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Design and Control of IoT Based Solar Power Monitoring Systems Application in Hydroponic Farming.

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A B S T R A C T

This project introduces an innovative approach to plant cultivation using hydroponics, IoT technology, and solar power. By eliminating soil and utilizing sensors for monitoring key parameters like temperature, humidity, and light intensity, farmers can optimize conditions for maximum yield. Real-time data is sent to a central control hub, and a mobile application can be developed to provide farmers with remote access to allowing monitoring and control their hydroponic Farm. Solar power ensures energy efficiency and reduces environmental impact. We are getting benefited from hydroponic Farming is a real time monitoring, automation and data-driven decision -making for improved crop management, resource efficiency, and high-quality yields in commercial setups.

Keywords: Solar PV, charger controller, Raspberry Pi PICO W, IoT devices.

1. Introduction

An IoT-based solar-powered monitoring system is an innovative application for hydroponic farming. This system integrates Internet of Things (IoT) technology with solar power to enhance the efficiency and sustainability of hydroponic farming. It allows real-time monitoring and control of crucial parameters such as light, temperature, humidity, nutrient levels, and water quality in hydroponic setups.

2. Existing system

Monitoring of hydroponics plant is by human

Frequent supply of water is required so time taken will be high.

It is not ecofriendly because supply to the motor is from main.

Nutrient supply to the plant and draining of excess water is also by human.

3. Proposed system

3.1 Block Diagram

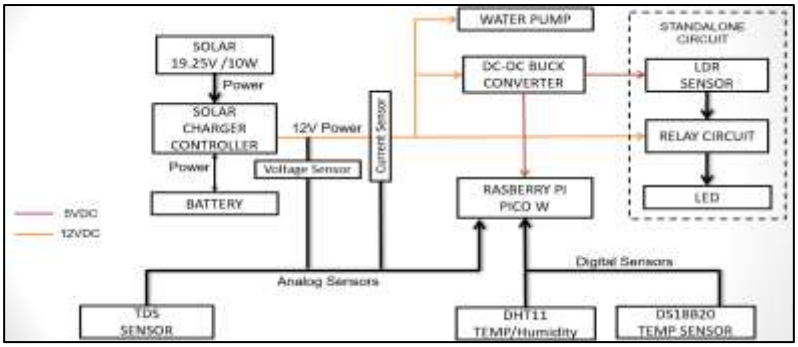


Fig. 1 – block diagram of proposed system.

3.2 Connection Diagram

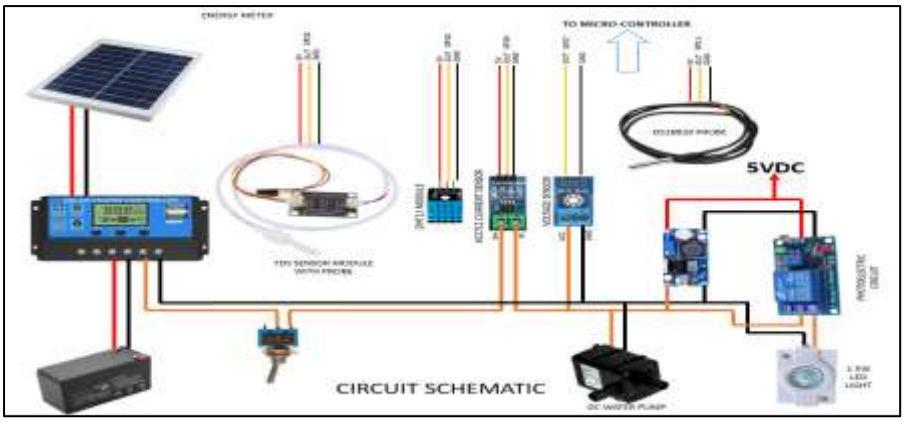


Fig. 2 – Connection diagram of proposed system.

Working

In our solar-powered system, the solar panel converts sunlight into electricity, serving as the primary renewable energy source. We utilize a 12V/20W solar panel to power and charge the battery, with its effectiveness depending on sunlight availability. The battery stores the generated electricity, its capacity determining system power storage. A brushed DC motor is employed for various applications, like solar-powered water pumps. A DC-DC buck converter steps down voltage (5V) and is connected to a photoelectric circuit, aiding sensor operation. Micro Python coding operates sensors such as temperature, LDR, voltage, current, and humidity sensors, regulating component parameters effectively.

3.4 Monitoring software

Thing Speak is an open-source IoT platform that allows you to collect, analyse, and visualize data from various sensors and devices. It enables you to store sensor data in the cloud and analyse it using MATLAB, making it popular for IoT projects, environmental monitoring, and research applications. Thing Speak provides APIs for data integration and customization, making it versatile for different IoT applications. It offers monitoring capabilities, enabling users to track various parameters such as temperature, humidity, motion, and more. Users can set up alerts and notifications based on predefined thresholds, allowing them to take action when certain conditions are met. Overall, Thing Speak is a convenient solution for monitoring and managing IoT devices and applications.

4. Hardware setup

4.1 Hardware model

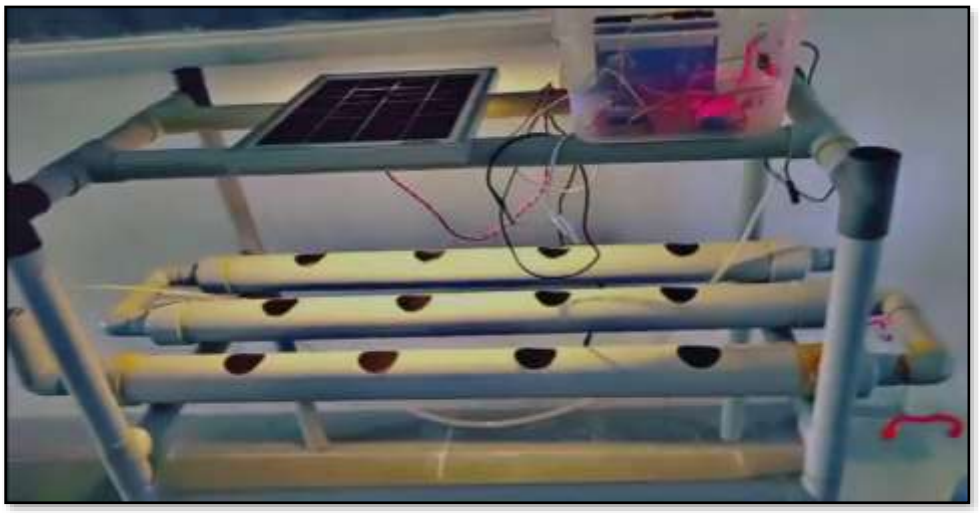


Fig. 3 – Hardware model of proposed system.

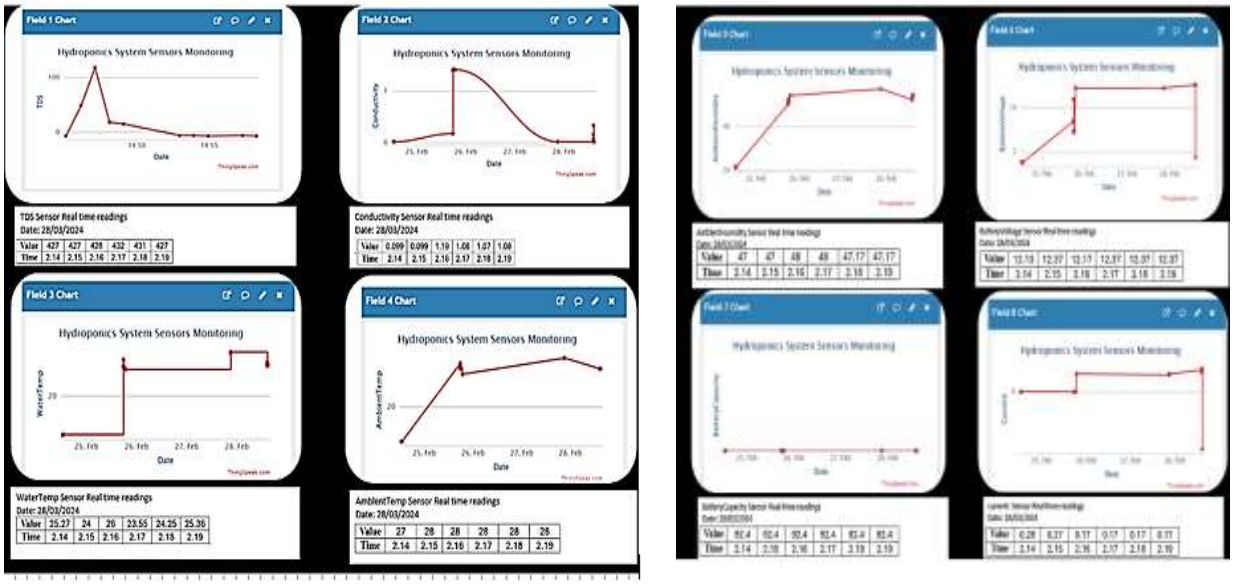
4.2 Sensors and components

Following are the compotes and sensors are required for the hardware setup-

Solar panel, solar charge controller, water pump, battery, Rasbery pi pico, voltage sensor, current sensor, TDS sensor, temp sensor, humidity sensor.

5. Results

Results are taken from the various sensors to sense various parameters of the systems. According to that the plants are grown up with time. Following are the few of the readings from sensors which is monitord on thing speak software throw IoT.



(a) **(b)**

Fig. 4 – Results on thing speak software TDS sensor, current sensor, water temp and ambient temp at different time interval a) and b)

6. Conclusion

From this project we conclude implementation of IoT based solar power monitoring system application in hydroponic farming. It monitors various parameters like TDS , humidity , water temperature, check moisture automatically and accordingly supply water for given time interval for efficiently growing of plants.

7. Future scope

Agriculture automation can be amalgamated with future agriculture systems such as hydroponics. We can plan to build an autonomous agriculture system in future which will not require any human intervention and the crops can be sown cultivated and harvested without human intervention.

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