



## WEB BASED AUTOMATIC GREENHOUSE CONTROL SYSTEM

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### ABSTRACT

*A very significant event in the world history of Agriculture is the housebreaking of plants by mankind. Agriculture is the backbone of world economic activity. We need a new and effective technology which can improve continuously the beneficial, sustainability of our major farming systems. This paper proposes a design for greenhouse automation system using raspberry pi, sensor node. The system provides a web interface to the user so that the user can control and monitor the system remotely. Research and development professionals are seizing the opportunity to design and integrate more functions and services for smart greenhouse monitoring and control systems. Raspberry pi acts a central coordinator and end devices act as various routers. Raspberry has an Ethernet interface and runs the simple data web server. The sensor are ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air. User can make the irrigation system ON or OFF remotely. The system will reduce the water consumption. The paper explains the complete installation of the system including hardware and software aspects.*

**Keywords- Agriculture, automated greenhouse, Raspberry Pi, Soil sensor, Greenhouse.**

### I. INTRODUCTION

There are more than 60 countries now in the world where cultivation of crops is undertaken on a commercial scale under cover. The Greenhouse structure of various types are used for crop production. Although there are benefits in each type for a specific application, in general there is no single type greenhouse, which can be constituted as the best. Different types of greenhouses are designed to meet the specific needs. Agriculture is the worldwide prime occupation of human being, 64% of total available land is occupied by the agriculture, and it consumes 85 % of available fresh water. This figure of water consumption increases every year due to globalization and population growth. There is a challenge in front of every country to sustain the fresh food requirement and reducing the farm water consumption. The requirement of building an automation system for greenhouse is increasing day-by-day. Industrialist and researchers are working to build well-organized and financial automatic systems to control different machines like lights, fans, air conditioners based on the requirement. Automation makes an efficient use of the electricity and water and reduces much of the wastage. Irrigation is the process of watering the soil. The requirement of water to the soil depends on soil properties like moisture and temperature. It also depends upon the yield which grows in the air. From last decade, few existing system working for reducing the agriculture water consumption, but these systems have some limitations. Also

systems required more human intervention and time consuming. So we require modern technology to resolve this problem and support better irrigation management. For that we have proposed system which is Web based system. The function of the coordinator node in the system is to initiate the communication with distributed End device nodes and continuously collects the moisture and temperature data and store collected data in the database. The database is created on the raspberry Pi board which is a MySQL database. Coordinate node analyzes the received data and chooses the water required for the soil. If the analyzed data shows that water is required, the coordinator node sends commands to water pump controller make Irrigation system on. Rpi has an Ethernet interface and it runs a simple data web server. A sensor network that monitors humidity and temperature. The collected data from these sensors is transmitted to a web service via a coordinator. People can access, analysis and manage the system via the World Wide Web. User can make the irrigation system ON or OFF remotely.

## II. FIGURES AND TABLES

### 2.1 Proposed architecture used for automated greenhouse

Design of automated greenhouse control system is been as shown in Fig.1, Coordinator node manages the multiple sensor device nodes. The system consists of three parts Controller node, sensor node and web server. The web server is designed on Rpi for monitoring and control the greenhouse . Any devices which have the capability to access the web service will be used here for monitoring the data like PC, laptop, smartphone etc.

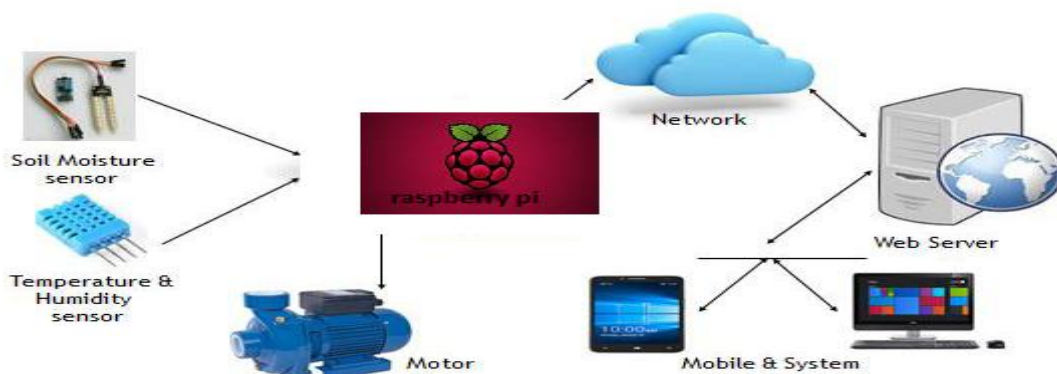


Fig. 1. Architecture of system

#### 2.1.1 Raspberry Pi :-

The Raspberry Pi is a credit card-sized computer. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word processing, browsing the internet. In this proposed system we have used Raspberry Pi as the supervisor of coordinator node. Rpi is the small, inexpensive minicomputer. It continuously collects the information send and processing large quantities of data timely and available for users to view. It is the core of the system.



Fig.2. Raspberry Pi

## 2.1.2 Sensor

### 2.1.2.1 Soil Humidity Sensor(YL69):-

The soil moisture sensor or the hygrometer is usually used to detect the humidity of the soil. So, it is perfect to build an automatic watering system or to monitor the soil moisture of your plants.

The sensor is set up by two pieces: the electronic board (at the right), and the probe with two pads, that detects the water content (at the left).

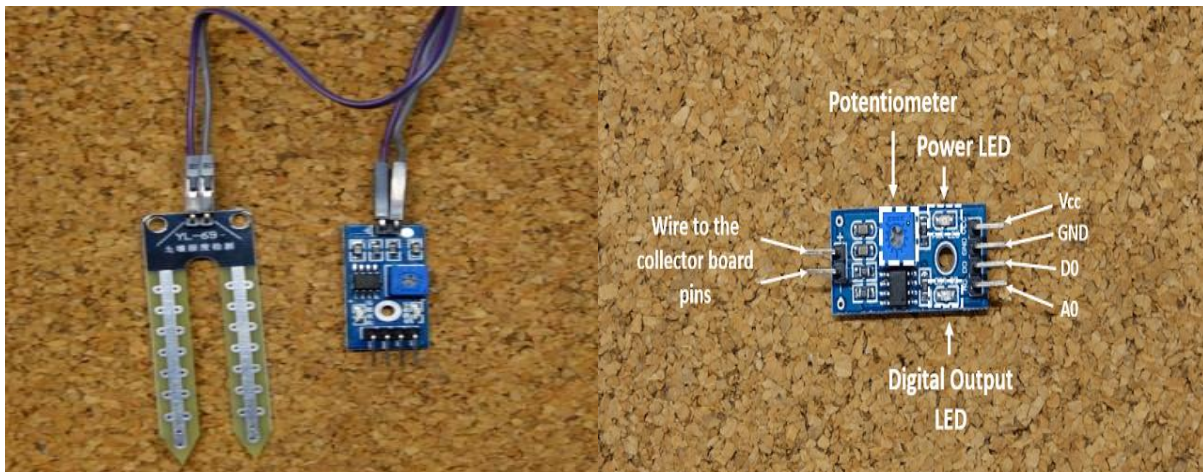


Fig. Soil Humidity Sensor(YL69)

The sensor has a built-in potentiometer for sensitivity adjustment of the digital output (D0), a power LED and a digital output LED, as you can see in the following figure.

### 2.1.2.2 DHT11 sensor

This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the special digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high regularity and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and connects to a high performance 8-bit microcontroller, offering superb quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly standardized in the laboratory that is extremely accurate on humidity calibration.

The calibration quantities are stored as programmers in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration easy and fast. Its

small size, low power consumption and up-to-20 meter signal transmission making it the superlative choice for various applications, including those most demanding ones. The element is 4-pin single row pin package. It is appropriate to connect and special packages can be provided according to users' request.



Fig. DHT11 sensor

### 2.1.3 Database and web server:-

#### 2.1.3.1 Database

A database is an structured collection of data It is the assembly of schemas, tables, queries, reports, views, and other objects. The data are typically organized to model features of reality in a way that supports processes requiring information, such as modeling the obtainability of rooms in hotels in such a way that supports finding a hotel with vacancies.

A database management system (DBMS) is a computer software application that cooperates with the user, other applications, and the database itself to capture and evaluate data. A general-purpose DBMS is designed to allow the definition, creation, update, and administration of databases. Well-known DBMSs include MySQL, PostgreSQL, MongoDB, MariaDB, Microsoft SQL Server, Oracle, and IBM DB2. Database management systems are often classified according to the database model that they maintenance; the most popular database systems since the 1980s have all maintain the relational model as represented by the SQL language.

#### 2.1.3.2 web server

A web server is a computer system that processes demands via HTTP(Hypertext Transfer Protocol), the basic network protocol used to allocate information on the World Wide Web. The term can refer to the whole system, or specifically to the software that accepts and controls the HTTP requests.



A Web server is a program that uses HTTP to serve the files that form Web pages to users, in response to their requests, which are forwarded by their computers' HTTP clients. Dedicated computers and appliances may be referred to as Web servers as well. All computers that host Web sites must have Web server programs.

Web servers often come as part of a larger package of Internet- and intranet-related programs for serving email, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, security characteristics, and the particular publishing, search engine and site building tools that come with it.

### III. CONCLUSION

This system is reduces the water use because it provide irrigation as per the requirement of the crop. This system is automated greenhouse system so it reduces the human resources. This system was found to be cost effective for optimizing water resources for agricultural production. The system can be adjusted to a variety of specific crop needs and requires minimum maintenance. Using this system we can monitor the status of all the sensors (Soil-moisture, Temperature, Water level) and also the ON/OFF status of the motor and Fan.

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