DETECTION OF MOISTURE LEVEL FOR SPRINKLER IRRIGATION SYSTEM BY USING ARDUINO

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ABSTRACT:

Irrigation is the most important culture practice in which a controlled amount of water is supplied to plants at regular interval. Healthy plants can transpire a lot of water, resulting in an increase in the humidity of greenhouse air. This paper presents a detection of moisture level for Sprinkler Irrigation System, it proposed by using Arduino board. Plants need water continuously during their life time and water requirement is change according to the season or according to soil type. By using Microcontroller, it is coded in such way to sense the moisture level and supply the required water to the plant growth. It is designed for high reliability, fast and precise closed loop control of watering system. By this process it is easier to form a healthy greenhouse.

Keyword: Moisture level, sprinkler water, Arduino board.

I. INTRODUCTION

Water is one of the most important inputs for the production of crops. 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. The sprinklers have pipe thread inlets on the bottom of them which is attached to them. The sprinklers are present in the top of the head flush with the ground surface. The head will pop up out of the ground and water the area until the valve closes and shuts off that zone when it pressurized. Sprinkler head retract to the ground in low pressure of water. Emitters are buried a few inches to reduce evaporation losses. Healthy plants can transpire a lot of water, resulting in an increase in the humidity of the atmosphere. A high humidity can increase the incidence of disease and reduce plant transpiration. In the warmer summer months increases the greenhouse air humidity so cooling structure is used. Greenhouses located in dry, dessert environments benefit greatly from evaporative cooling systems because large amounts of water can be evaporated into the incoming air, resulting in significant temperature drops. In This Irrigation System, Soil Moisture Sensor finds the moisture level in the soil and when moisture level is low then Arduino board switches On a water pump to supply water to the plant. Water pump gets automatically off when system finds enough moisture in the soil. This system is mainly used in Farms, gardens, home plants. This system is completely automated and there is no need for human intervention. This technology in the areas of irrigation has proven to be of great help as the produces efficiency and accuracy.

II. DESIGN OF SPRINKLER WATERING SYSTEM

The automatic watering system that are by using sprinkler system, nozzles. In this design uses watering sprinkler system because it can water the plants located in the field. There are major components in this project: Moisture Sensor, Water pump and Arduino Uno. It is coded using Arduino (IDE Software). The Moisture sensor used to sense the level of moisture in the soil and water pump supplies water to the plants.

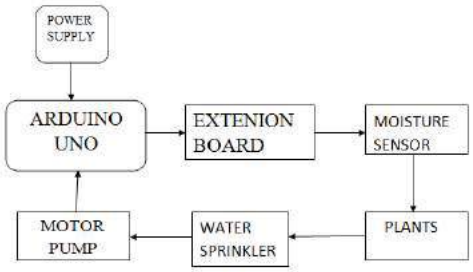


Fig:1 Block diagram of Sprinkler Watering System

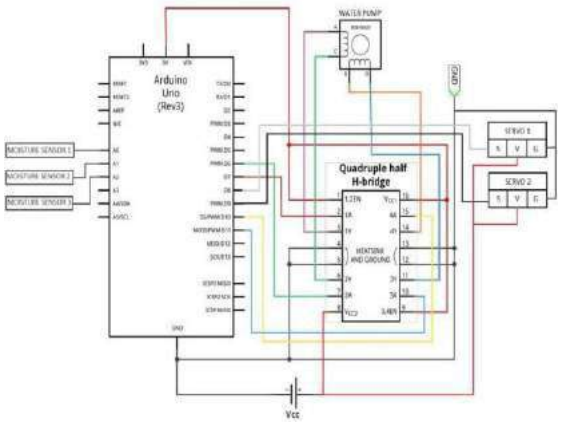


Fig.2 Pin Configuration

We use Arduino Uno to controls the motor. by the schematic to connect the Arduino to the motor driver, and the driver to the water pump. The motor can be driven by a 9 Volt battery, and current measurements show us that battery life. The

Arduino Board is programmed using the Arduino IDE software. If watering is required, the moisture sensor measures the level of moisture in the soil and sends the signal to the board. The motor/water pump supplies water to the plants until the desired moisture level is reached.

III. DEVICES

The following device can be used for the detection of moisture level for sprinkler water system.

A. ARDUINO UNO

FEATURE	SPECIFICATION
MICROCONTROLLER	ATmega 328
OPERATING VOLTAGE	5v
DIGITAL I/O PIN	14
ANALOG INPUT PIN	6
FLASH MEMORY	32KB
SRAM	2KB
EEPROM	1KB
CLOCK SPEED	16MHz

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), 6analog 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 programmed as a USB-to-serial converter.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center - positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The ATmega328 on the Arduino Uno comes preboned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). We can also bypass the boot loader and programs the microcontroller through the ICSPheader; see these instructions for details.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .int file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

A. MOISTURE SENSOR

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. Technologies commonly used in soil moisture sensors include: Frequency domain sensor such as a capacitance sensor. Neutron moisture gauges, utilize the moderator properties of water for neutrons. Electrical resistance of the soil. In this particular project, we will use the moisture sensors which can be inserted in the soil, in order to measure the moisture content of the soil. Moisture Sensor Soil electrical conductivity is simply measured using two metal conductors spaced apart in the soil except that dissolved salts greatly alter the water conductivity and can confound the measurements. An inexpensive fix is to embed conductors in a porous gypsum block which releases calcium and sulphate ions to swamp the soil background level of ions. The water absorbed by the block is correlated with soil water potential over the range -60 to -600 kPa providing a tertiary indicator for use in medium to heavy soils. Non-dissolving granular matrix sensors are now available with a more exacting specification for the range 0 to -200 kPa and use internal calibration methods to offset variations due to solutes and temperature. Methods for exploiting soil dielectric properties actually measure proxy variables that more or less include a component due to the soil electrical conductivity and are thus inherently sensitive to variations in soil salinity and temperature as well as water. Measurements are also affected by soil bulk density and the proportion of bound and free water determined by the soil type. Research-grade instruments typically have laboratory measured accuracy worse than +/- 4% when relying on factory settings or as good as +/- 1% when calibrated for the specific soil. Sensors based on the TDR method seem to require least calibration but may be unsuitable for soils with very high salinity or clay content. There are no comparable laboratory specifications for granular matrix sensors, possibly because they are technically more difficult to calibrate, their response times are relatively

slow and the output is hysteretic for wetting and drying curves. Soil dielectric measurement is the method of choice for most research studies where expertise is available for calibration, installation and interpretation, but scope for cost reduction through sensor multiplexing is limited due to the possibility of stray capacitances. A lower manufacturing cost is possible through development of application specific integrated circuits (ASICS), though this requires a high level of investment. Thus, by using the moisture sensors, the over-riding factor will be reliable, cost-effective sensors and electronic systems for accessing and interpreting the data.

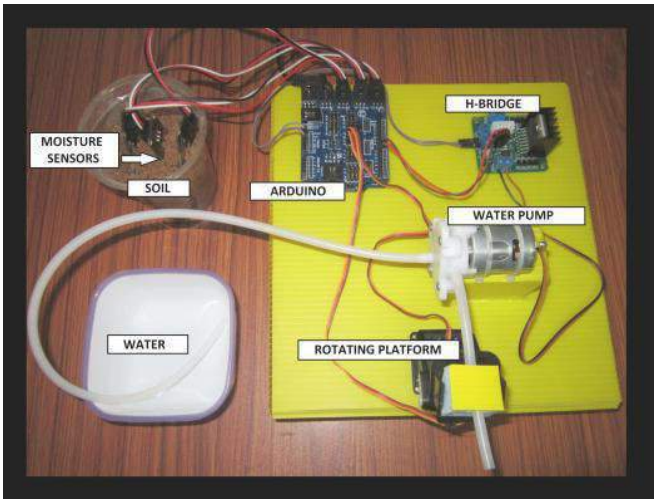
B. WATER PUMP

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 H-Bridge. The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, washing, or sewage treatment, or for evacuating water from an undesirable location. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption. All other processes depend or benefit either from water descending from a higher elevation or some pressurized plumbing system. The partial vacuum created, allows the earth's air pressure to force water up the suction hose (straw), and into the suction (inlet) side of the pump to replace the displaced water. When the water hits the rotating impeller, energy of the impeller is transferred to the water, forcing 68the water out.

C. STEPPER MOTOR

A stepper motor or step motor or stepping motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed. Stepper motors effectively have multiple "toothed" electromagnets arranged around a central gear-shaped piece of iron. The electromagnets are energized by an external driver circuit or a micro controller. To make the motor shaft turn, first, one electromagnet is given power, which magnetically attracts the gear's teeth. When the gear's teeth are aligned to the first electromagnet, they are slightly offset from the next electromagnet. This means that when the next electromagnet is turned on and the first is turned off, the gear rotates slightly to align with the next one. From there the process is repeated. Each of those rotations is called a "step", with an integer number of steps making a full rotation. In that way, the motor can be turned by a precise angle.

IV. PROTOTYPE FOR SPRINKLER IRRIGATION SYSTEM



The Moisture Sensor provides an analogue output, which can easily be interfaced with Arduino. The program in the Arduino reads the moisture value from the sensor and supply the required water to the plant growth. When desired moisture level is reached, the water pump is automatically turn OFF. It is designed for high reliability fast and precise closed loop control of watering system. By this process it is easier to form a healthy greenhouse.

V. CONCLUSION

Detection of moisture level for sprinkler water system has been designed and tested. 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. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the Arduino 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.

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