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" AN AUTOMATED AQUAPONICS SYSTEM "

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ABSTRACT :

An Automated Aquaponics System is a creative endeavor that seeks to reduce manual intervention and maximize resource use. Aquaponics is a sustainable food production technique that blends hydroponics (soil-less plant cultivation) and aquaculture (fish farming). The system monitors and controls temperature, PH level, nutrient levels, water quality, and other important parameters by integrating sensors, actuators, and a central control unit. The system keeps fish and plant conditions at their ideal levels, increasing output and lowering failure rates. Moreover, the automation of operations makes aquaponics accessible to a broad spectrum of people, even those with no prior agricultural expertise.

Keywords-Automated Aquaponics system, Aquaculture, hydroponics, PH level, IOT Technology.

INTRODUCTION :

The efficient and sustainable food production methods has increased recently as traditional agricultural systems is increasing strain by urbanization and population development. A possible way to deal with these issues is aquaponics, which is a symbiotic combination of hydroponics and aquaculture.
Through the use of beneficial bacteria, plants, and fish, aquaponics to produce fish and vegetables in a closed- loop environment with little waste and resource usage. However, attentive monitoring and control factors like - temperature, fertilizer levels, and water quality, are frequently necessary for aquaponics systems to be successful. The labour- and time-intensive nature of manual intervention might restrict the scalability and efficiency of these systems, particularly in urban environments where resources and space are scarce.

LITERATURE SURVEY

Designing an Aquaponics System Integrated With a Solar- Powered Ardunio
Authors: Cledera, X.M., Lim, C.A., Omalin, J.I., & Yacapin, A.M.
Abstract: This study aims to solve the problem of water consumption in the agricultural sectors where 80% of the total Philippine water consumption comes from the agriculture areas. It is relevant to the researcher's study as it is like the researcher's aquaponics system, which uses Ardunio and solar panels for recirculating the Aquaponics system. The study uses different sensors and a website that is connected to the devices for monitoring and controlling the growth factors inside the system, like the temperature of the water, the humidity, pH level, and the temperature inside the system, while the related study only uses an incorporated Ardunio uno sensor for fish feeding.
. [1]

IOT based Smart Aquaponics with disease detection Authors: R.Barosa,S.I.S. Hassen,L.Nagowah
Abstract: Combine hydroponic with conventional agriculture system to develop Plantabo Aevum system .The IOT devices are used to continue monitoring the environmental factor and providing the real time feedback .Live cameras are used to continue image processing .with the detection of the main
features of the plant leaf the system detect the disease in it and generated the report on Mobile application. [2]

Nutrient optimization for plant growth in aquaporin irrigation using machine learning for small training datasets
Author: S.B. Dhal, M.Bagavathiannan
Abstract: The sensors are used for the nutrient regulation of the optimal growth of plants. The dataset for that study is taken from aquaponic farms of Bryan, Caldwell, and Grimes countries in Texas .The data is collected from the plant bed and fish tanks of the farms. [3]

PROPOSED SYSTEM ARCHITECTURE

The configuration of our system. There are following components: Arduino Uno, Ph sensor, Temperature sensor, Turbidity sensor, LCD, Buzzer, Relay, Pump, Air blower (Fan), Wi-Fi module.

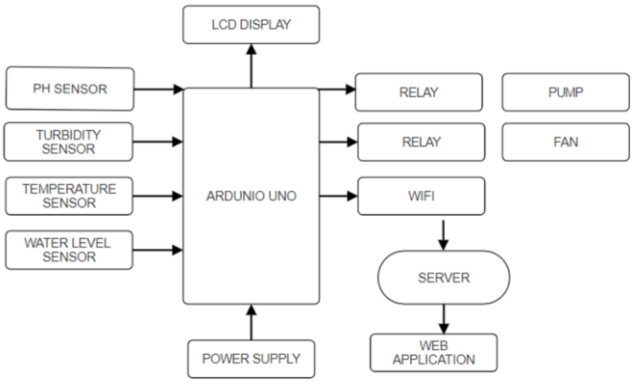

Fig1: Block schematic of the suggested system

The main objective is to develop a smart IOT based aquaponics system to optimize fish cultivation. To develop a system for the water conservation and nutrient recycling for the growth of various plants and fish breeds.

COMPONENTS

Hardware components

1. **Arduino Uno**

A well-known microcontroller board built around the ATmega328P chip is the Arduino Uno. Because of its ease of use and versatility, it's frequently used for DIY electronics projects and prototyping. With its fourteen digital input/output pins, six analog inputs, a power jack, a reset button, a USB connection for programming, and compatibility with a wide range of sensors, actuators, and shields, the Uno is an excellent option for novices.

2. **Ph sensor:**

A ph is an electric device that measures activity (acidity or alkalinity).IN the aquaculture ,the waters ph goes from 6.59.5 and the acceptable range from5.5-10,however this range
can slightly vary with fish species

3. **LCD:**

LCD 16X2 is a 16-pin device that has 2 rows that can accommodate 16 characters each. LCD to display the parameters such as ph, temperature, humidity, water level and distance.

4. **Relays:**

Relays are used to control the operation of water pumps responsible for circulating water within the system. They can turn pumps on and off based on preset schedules, sensor inputs (such as water level or temperature).

Software Requirement

1. **Arduino IDE:**

An application called the Arduino IDE is used to program Arduino microcontrollers. For creating, compiling, and uploading code to Arduino boards, it provides an easy-to- use interface. For both novice and expert users, the integrated programming environment (IDE) simplifies the development process with features like syntax highlighting, auto- indentation, and an integrated compiler. In addition, it has a library manager that makes it simple to integrate prewritten code and a serial monitor for debugging and communicating with Arduino boards.

2. **Adafruit IO:**

Adafruit Industries created Adafruit IO, a cloud service specifically for IOT projects. With Adafruit IO, you can effortlessly create dashboards to visualize your data, set up triggers and notifications, and manage your Internet of Things projects. It enables to send, receive, and process data from connected devices using HTTP and MQTT.

3. **MATLAB:**

MATLAB is a high-position programming language and interactive terrain for numerical calculation, visualization, And programming. It enable to dissect data, develop algorithms, and produce models and operations. MATLAB is extensively used in engineering, wisdom, and mathematics for tasks similar as control systems, signal processing, and image processing and computational biology.

FLOW OF DATA FROM THE USER TO THE DISPLAY UNIT

The system manages the aquaponics system manages the Aquaponics system ecosystem by monitoring and regulating Temperature, turbidity, water level, fish feeder, and plant watering pumps

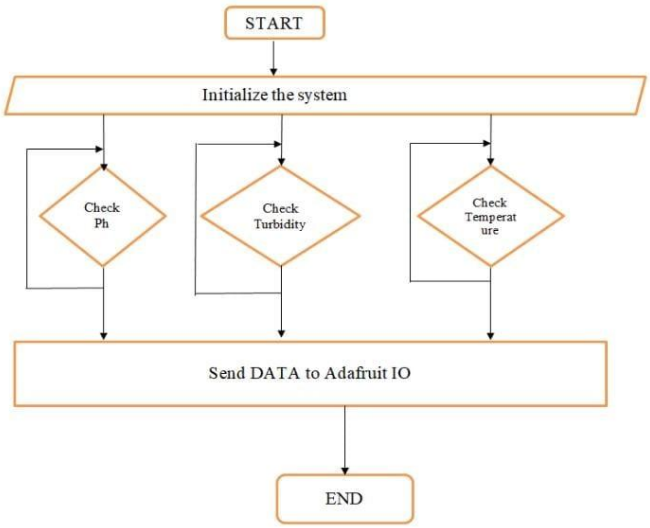

Fig 2. Flow chart

RESULT ANALYSIS

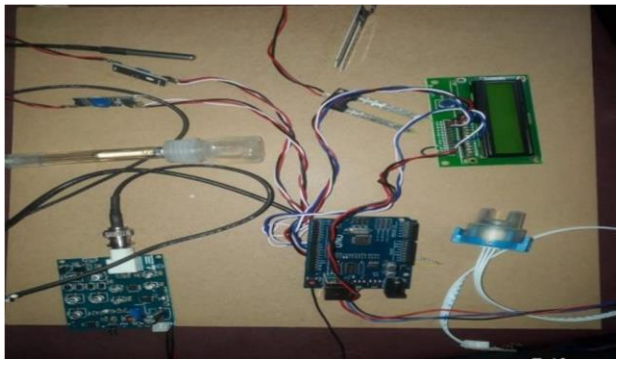

Fig 3. Hardware setup

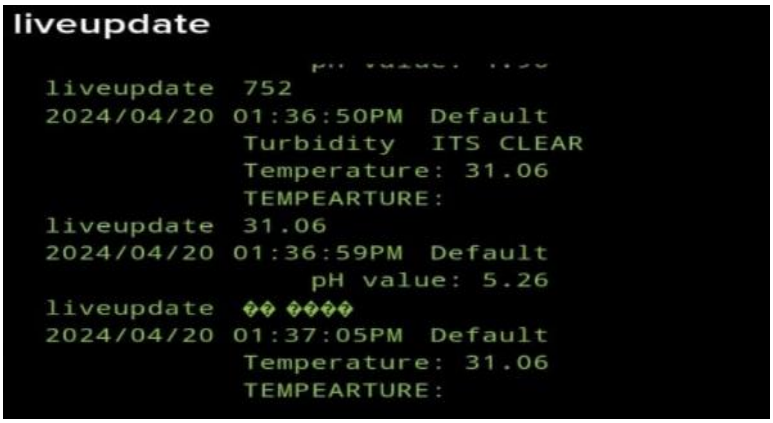

Fig 4. Live Updates

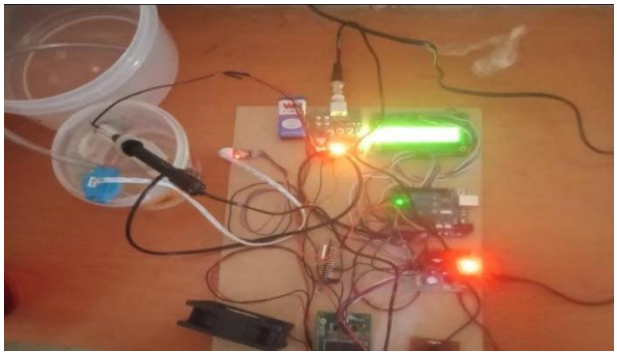

Fig 5. Output display

CONCLUSION

The design of an automated aquaponics system provides a sustainable and efficient method for cultivating both fish and plants in a symbiotic environment. Through the integration of sensors, actuators, and a central control system, it optimizes resource utilization, minimizes manual intervention, and maximizes productivity.

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