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Design and Simulation for Sensors used in Smart Agriculture

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Abstract

Agriculture is done manually for ages, to reduce manual labor many new technologies and implementations are introduced in agriculture. we aim to make use of evolving technologies i.e. IOT and smart agriculture using automation. In this project, using a Wi-Fi module agrobot is designed for seed sowing. Agrobot is an important tool for modern farmers looking to improve their efficiency and sustainability. This agrobot uses some sensors for measuring some vital parameters in agriculture. DHT22, FC28 sensors are used to provide temperature, humidity, and moisture content of soil respectively. A Wi-fi module is used to control the sensors and movement of the device.

Keywords: Seed Sowing, Smart Sensor, IOT-based Agriculture.

1. Introduction

Agriculture in India establishes an extra 60% of the major occupation. It serves to be the backbone of the Indian economic system. It has a vital role to improve the effectiveness and profitability of agriculture at the identical time giving secure cultivation to the farmers. Automation of irrigation structures in frameworks is moreover sustained with the aid of estimating the water rate in the soil and managing to irrigate the system.

The vital and the maximum tremendous motive behind this issue is the huge increment inside

the population which has expanded at a price that is quicker than the nourishment creation charge. Every crop field has different characteristics that can be measured separately in terms of both quality and quantity. For this need smart agriculture provides communication technologies and monitoring a crop constantly. Agriculture System is proposed as an idea of IOT, WSN, and Cloud Computing to help farmers by estimating the plan of improving a crop yield. Solar technology offers farmers to gives the possibility to stabilize electricity charges. This permits farmers to improve their financial status effectively and to earn money with low power consumption. The various sensors are utilized to manipulate numerous parameters of the robot for planting the seeds with the aid of making use of a microcontroller. The proposed calculation is carried out to monitor the development of plants, and the difficulty for automated agricultural development. Other Researchers built up a framework that is sunlight-based programmed seed planting. Programmed seed planting device fulfills the burrowing, seed planting, water pouring, and treating by making use of sunlight-based vitality seed. This programmed planting system helps the farmers to limit time. Further more, they can play out their everyday development movement in agricultural fields. In our proposed paper we have to program seeding plants by using an agrobot and development was monitoring by using an IOT. Sensors as a rapidly growing component of IOT have gained much attention recently due to their incredible potential to enable the emerging application of high societal and economic impact. To test the efficiency of measuring the rang of sensors and to analyze the output, the simulation process is carried out in MATLAB.

2. Types of Sensor

DHT22 sensor for temperature and humidity, FC28 sensor for moisture of soil, and Soil pH to measure pH level.

2.1. DHT22 Sensor

DHT22 sensor consists of a thermistor and a capacitive humidity sensor. It measures the temperature and humidity content in the surrounding air and gives the output as a digital signal. The readings from DHT22 sensor can be get every second. The input power ranges from 3 to 5v.2 to 5% accuracy in humidity reading, and +/-0.5°C accuracy in temperature reading. 0.5 Hz sampling rate and weights up to 2.4g. It measures 40°C to temperature ranges and 0% to 10% humidity range. DHT22 sensor is factory calibrated and outputs as serial data. It finds application in local weather stations, automatic climate control, and environment monitoring.

2.2. FC28 Sensor

The FC28 soil moisture sensor is used for measuring the moisture content in the soil. The two long tips function as probes for the sensor and also act as a variable resistor. If the water content in the soil is higher, there will be high conductivity and low resistance between the probes. The Input of this sensor ranges from 3.3 to 5v. The accuracy of the sensor is 3% of the volumetric water content in the soil.

2.3. Soil pH Sensor

The soil pH sensor is used to measure the alkalinity and pH value in the soil. It measures the pH value of the soil by inserting two probes inside the soil. The accuracy of the pH sensor is +/-0.3 pH. Power consumption is 0.5w, operating temperature -20°C to 60°C. Response time is 10 seconds.

3. MATLAB & Simulink

In Fig.1, the initial block consists of

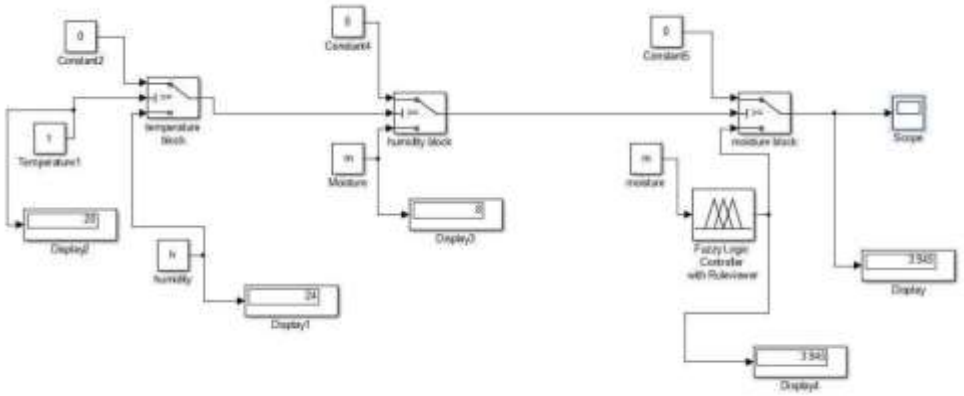

Figure.1. Stimulation Diagram for Monitoring Various Sensor Information using MATLAB

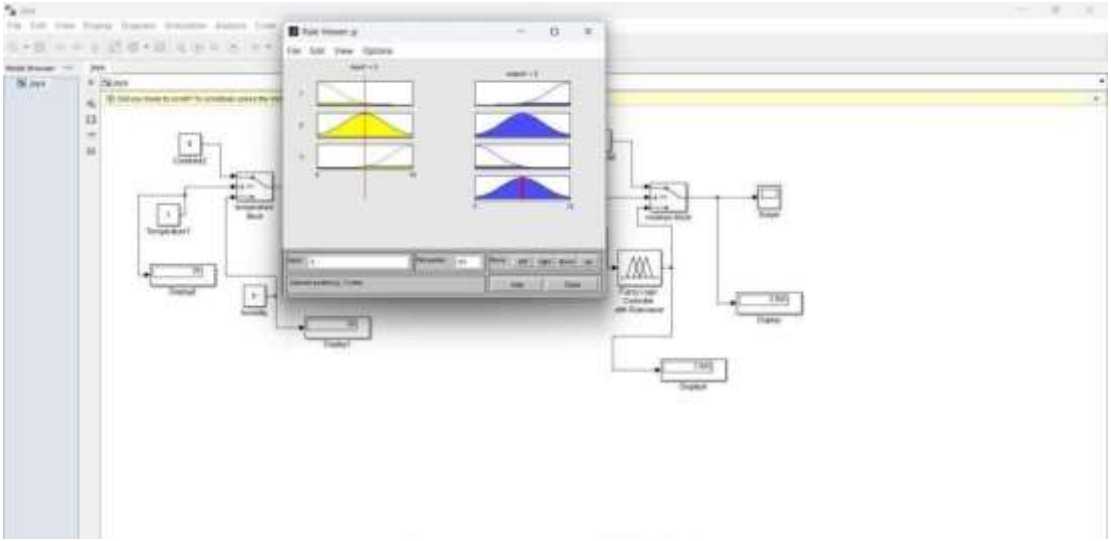

Figure.2. The above chart shows the temperature, humidity, and soil moisture range of the atmosphere

temperature measurement. Now the input is given and a specific value is set a threshold value condition gets checked, whether the input value is greater than or equal to the threshold. If the input is greater, the corresponding output will be displayed on the screen, and eventually humidity value is measured in this block.

The next block consists of humidity measurement. A particular percentage is set as a threshold (010%). If the input value is lesser than the threshold, the output will be displayed on the screen

or else it indicates as 0. Input for humidity measurement is given and the condition gets checked. The output percentage of humidity is displayed on the screen.

The last block of stimulation is a measurement of soil moisture a specific moisture percentage is set as a threshold value (0-39%), and if the input value is below the threshold, the corresponding output will be displayed on the screen. If the moisture value is below the threshold value, using the fuzzy logic controller, the pump will be turned ON and it helps to increase the moisture level of the soil, the blocks can be combined and viewed as a graph in Fig.2.

4. Result

The simple and efficient stimulation is proposed in this paper to predict internal air temperature, humidity and moisture of soil. The predicted values present a good correlation with the measured values. The simulation results of this study are useful for the design and optimization of environmental control system. The output will be displayed on the screen. The analysed data can be used to monitor the temperature and humidity levels in air at regular time intervals.

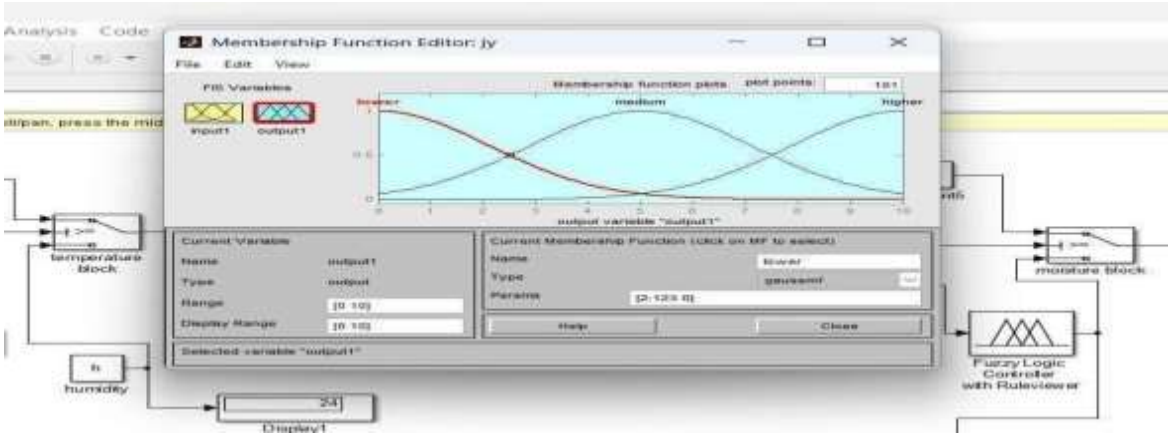

Figure.3. Fuzzy inference System

5. Conclusion

The soil moisture sensor, DHT22 sensor were stimulated and tested for achieving low-cost, accurate, and reliable measurements. This integrated temperature and humidity measurement has the advantages of a wide detection range, high precision, and fast response. future work can include measurements and testing of nutrients in the soil by NKP sensor.

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