SAPLING HEALTH MONITORING WITH SMART DRIP IRRIGATION SYSTEM

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Abstract

Automated system operates with less human interaction which reduces job overheads. The main objective of the project is to develop a sapling health monitoring with smart drip irrigation system using Raspberry Pi and Internet of things (IoT) gateway. This project represents an automated sapling monitoring system which could be applicable for practical plantation field to boost up the agricultural productions. The monitoring system, uses four sensors to measure humidity, temperature, and moisture of the surroundings of the test plant and provides the most suitable amount of water to plant depending on the coefficient generated from the sensors' data through smart drip irrigation system. The data obtained from the respective sensors are displayed as outputs in the MySQL Database server html page and also via Chatbot. Thereby providing us with the details of predictive time taken for the growth of sapling to a plant and also time taken for development of fruit from the plant. This analysis of data gathered from sensors helps not only in monitoring plant's health condition considering various parameters but also maintaining a proper economic system subjected to farming.

Considering the reduction of water consumption during cultivation in farming since large amount of water goes waste due to improper planning of water usage, smart drip irrigation system is used to maintain balanced moisture level in the soil. In this system Raspberry Pi can form the mesh between the nodes and IoT gateway. Low cost and good results of practical experimentations present that the system is viable to implement in large scale plant monitoring and irrigation.

Keywords: Sapling, Drip Irrigation.

Introduction

Smart gardening and farming system make use of traditional methods where the health of the plant is monitored with the assistance of different sensors embedded into the soil of the plant. When there are differences in the data obtained from various sensors embedded, to the reference or threshold values set, the automated system attached to the controlling unit supplies water into the field with the help of sprinklers or pipes which are set along the lengths of the field which does not ensure productive use of water and prevention of soil erosion. Adding to the above procedure this project i.e. "SAPLING HEALTH MONITORING SYSTEM WITH SMART DRIP IRRIGATION SYSTEM USING IoT" is an integration of two modules. This project uses Embedded system and IoT as its gateway.

A Sapling is termed as a Young Plant. The first module includes the inputs to the Raspberry Pi 3 and embedment of the sensors into the soil. The sensors used in this system are Temperature Sensor (LM35), Humidity Sensor (HR202), and Soil Moisture Sensor(YL69). The Temperature sensor and Humidity sensor are placed above the surface of soil whereas the Soil Moisture sensor is placed inside the soil. The Raspberry Pi 3 which runs on Linux Operating System is connected via Remote Control and VNC viewer. The source code for the system along with definition of input sensors and controlling of Output unit is written into the Raspberry Pi 3 using Python Programming Language. The values obtained can be accessed via MySQL Database server html page by connecting to the same network to

which Raspberry Pi is connected and entering the IP address of the Raspberry Pi in the Browser (Connecting to the same network ensures security and one doesn't need domain specification which would be accounted to pricing and publicizing the IP of Raspberry Pi). Along with definition of MySQL Database, the source code includes a Chatbot which uses Telegram application, thereby ensuring the accessing of data and monitoring of plant's health using a mobile phone.

The Second module includes smart drip irrigation system mechanism. Smart Drip Irrigation is one of the most efficient methods of suppling water to the plants. This irrigation system supplies water drop by drop directly to the roots of the sapling and ensures there is no wastage of water or soil erosion and thereby promoting an effective and highly economic farming.

Related Work:

The sensors value is obtained in terms of voltage which are Analog data. This data is converted into Digital value using an ADC converter. The Raspberry Pi with the source code encoded, runs the programs and makes note of data obtained. It checks and compares each value of temperature, humidity and moisture level with the threshold set in the program respectively and controls the output by turning the relays ON or OFF along with the Mini Water Pump and supplies water droplets directly to the roots of the sapling with the help of pipes.

MySQL Database:

This project had included the use of multiple software applications, starting from Linux Operating System present in Raspberry Pi 3 to the deployment of results in MySQL Database server using HTML, PHP, and Chatbot developed using Telegram and other miscellaneous software resources. The data in a MySQL database are stored in tables. A table is a collection of related data, and it consists of columns and rows. Databases are useful for storing information categorically.

PHP + MySQL Database System:

PHP combined with MySQL are cross-platform (you can develop in Windows and serve on a Unix platform).

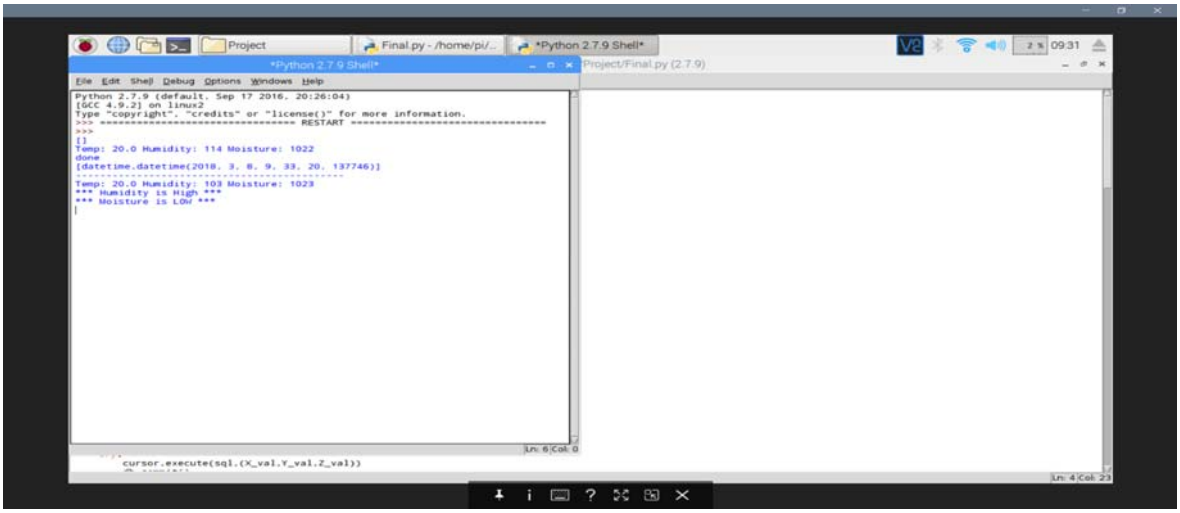
Abbreviations:

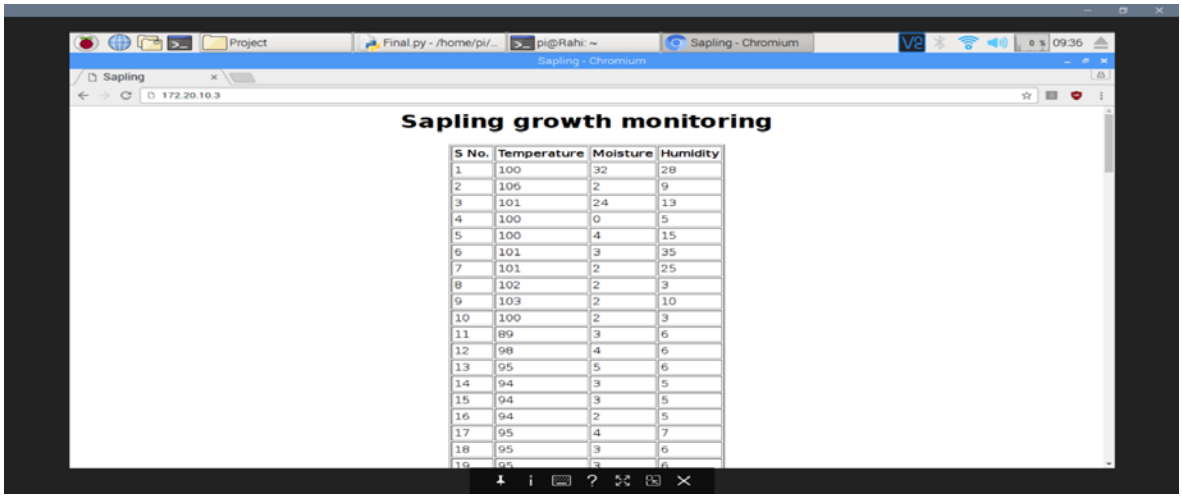
HTML: Hyper Text Markup Language
PHP: Personal Home Page
ADC: Analog to Digital Converter
GSM: Global System for Mobile

Results

Outputs of the project can have access in Python IDE, MySQL database server, Telegram Bot. This helps in accessing the data and keep the track of Sapling Health condition.

The values of Temperature, Humidity and Moisture level are obtained time to time





Conclusion:

With the help of advancements in Embedded Systems and Automation, used in the development of this prototype, it guarantees a better and a productive Irrigation System creating a balance in terms of both Environment and Economy. The data obtained can be further used for Data Analysis which helps in absolute prediction of development of fruit or vegetable from the plant, and also the growth of the Sapling till it develops into a plant can be monitored. In contrast, the prototype has overcome many drawbacks that were present in the traditional automated systems.

Future Scope:

Our project can be improvised by adding a Webscaper, which can predict the weather and water the plants/crops accordingly. If rain is forecasted, less water is let out for the plants. Also, a GSM module can be included so that the user can control the system via smart phone. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. A solenoid valve can be used for varying the volume of water flow. Furthermore, Wireless sensors can also be used.

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