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A futuristic digital interface with a glowing Earth globe in the center. The background is dark blue with various data visualizations including bar charts, line graphs, and text boxes. The text 'BUSINESS', 'NETWORK SEARCH', and 'WORLD' is visible. A hand is shown at the bottom, interacting with the interface.

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Aquaponics Mushroom Monitoring Using IOT

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ABSTRACT: Aquaponics is a method of growing food that mixes hydroponics and aquaculture. The plants are given nutrient-rich water from the aquaculture. Mushroom Cultivation Environment, used to grow plants under controlled climatic conditions for efficient production, forms an important part of the mushroom cultivation and horticulture sectors. To create an optimal environment, the main parameters such as temperature, humidity, light intensity, ground water, etc. need to be controlled. The main objective of this project is to design an automated mushroom cultivation system which is purely sensor-based. The system receives input from various sensors and displays its output. The developed system is simple, cost-efficient, and easily installable. The results show that the system could be more efficient in terms of manpower savings and raising the economic value of products. This asset allows the green housekeeper to improve the cultivation in a way the plants need. It leads to a higher crop yield, a prolonged production period, better quality, and less use of protective chemicals. For continuous monitoring and control, we are using a wireless sensor network. Here, the mushroom cultivation parameters are sent through the internet to the open-source cloud server. The parameters can be controlled by another web server hosted locally. This project mainly focused on user-friendly UI design and an automatic system.

KEYWORDS: Aquaponics, Temperature, Humidity, pH, Open source cloud server, UI design, Automatic system.

I. INTRODUCTION

Aquaponics is a food production system that is a combination of aquaculture and hydroponics. However, the traditional approach to aquaponics lacks intelligent diagnosis, is difficult to control, and also has low efficiency. So, a project called Aquaponics mushroom monitoring using IoT is developed, which contains two modules. This helps monitor the parameters, like humidity and pH, of a soil and the humidity, pH, and dissolved oxygen of a fish tank, and actions are taken based on that. So, the key concept of this project is to monitor and control the environment using IoT. Thus, the maintenance of optimal humidity and pH is improved, and as a result, yield is improved. Users can also monitor and take control through an interface.

II. RELATED WORK

Global population is expected to exceed 9 billion people by 2050, according to crop forecasts and the food situation report released by the Food and Agriculture Organisation (FAO) of the United Nations in 2002. As a result, during the next 40 years, the demand for food will rise by 1.2-2.4% year. [1] Three key components make up the indoor aquaponics system's architecture. server, client 2 (internal module), and client 1 (user). Using a server, the user can control the model remotely. [2] Based on testing and analysis results, it can be determined that hydroponics and aquaculture system features are prepared to accommodate the cultivation of fish and greenery to improve the convenience of growing our own food. E-aquaponics may be used to grow fish and greenery remotely. [3]

III. METHODOLOGY

In this work, low-cost soil moisture sensors and mineral sensors are used. They continuously monitor the field and send it to the web server using an ESP8266 transmitter and receiver and an Ethernet connection at the receiver end. The web application is designed in such a way to analyse the data received and check the threshold values of moisture and pH. The decision-making is done on the server to automate irrigation. If the soil moisture is less than the threshold value, the motor is switched on, and if the soil moisture exceeds the threshold value, the motor is switched off. This method can also be used in green houses, where light intensity control can also be controlled and automated. The system design is represented in Fig. 3.1

BLOCK DIAGRAM:

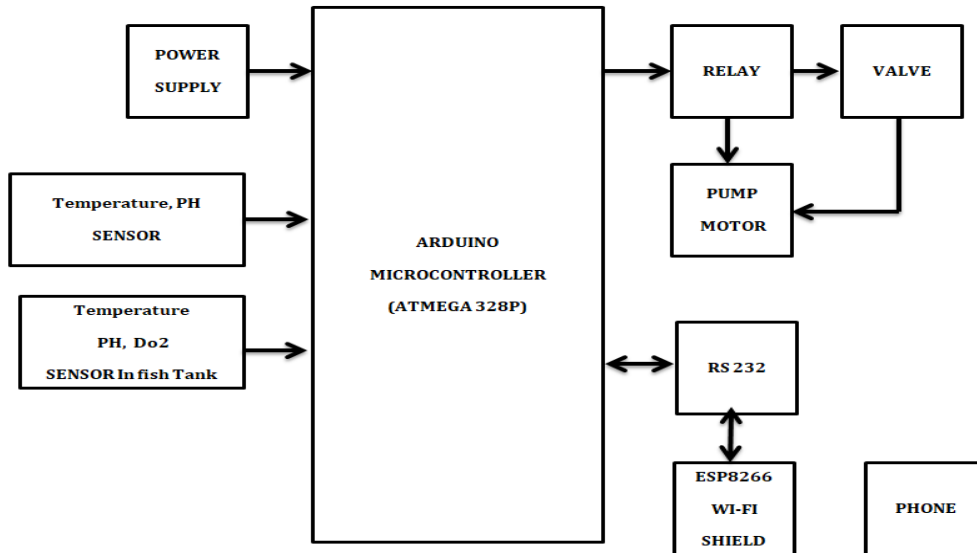


Fig. 3.1

IV. EXPERIMENTAL RESULTS

The figures below shows the experimental setup and webpage that shows the current status of the plant. It shows the temperature and pH of soil and pH, humidity and dissolve O₂ of the fish tank. It also shows the current status of the motor based on the humidity level of the soil.

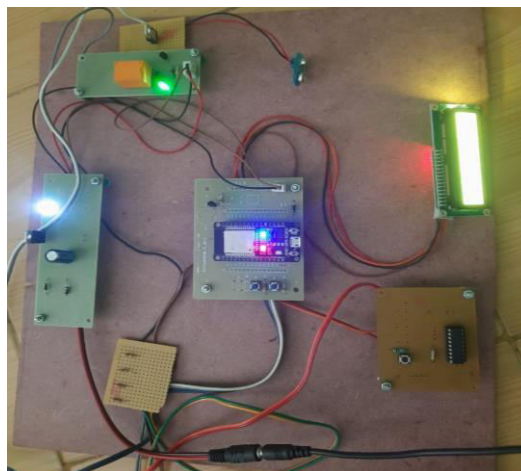


Figure (a)

Figure (a) shows the experimental setup of the project.



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Figure(b)

Figure(b) shows the LCD display which displays the value of sensed parameters.

MUSHROOM PLANT MONITORING SYS

- SOIL PH:7
- SOIL HUMIDITY:20
- FISH TANK TEMPERATURE:98
- FISH TANK PH:11
- DISSOLVED OXYGEN:895
- PUMP STATUS:PUMP ON
- MOTOR ON MOTOR OFF

control

Figure(c)

Figure(c) shows the webpage that displays the sensed parameter values in real time. Here the humidity is 20%(less than 50%), so the motor (pump status) is ON.

MUSHROOM PLANT MONITORING SYS

- SOIL PH:7
- SOIL HUMIDITY:74
- FISH TANK TEMPERATURE:98
- FISH TANK PH:11
- DISSOLVED OXYGEN:872
- PUMP STATUS:PUMP OFF
- MOTOR ON MOTOR OFF

control

Figure(d)

Figure(d) shows the webpage. Here the humidity is 74%(greater than 50%), so the motor(pump status) is OFF.



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V. CONCLUSION

Precision mushroom cultivation can be made more accurate and efficient with IOT-enabled technologies. IOT can be applied in different domains of the green house. With the help of IOT, the use of effective energy for pumps, boosters, lighting, and other purposes is also done. The second one is crop monitoring. By deploying sensors in the crop field that are connected to the internet, an appropriate decision can be taken with IOT. Efficient use of fertilisers can be made with IOT. Finally, we conclude that we need to develop an optimal Agri-IoT architecture that is enclosed with low cost, low power consumption of devices, better decision-making processes, QoS service, optimal performance, and is easy to understand for the farmer without knowledge.

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