Arduino Based Automatic Watering System

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Abstract:
For plants to develop, there must be a sufficient amount of water. The plants require additional water when the rainfall is insufficient. We are aware that when individuals leave on vacation or frequently forget to water plants, they do not pour water on the plants in their gardens. Consequently, there is a possibility of the plants being harmed. I am working on a project called "Arduino Based Automatic Plant Watering System." India is an agriculturally focused nation, and the rate at which its water supplies are running out poses a serious challenge, necessitating the development of innovative and effective irrigation techniques. I used sensors in this project to determine the soil's humidity level (in an agricultural field) and to deliver water to the field that needs it. The project's microcontroller-based design regulates the water supply and the irrigation field. Each field contains sensors, but they won't work until there is water on the surface. Sensors detect the need as soon as the field becomes dry till they are reactivated. The microcontroller will prioritise the first signal it receives and irrigate the fields as necessary if there are many signals indicating the need for water.

Keywords: Arduino, Irrigation, Soil Moisture Sensor, Agriculture Field, Water, servo motor

I. INTRODUCTION

Agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. It also has a major impact on economy of the country. A major quantity of water is used for irrigation system and therefore 85% of available fresh water resources are used for yielding agricultural crops. This resource of water will decrease day by day and consumption of water will dominate and increase more than 85% in upcoming half century. This is due to the high growth in population due to this tremendous growth in population there is huge demand for food. Agriculture is the main source for food production. Using science and technology we need to implement a method by which there can be limited consumption of water Till date many methods have come into existence where water can be limitedly consumed. A method where monitoring water status and based on status of water whether it is high or low irrigation is scheduled which is based on canopy temperature of plant, which was captured with thermal imaging. Another method is making use of information on volumetric water content of soil, using dielectric moisture sensors to control actuators and save water, instead of the scheduled irrigation at a particular time of day and supplying water only for a specific duration. This above method just opens the valve and supply water to bedding plants when volumetric content of soil will drop below threshold value. In this paper a use of the second method where sensors are placed and based on that water is supplied to the field and intimated to the farmer using software application. Wireless sensor networks is also called as wireless sensors and actor network, are distributed spatially autonomous sensors to monitor physical or environmental conditions as temperature, pressure sound, moisture etc. and it co-operatively passes these data via network to the main location. WSN is built of few to several thousand nodes, where each node is connected to sensors each sensor network node has typically several parts: a radio transceiver with an internal/external antenna, a microcontroller, an electronic circuit for interfacing with sensors and an energy source such as battery.

II. BLOCK DIAGRAM &WORKING:

There are two functional components in this project. They are the moisture sensors and the motor/water pump. Thus the Arduino Board is programmed using the Arduino IDE software. The function of the moisture sensor is to sense the level of moisture in the soil. The motor/water pump supplies water to the plants. This project uses Arduino Uno to controls the motor. Follow 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. The moisture sensor measures the level of moisture in the soil and sends the signal to the Arduino if watering is required. The motor/water pump supplies water to the plants until the desired moisture level is reached.

Figure.1. Automatic Plant Watering Block Diagram

III.SERVO MOTOR

A servo motor controller is a circuit that is used to control the position of a servo motor. It is also called as a servo motor driver. A servo motor controller consists of a controller, the servo motor and the power supply unit. For understanding servo motor control let us consider an example of servomotor that we have given a signal to rotate by an angle of 45° and then stop and wait for further instruction. The shaft of the DC motor is coupled with another shaft called output shaft, with help of gear assembly. This gear assembly is used to step down the high rpm of the motor's shaft to low rpm at output shaft of the servo system.

The voltage adjusting knob of a potentiometer is so arranged with the output shaft by means of another gear assembly, that during rotation of the shaft, the knob also rotates and creates an varying electrical potential according to the principle of potentiometer This signal i.e. electrical potential is increased with angular movement of potentiometer knob along with the system shaft from 0° to 45°. This electrical potential or voltage is taken to the error detector feedback amplifier along with the input reference commends i.e. input signal voltage. As the angle of rotation of the shaft increases from 0° to 45° the voltage from potentiometer increases. At 45° this voltage reaches to a value which is equal to the given input command voltage to the system. As at this position of the shaft, there is no difference between the signal voltage coming from the potentiometer and reference input voltage (command signal) to the system, the output voltage of the amplifier becomes zero.

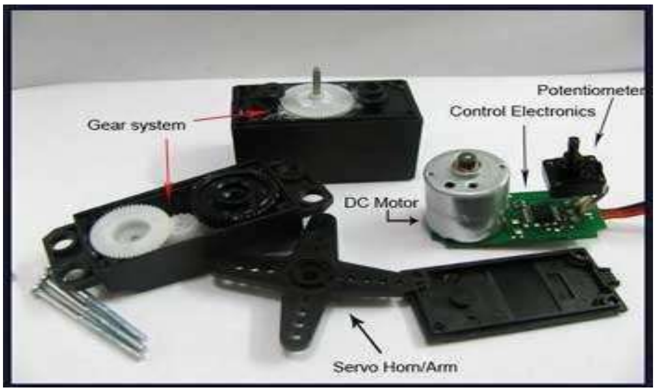

Figure.2. Servo motor

IV. 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 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.

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 Ground 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.

Figure.3. Arduino Uno

Table.1. Arduino Specifications

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

V. MOISTURE SENSOR:

Soil moisture sensors measure the volumetric water content in soil .Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

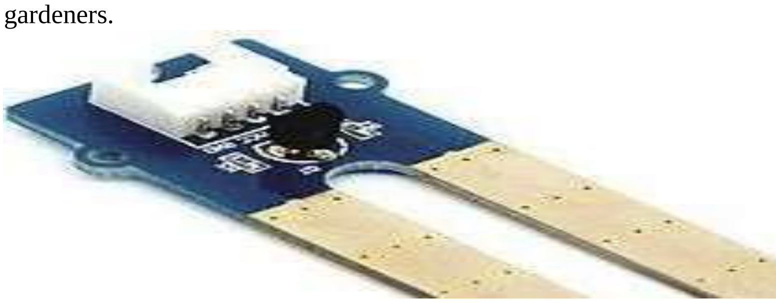

Figure.3. Moisture Sensor

ADVANTAGES:

- Saves water
- Improves growth
- Discourages weeds
- Saves time
- Helps control fungal diseases
- Adaptable
- Eliminates the manual operation of opening or closing valves

• Adaption of the advanced irrigation systems and the new technologies, especially the new irrigation systems that are complex and difficult to operate manually.
• The system will be operated in night also which results in minimization of the water loss due to evaporation.
• Irrigation process starts and stops exactly when required, thus optimizing energy requirements

VI. RESULTS

Irrigation becomes easy, accurate and practical with the same soil sample impossible. Because of the idea above shared and can be implemented in agricultural difficulties of accurately measuring dry soil and water fields in future to promote agriculture to next level. The Volumes, volumetric water contents are not usually output from moisture sensor and level system plays major determined directly. Role in producing the output.

VII. CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their Crops/plants. It also covers those farmers who are wasteful of water during irrigation. The project can be extended to greenhouses where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agricultural lands with severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil.

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