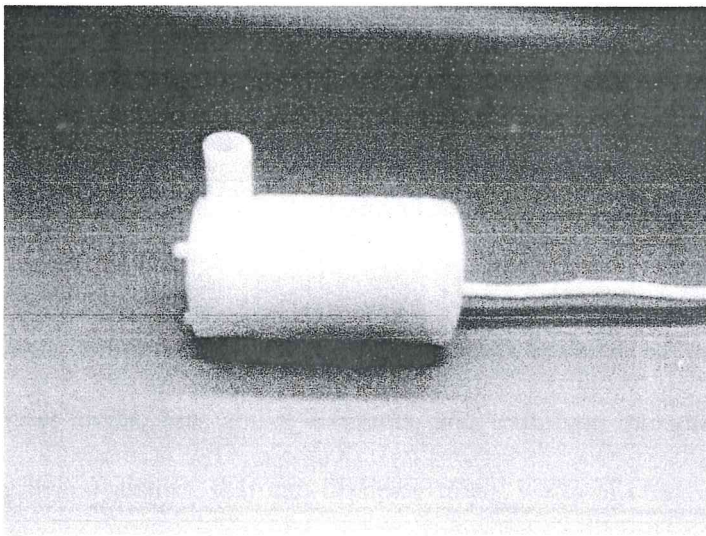


Figure 2.3.3 : Water pump

2.3.4 RELAY

Relay is a kind of semi-mechanical devices and electronic semiconductors. It is a kind of switch. Relay does not generate any voltage mention any current. As well as the usual switches, relays also acts as a switch. A switch that can be equated with the relay is a two-way switch. Relay is 5 feet unlike regular two-way switch that is 3 feet. 3 feet to 2 feet of construction diversion and again is connected to the voltage source. 2 feet voltage source is connected to the coil or coils contained in the relay. It acts as a magnet attracts iron plate.

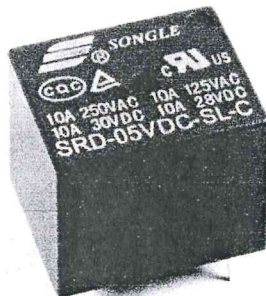


Figure 2.3.4 : Relay

2.3.5 RESISTOR

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors, that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance will fall within a manufacturing tolerance.

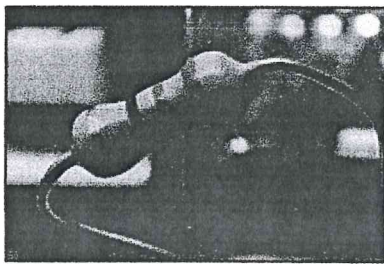


Figure 2.3.5 : Resistor

	Color	Significant figures			Multiply	Tolerance (%)	Temp. Coeff. (ppm/K)	Fail Rate (%)
Black	black	0	0	0	$\times 1$		250 (U)	
Brown	brown	1	1	1	$\times 10$	1 (F)	100 (S)	1
Red	red	2	2	2	$\times 100$	2 (G)	50 (R)	0.1
Orange	orange	3	3	3	$\times 1K$		15 (P)	0.01
Yellow	yellow	4	4	4	$\times 10K$		25 (Q)	0.001
Green	green	5	5	5	$\times 100K$	0.5 (D)	20 (Z)	
Blue	blue	6	6	6	$\times 1M$	0.25 (C)	10 (Z)	
Violet	violet	7	7	7	$\times 10M$	0.1 (B)	5 (M)	
Grey	grey	8	8	8	$\times 100M$	0.05 (A)	1 (K)	
White	white	9	9	9	$\times 1G$			
Gold	gold				$\times 0.1$	5 (J)		
Silver	silver				$\times 0.01$	10 (K)		
None	none					20 (M)		

6 band		3.21k Ω 1% 50ppm/K
5 band		521 Ω 1%
4 band		82k Ω 5%
3 band		330 Ω 20%

gap between band 3 and 4 indicates reading direction

Figure 2.3.6 : Colour code

2.3.7 DIODE

In electronics, a diode is a two-terminal electronic component that conducts primarily in one direction (asymmetric conductance); it has low (ideally zero) resistance to the flow of current in one direction, and high (ideally infinite) resistance in the other. A semiconductor diode, the most common type today, is a crystalline piece of semiconductor material with a p-n junction connected to two electrical terminals. A vacuum tube diode has two electrodes, a plate (anode) and a heated cathode. Semiconductor diodes were the first semiconductor electronic devices. The discovery of crystals' rectifying abilities was made by German physicist Ferdinand Braun in 1874. The first semiconductor diodes, called cat's whisker diodes, developed around 1906, were made of mineral crystals such as galena. Today, most diodes are made of silicon, but other semiconductors such as selenium or germanium are sometimes used.



Figure 2.3.7: Diode

2.3.8 LED (Light Emitting Diode)

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Recent developments in LEDs permit them to be used in environmental and task lighting. LEDs have many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are now used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes and lighted wallpaper.

LEDs have allowed new text, video displays, and sensors to be developed, while their high switching rates are also used in advanced communications technology.

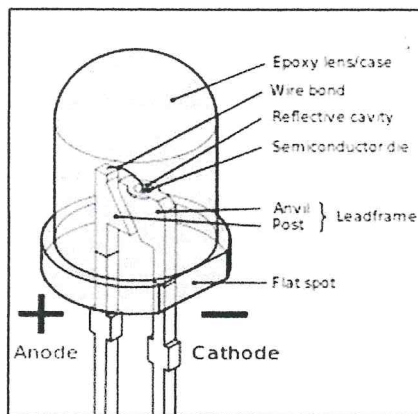


Figure 2.3.8: Led

2.3.9 TRANSISTOR

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

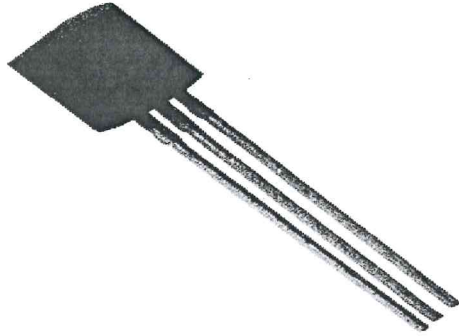


Figure 2.3.9: Transistor 2N2222

2.4.0 Software Proteus 8

Proteus 8.4 was largely based on two new features and Windows 10 support. Curved Routing: Placing a route with curved corners can be helpful with signal integrity and net tuning or simply for aesthetic reasons. In Proteus, you can switch to curved route placement by holding down the CTRL key during route placement. Releasing the CTRL key will immediately switch back to linear routing giving you the control to curve only specific parts of the route. The process of placing the route is exactly the same as before, except we hold CTRL down on the keyboard for curves.

The latest 3D viewer now supports the delay of True Type Fonts.

Monitors with a high DPI setting are also now supported (part of the Windows 10 support)

Over the last few years the STEP file format has become the de-facto standard for data exchange and we have therefore implemented full support in the Version 8.3 release.

We have also taken a close look at our customer feedback logs and implemented several of the most requested features.

Meanwhile, on the Proteus VSM front we have been hard at work on MSP430® development (variants listed over leaf), the addition of some new PIC®18 variants and also the ILI9341 TFT display. We've also included some new Arduino™ Shields and updated the VSM Studio IDE to support Arduino 1.6.3

2.4.1 16x2 Liquid Crystal Display (LCD)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable, have no limitation of displaying special & even custom characters, animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

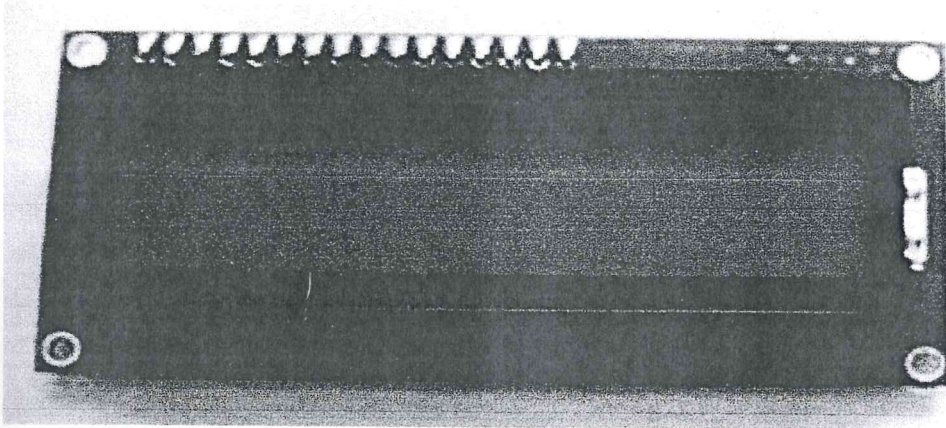


Figure 2.4.1: LCD

2.4.2 Switch

A switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch may be operated directly by a human operator to control a circuit (for example, a light switch or a keyboard button), may be operated by a moving object such as a door-operated switch, or may be operated by some sensing element for pressure, temperature or flow. A relay is a switch that is operated by electricity. Switches are made to handle a wide range of voltages and currents; very large switches may be used to isolate high-voltage circuits in electrical substations

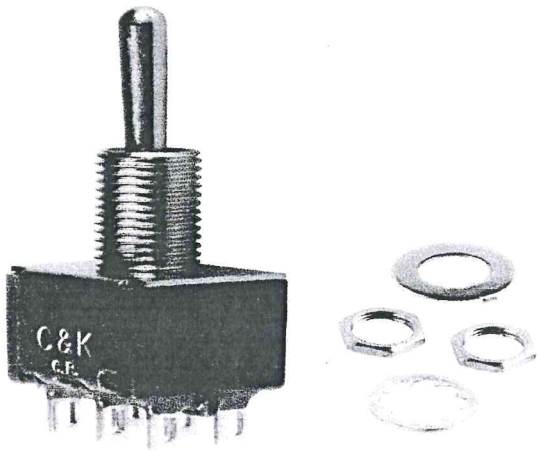


Figure 2.4.2: switch

2.4.3 Jumper

A 'jumper' might be where temporarily connect two conductors which aren't usually connected, for the purposes of working around a fault.

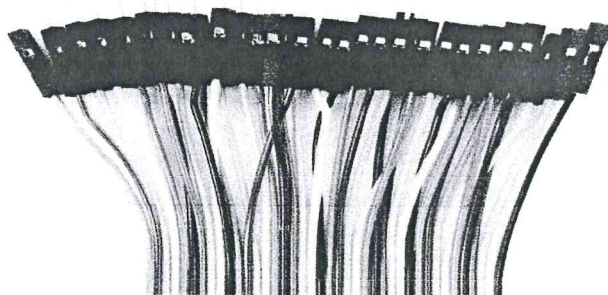


Figure 2.4.3 : Jumper

CHAPTER 3

METODOLOGY

3.1 INTRODUCTION

Automated Plant Watering System is receives inputs about the soil's moisture level from the moisture sensors. It determines whether the soil moisture is lower than the threshold value set in the program. If it is no, it will go back to the initial of the program meanwhile if it is yes, the Arduino microcontroller will be initiated. Next, The relay will be switched on will move to pump into pot of the plants.

Start

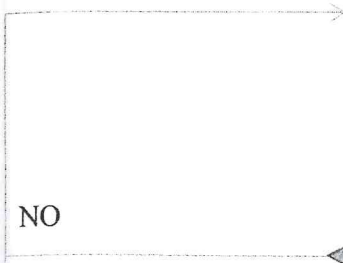


Sense the moisture of the soil



If the soil moisture is low?

NO



YES



Initiates the Arduino system



The relay will be switched on



Pump on



End