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Design and Fabrication of Automatic Plant Watering System

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ABSTRACT

The Main aim of this project is watering plants at home with the help of this Automatic Plant Watering System, which automatically switches the water pump ON or OFF depending on the moisture content of the soil, which is continuously sensed by the soil moisture sensor.

Automatic plant watering systems have several benefits, including water conservation, time-saving, and promoting healthier plants. They can be simple drip systems or more complex setups that utilize sensors and programmable controllers, depending on the needs of the garden or greenhouse.These systems are becoming increasingly popular due to their convenience and efficiency, particularly for those who have busy schedules or frequently travel. By using an automatic plant watering system, plants can receive consistent and appropriate amounts of water, resulting in healthier growth and better yields.

Keywords-Arduino,Soil moisture sensor,Waterpump,Moisture content of the soil.

INTRODUCTION

We all know that plants are very beneficial to all human Beings in many aspects. Plants helps in keeping the Environment healthy by cleaning air naturally and producing Oxygen. Many people love to have plants in their backyard. But due to civilization and insufficiency of place many People used to grow plants in a mold or dirt, pot, and placed On the windowsill. During day to day activities many people often forget to Water their plants and thus it becomes challenging for them to Keep their plants healthy and alive and Now days farmers are facing major problem in watering their crops,because they do not have any proper idea about availability of the power.Even it is available ,they need to pump water and wait until the field is properly watered,It is difficult to farmer.But,there is a solution-"An Automatic plant watering System" not only helps farmers but also other for Watering their gardens as well .watering of plants in garden is difficult because lack of time .

An automatic plant watering system is a device that is designed to automatically water plants in a garden or indoor setting without the need for human intervention. These systems can be designed to operate using a range of different technologies, including microcontrollers, sensors, pumps, and valves.The basic concept of an automatic plant watering system involves setting up a water source and a delivery mechanism that can deliver water to plants as needed.This can be achived using a range of different technology.one the popular approach to designing an automatic plant watering system using soil moisture,arduino.

To build an automatic plant watering system using Arduino, you will need an Arduino board, a water pump, a moisture sensor, and some tubing. The moisture sensor is used to detect the moisture level of the soil, and the Arduino board uses this information to control the water pump.The basic principle of the system involves the Arduino board checking the moisture sensor's output to determine whether the soil is dry. If the soil is too dry, the Arduino sends a signal to the water pump to start pumping water through the tubing and into the soil. Once the moisture sensor detects that the soil is sufficiently moist, the Arduino sends a signal to the water pump to turn off.

PAST STUDIES

There have been several studies conducted on the topic of automatic plant watering systems using blynk. Here are some examples:

1."Design and Development of Automatic Plant Watering System using Blynk" by K. Ramesh and S. Lakshmana Kumar. This study focused on the design and implementation of an automatic plant watering system using a blynk-based sensor. The system was tested on different types of plants, and the results showed that it was effective in maintaining optimal soil moisture levels.

2."A Wireless Sensor Network Based Automatic Plant Watering System Using Blynk" by R. K. Jeyaprabha and M. Jaya Bharathi. This study proposed a wireless sensor network-based automatic plant watering system that used a blynk sensor to monitor soil moisture levels. The system was able to detect soil moisture levels and water the plants automatically when the moisture level fell below a certain threshold

3."Water planting System for Sustainable Agriculture Using Blynk Sensor" by S. Sathya and S. Lakshmi. This study proposed a smart irrigation system that used a blynk sensor to monitor soil moisture levels, temperature, and humidity. The system was able to adjust the amount of water provided to the plants based on the environmental conditions, thus reducing water wastage and improving crop yield.

Overall, these studies demonstrate the potential of blynk-based automatic plant watering systems in improving the efficiency and effectiveness of plant watering, which can lead to better plant growth and sustainability.

THE EXISTI-NG SYSTEM

The automatic plant watering system using blynk is an existing system that uses a sensor to detect the soil moisture levels and triggers an Water planting system to water the plants when the soil moisture level falls below a certain threshold. The system typically consists of the following components:

1.Bylink sensor: The sensor is placed in the soil to detect the moisture level of the soil.

2.Microcontroller: The microcontroller is responsible for reading the moisture level data from the blynk sensor and controlling the irrigation system based on the data.

3.Water pump: The water pump is used to deliver water to the plants when the moisture level falls below the threshold.

4.Solenoid valve: The solenoid valve controls the flow of water from the water source to the Water planting system.

5.Power supply: The system requires a power supply to operate, which can be a battery or a power adapter.

The existing system has several advantages over manual watering methods, including improved plant growth, reduced water usage, and reduced labor costs. The system is also easy to install and operate, making it an attractive option for both small-scale farmers and home gardeners.

However, there are some limitations to the existing system. The accuracy of the blynk sensor may vary depending on the type of soil and environmental factors such as temperature and humidity. The system may also require periodic calibration to ensure accurate readings.

Overall, the existing automatic plant watering system using blynk is a promising technology that can help improve the efficiency and sustainability of agriculture and gardening practices. With continued development and improvement, the system has the potential to revolutionize the way we water our plants.

METHODOLOGY

The automatic plant watering system was designed to continuously sense the moisture and temperature level of the soil. The system responds appropriately by watering the soil with the exact amount of water required and then shuts down the water supply when the required amount of soil moisture is achieved. The reference amount of soil moisture is already fed to the microcontroller beforehand. This reference soil moisture content was made to be adjustable for the three most common soil types (sandy. Loamy and clayey soils).The moisture sensors and temperature sensors were designed using probes made from corrosion resistant material which can be stuck into soil sample.Voltage levels corresponding to the wet and dry status of the soil sample were computed by measuring the resistance between the moisture probes and matching them to output voltage of a comparator circuit.

COMPONENTS USED FOR IMPLEMENTATION OF SYSTEM

The system requirements of hardware and software components required in the design as follow:

1. Arduino Uno Board
2. Soil Moisture sensor
3. Water pump
4. Relay Module

Arduino Uno Board: Arduino is an open source electronics electronic platform based on easy to use hardware and software .Arduino boards are abile to read inputs of sensor,a finger on a button and turns into an output activating on a motor ,turning on an LED ,publishing something online.now a daysarduino is the brain of thousands of projects.aworldwise community of markers has gathered around this open source platform, their contributions have add to up an incredible amount of accessible knowledge that can be great help to novice and experts.

FIGURE 1: Arduino Uno Board

Soil Moisture sensor:

The Soil moisture is the primary part of this project.Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon.Soil moisture sensore do not measure water in soil directly. Instead,they measure changes in some other soil property that is related to water content in a predictable way.

FIGURE 2:Soil Moisture sensor

Water pump

The water pump is utilized to give water to work.As required, it can be started ON/OFF by the transmitting signals. A 12 voltage dc motor is used with the pump. By activating the motor driver circuit by the read value of the Arduino board with the set reference value, the pump will automatically turn on and turn off.

FIGURE 3:Water pump

Relay Module:

Relay board module is used for controlling higher current loads from microcontroller development board, PC parallel or arduinouno. This board has one onboard relay which can switch upto 7 amps. Relays terminals (C,NC,NO) are accessible through screw terminals which makes wiring up the board very easy. The relay is safely driven by transistor BC547 hence input device, such as arduino, is protected from realy circuit. There is free wheeling diode which will further protect microcontroller from relay kick back.

FIGURE 4: Relay Module

BLOCK DIAGRAM

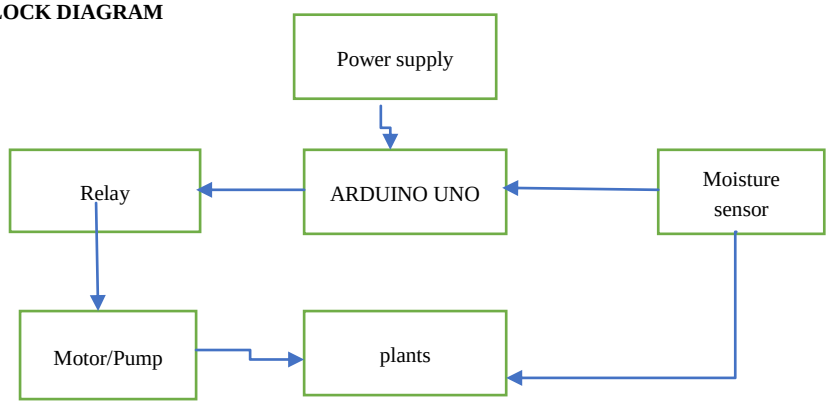

Figure: Block diagram of automatic plant Watering system

There are two functional components in this system. 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.

COST ESTIMATION FOR AUTOMATIC PLANT WATERING SYSTEM

Cost of Arduino Board with cable : RS.900
Cost of Relay Module and Node MCU : RS.600
Cost of Soil moisture sensor and Bread Board : RS.500
LED Screen,water pump and other accessories : RS.900

BLYNK APP

We can install Blynk app setup.Blynk App is an IOT platform for iOS or Android smartphones that is used to control the Arduino .This application is used to create a graphical interface or human machine interface by compiling and providing the appropriate address on the available widgets.

RESULT AND DISCUSSION

1.Water savings: The amount of water savings will depend on the amount of water used for manual watering and the efficiency of the automatic system. For example, suppose you have a garden with ten plants that require 4 liters of water per day. Manual watering would require 38 liters of water per day. With the automatic system, if the blynk sensor detects that the soil moisture level is adequate and only waters the plants when necessary, it may use only for 19 liters of water per day, resulting in a daily water savings of 19 liters.
2.Labor savings: The amount of labor savings will depend on the size of the garden or farm and the frequency of watering. For example, suppose it takes one hour per day to water a garden manually, and the automatic system eliminates the need for manual watering. In that case, the system can save one hour of labor per day.
3.Fertilizer savings: The amount of fertilizer savings will depend on the type of plants, the soil quality, and the frequency of watering. By ensuring that the plants receive the optimal amount of water, the system can reduce the need for fertilizers. Suppose you use 1000 Rupees of fertilizer per week for manual watering. In that case, the automatic system may reduce the need for fertilizers by 25% or 250 Rupeesper week, resulting in weekly fertilizer savings of 250 Rupees.
4.Improved plant growth: The value of improved plant growth can vary depending on the type of plants, the yield of crops, and the property value of the garden or farm. Improved plant growth can lead to higher crop yields, which can increase revenue for farmers, or increased property value for homeowners.
Overall, the savings of an automatic plant watering system by using blynk will depend on several factors, including water usage, labor costs, fertilizer usage, and plant growth. By calculating these factors, you can estimate the potential savings of the system and determine if it is a cost-effective investment for your garden or farm.

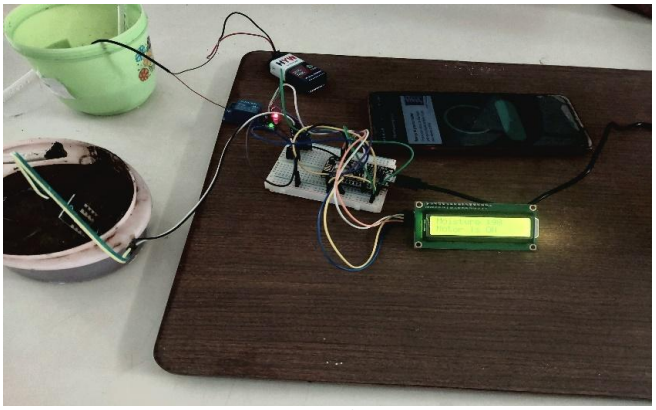

Fig.5: Circuit diagram of proposed system.

Table 1:Performance test on different soils.

S.NO	Type of soil	Moisture content(%)	Motor ON/OFF
1	Wet soil	98	OFF
2	Partially wet soil	60	ON
3	Dry soil	35	ON

CONCLUSIONAND FUTURE SCOPE

In conclusion, the automatic plant watering system using blynk has proven to be an effective solution for maintaining optimal soil moisture levels and improving plant growth. Blynk sensors are capable of accurately measuring soil moisture levels and triggering the irrigation system to water the plants only when necessary, reducing water waste and ensuring that the plants receive the right amount of water they need.

There is a lot of future scope for the development and improvement of automatic plant watering systems using bylink. One potential area for further research is to explore the use of machine learning and artificial intelligence to enhance the accuracy of blynk sensors in measuring soil moisture levels and predicting the watering needs of different plant species.

Another area for future improvement is to integrate the system with smart home automation technologies to allow for remote monitoring and control of the system. This would allow users to easily monitor their plants' watering needs from anywhere and adjust the watering schedule accordingly.

In addition, the development of low-cost and energy-efficient blynk sensors can make the technology more accessible to small-scale farmers and home gardeners, who can benefit greatly from the improved plant growth and reduced water usage that the system provides.

Overall, the automatic plant watering system using blynk has great potential for revolutionizing agriculture and gardening practices by making the process of watering plants more efficient, cost-effective, and sustainable.

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