

Arduino-Powered Smart Irrigation System

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ABSTRACT

The automation process is integrated to control devices to operate autonomously and interact with smart technologies and devices that perform many tasks without human hands. Thus, this work Arduino-Powered Smart Irrigation System based on smart sensors that can be rationally and economically used to monitor a mint or any facility by integrating some connected electronic devices and other useful tools commonly used in the IoT field. This system includes a soil moisture sensor placed in the root zone of the plant, a temperature sensor and a water flow sensor connected to the valve of the water pump motor. These sensors are integrated with Arduino UNO microcontroller, relay module, DC pump motor and batteries. In other words, the behaviour of this automated system is encapsulated in detecting soil moisture and temperature levels and automatically starting the pump motor based on soil moisture. In general, such an automatic watering system can be easily implemented in small gardens, nurseries or greenhouses. Recently, innovative solutions have been introduced to reduce costs, save time and optimize the use of resources.

Keywords: Arduino UNO, Smart Irrigation System, DC Pump

1. INTRODUCTION

The proposed system ensures optimal watering by automatically switching the pump motor through the relay module according to the soil moisture and temperature threshold. The system is quite functional and the results observed are very encouraging. There are many systems dedicated to the conservation of irrigation water for the cultivation of various crops, from the rudimentary to the technologically advanced. For example, an automatic irrigation system using a wireless sensor network and a GPRS module was created to optimize water use for crops. Temperature sensors and a gateway unit for processing sensor data, controlling actuators and transferring data to a mobile application. The application enables data verification and water schedule control through a duplex connection based on a cellular network interface. The use of solar energy in this irrigation system is also done with solar panels. The system has significant potential for installation in geographically remote areas characterized by limited water availability, as it can provide better irrigation control while saving water. Similarly, an intelligent irrigation water demand forecasting system was developed, based on soil measurements, such as soil moisture and temperature measurements, as well as climate forecast information available on the Internet, such as precipitation, air temperature, humidity and UV in the near future also in the open countryside source techniques. Data is collected and shared wirelessly to the cloud using web services and analyzed by a web-based decision support system that provides real-time information to optimize water use and address the problem of overwatering due to weather changes and post-irrigation rains. The system makes a real-time irrigation decision based on predicted soil moisture during rain. The soil moisture forecast is prepared based on the data detected from the soil.

2. PROPOSED SYSTEM

The sole data used in this experiment to determine soil water scarcity comes from sensors. This Arduino-Powered Smart Irrigation System's main advantage is that water is only applied when the soil moisture content drops below a predetermined threshold. In densely populated areas where land is limited and rooftop gardening seems to be the

only practical option, this technique might be used in roof gardens. Home lawns can be managed by this technology, reducing the need for human monitoring.

The following purposes will be served by the Arduino-Powered Smart Irrigation System:

1. A significant amount of water is prevented from being wasted because there is no unforeseen water use.
2. Only when the land is completely dry is irrigation used, and sensors determine when to turn on or off the pump. As a result, farmers will save a substantial amount of time. Without the need to manually turn the pump on and off, farmers will be able to get some much-needed rest.

3. PROBLEM STATEMENT

Building an automated irrigation system that senses the ground's moisture level and turns the pumping motor on and off is the aim of the Arduino-Powered Smart Irrigation System project. Using the right irrigation technologies is essential in the farming industry. Using these systems has the advantage of requiring less human interaction while yet providing the proper watering. The proposed paradigm consists of three steps: Finding out how damp the ground is is the first step. Finding out if it's wet or dry is the second step. Motor control is the third and last level. to construct an automated irrigation system that senses the amount of moisture in the earth and turns on and off the pumping motor.

4. RESULT ANALYSIS AND DISCUSSION

The process of watering plants based on soil moisture levels is efficiently automated by the Arduino-Powered Smart Irrigation System. The findings indicate that, in comparison to manual watering, timely and consistent irrigation produces healthier plants with higher growth rates. The system's scalability, customization flexibility, and dependability may all be discussed, along with any drawbacks or prospective areas for development, including sensor accuracy or power efficiency. All things considered, it offers a viable approach to effective plant maintenance in both residential and commercial environments.

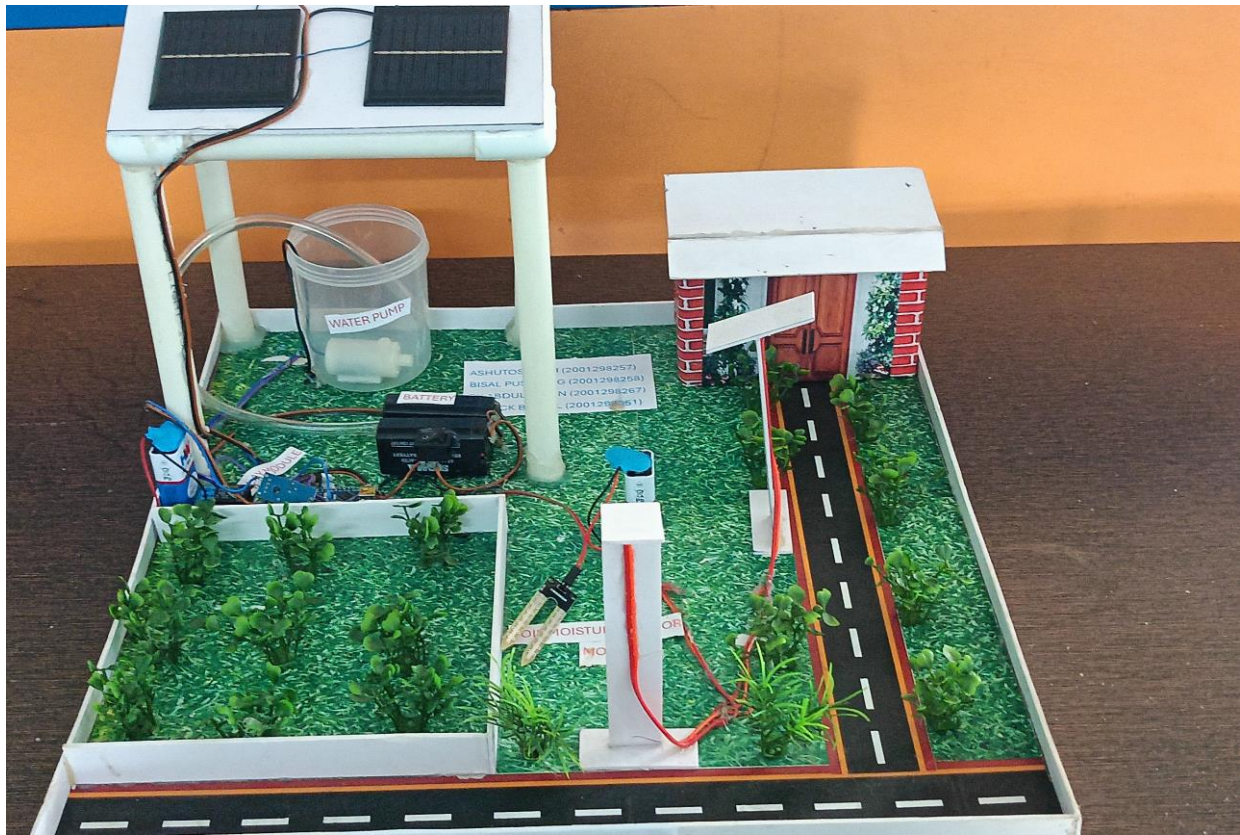


Fig-1 Proposed Arduino-Powered Smart Irrigation System.

5. CONCLUSION

The proposed study provides information on various soil parameters such as soil temperature, soil moisture and air temperature to predict irrigation efficiency. The system helps ensure better irrigation systems for agriculture by analyzing soil parameters. The data collected from the sensors is trained using machine learning techniques and the system is automated. The adoption of smart farming systems based on IoT will help to obtain high quality crops and reduce human intervention in agriculture. Smart irrigation is a rapidly growing technology that has the potential to transform agriculture and improve the environment. With the emergence of new technologies such as artificial intelligence, drones, IoT and machine learning, the future of smart irrigation is bright. As water scarcity increases, the importance of smart irrigation systems becomes even more important, helping to conserve water, improve yields and reduce environmental impact.

5. REFERENCES

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