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GSM BASED SMART IRRIGATION SYSTEM

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ABSTRACT:

The economy being highly based on agriculture demands innovative and reliable methods of irrigation. The shortcomings of manual methods of irrigation can be rectified using automated process. This paper presents the idea of automatic irrigation method and the following research sustains this idea. The task of automatic irrigation is done through assistance of soil moisture sensors. In the project, apart from IOT for soil moisture sensor. Humidity and temperature sensors are also used to make the process more advance. The proposed design also has the feature of GSM which makes this system wireless.

The electricity required by components is provided through solar panels hence this liberates us from interrupted power supply due to load shedding. The water content is constantly judged and whenever moisture level of soil gets low, the system sends a signal to motors asking them to turn on. The motors automatically stop after soil reaches its maximum upper threshold value which is decided by user. Every time the motor starts or stops automatically, the user will get a SMS about the status of operation and it displays on Think speak through wifi .

The major advantages of the project include avoidance from water wastage, growth of plants to their maximum potential, less chances of error due to less labor and uninterrupted supply of water due to solar energy.

I. INTRODUCTION

The main aim of this project was to provide water to the plants or gardening automatically using microcontroller. We can automatically watering the plants when we are going on vacation or don't we have to bother my neighbors', Sometimes the neighbors' do too much of watering and the plants end up dying anyway. There are timer based devices available in India which waters the soil on set interval. They do not sense the soil moisture and the ambient temperature to know if the soil actually needs watering or not. Assimilation is that the artificial application of water to the land or soil It is used to assist in the growing of agricultural crops [, maintenance of landscapes, and re vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. When a zone comes on, the water flows through the lateral lines and ultimately finally ends up at the irrigation electrode (drip) or mechanical device heads. Several sprinklers have pipe thread inlets on the lowest of them that permits a fitting and also the pipe to be connected to them. The sprinklers are usually used in the top of the head flush with the ground surface. As the method of dripping will reduce huge water losses it became a popular method by reducing the labor cost and increasing the yields. When the components are activated, all the components will read and gives the output signal to the controller, and the information will be displayed to the user (farmer). The sensor readings are analog in nature so the ADC pin in the

controller will convert the analog signals into digital format. Then the controller will access information and when the motors are turned On/Off it will be displayed on the LCD Panel, and serial monitor windows. There are many systems are available to water savings in various crops, from basic ones to more technologically advanced ones. For instance, in one system plant watering status was monitored and irrigation scheduled based on temperature presents in soil content of the plant.

II. LITERATURE REVIEW

Automation of irrigation system refers to the operation of the system with no or minimum manual interventions. Irrigation automation is justified where a large irrigated area is divided into Small segments called irrigation blocks and segments are irrigated in sequence to match the discharge available from the water source. In this regard, the works that we have surveyed describe the different types of automatic irrigation techniques, how they actually have served the purpose and the primary difference between our project and those literatures that we have contemplated. On this detail, the existing works "Applied engineering in agriculture, "Data acquisition system and irrigation controller" and "Automation in Micro-Irrigation" , employs subsurface drip irrigation using two drip tapes and are time based systems in which irrigation time clock controllers, or timers, are an integral part of an automated irrigation system. A timer is an essential tool to apply water in the necessary quantity at the right time. Timers can lead to under or over-irrigation if they are not correctly programmed or the water quantity is calculated incorrectly. Time of operation is calculated according to volume of water required and the average flow rate of water a timer starts and stops the irrigation process. It automatically schedules irrigation at random events by using timers where in the automation for the system and displays were not implemented.

The papers titled " Feedback Control for Surface Irrigation Management " and "Control and Automation in Citrus Micro-irrigation Systems" , employs open loop systems in which the operator makes the decision on the amount of water to be applied and the timing of the irrigation event. The controller is programmed correspondingly and the water is applied according to the desired schedule. Open loop control systems use either the irrigation duration or a specified applied volume for control purposes. Open loop controllers normally come with a clock that is used to start irrigation. Termination of the irrigation can be based on a pre-set time or may be based on a specified volume of water passing through a flow meter. In an open loop system, the operator makes the decision on the amount of water that will be applied and when the irrigation event will occur. This information is programmed into the controller and the water is applied according to the desired schedule. Open loop control systems use either the irrigation duration or a specified applied volume for control purposes. The drawback of open loop systems is their inability to respond automatically to changing conditions in the environment.

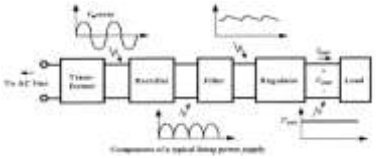
III. HARDWARE REQUIREMENTS

- POWER SUPPLY
- ARDUINO UNO
- MOISTURE SENSOR
- HUMIDITY SENSOR
- GSM

- ESP8266
- LCD
- SOLAR PANEL
- RELAY
- WATER PUMP

POWERSUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

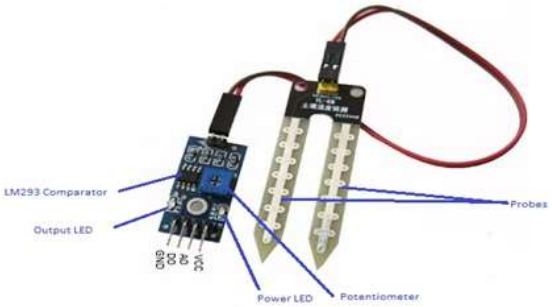


ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328 (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, 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. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

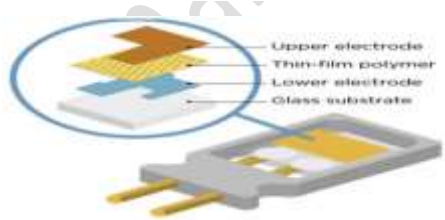
MOISTURE SENSOR

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings. Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Soil moisture content may be determined via its effect on dielectric constant by measuring the capacitance between two electrodes implanted in the soil. Where soil moisture is predominantly in the form of free water (e.g., in sandy soils), the dielectric constant is directly proportional to the moisture content. The probe is normally given a frequency excitation to permit measurement of the dielectric constant. The readout from the probe is not linear with water content and is influenced by soil type and soil temperature.



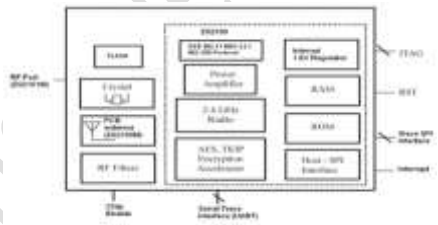
HUMIDITY SENSOR

Humidity is a term for the amount of water vapour in the air, and can refer to any one of several measurements of humidity. Formally, humid air is not "moist air" but a mixture of water vapour and other constituents of air, and humidity is defined in terms of the water content of this mixture, called the Absolute humidity. In everyday usage, it commonly refers to relative humidity, expressed as a percent in weather forecasts and on household humidistat's; it is so called because it measures the current absolute humidity relative to the maximum. Specific humidity is a ratio of the water vapour content of the mixture to the total air content (on a mass basis). The water vapour content of the mixture can be measured either as mass per volume or as a partial pressure, depending on the usage.



ESP8266:

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. The ESP8266 modules are low-power 802.11b implementations. All RF components, the baseband and the entirety of the 802.11 MAC reside on-module, creating a simple and cost-effective means to add Wi-Fi connectivity for embedded devices. The module(s) implement a high-level API, simplifying design implementation and allowing the ZG2100M or ZG2101M to be integrated with 8- and 16-bit host microcontrollers.



LCD DISPLAY:

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

SOLAR PANEL:

Solar panel Solar panels, also called photovoltaic or PV modules as it directly converts sunlight into electricity. It reduces the amount of electricity coming from fossil fuels by supplying your operations with clean, renewable energy from the sun. By providing more energy and lasting longer than other brands, solar panels are the best choice for cutting your carbon footprint down to size. Financial benefits

GSM:

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.There are various cell sizes in a GSM system such as macro, micro, pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

RELAY:

Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.

WATER PUMP

A submersible pump (or sub pump, electric submersible pump (ESP)) is a gadget which has a hermetically fixed engine close-coupled to the pump body. The entire get together is submerged in the

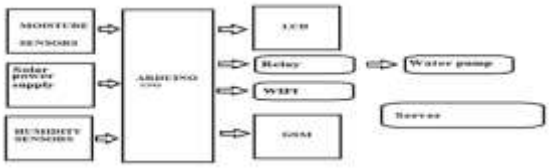
liquid to be pumped. The fundamental point of interest of this kind of pump is that it forestalls pump cavitations', an issue connected with a high rise contrast amongst pump and the liquid surface. Submersibles are more proficient than plane pumps. In spite of the fact that their constructional and operational components experienced a consistent advancement throughout the years, their essential operational guideline continued as before.

SOFTWARE REQUIREMENTS:

- ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. First, the Arduino compiler/IDE accepts C and C++ as-is. In fact many of the libraries are written in C++. Much of the underlying system is not object oriented, but it could be. Thus, "The arduino language" is C++ or C.

PROJECT DESCRIPTION:



WORKING:

In the project, apart from IOT for soil moisture sensor. Humidity and temperature sensors are also used to make the process more advance. The proposed design also has the feature of GSM which makes this system wireless. The electricity required by components is provided through solar panels hence this liberates us from interrupted power supply due to load shedding. The water content is constantly judged and whenever moisture level of soil gets low, the system sends a signal to motors asking them to turn on. The motors automatically stop after soil reaches its maximum upper threshold value which is decided by user. Every time the motor starts or stops automatically, the user will get a SMS about the status of operation and it displays on Thinkspeek through wifi . The major advantages of the project include avoidance from water wastage, growth of plants to their maximum potential, less chances of error due to less labor and uninterrupted supply of water due to solar energy.

IV. CONCLUSION:

Thus the "Automated Irrigation system based on soil moisture using Arduino and IoT" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Thus, the Micro Controller Based Automatic Plant Watering System has been designed and tested successfully . The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is goes to be below the desired and limited level, the moisture sensor sends the signal to the micro controller board which triggers the Water Pump to turn ON and supply the water to respective plant using the Rotating Platform/Sprinkler. When the desired moisture level is reached, the system halts on its own and the water Pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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