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AUTOMATED AQUAPONIC SYSTEM FOR INDOOR GARDENING

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ABSTRACT -Aquaponics is the eco-friendly system which is used for the production of food by utilizing certain concepts such as aquaculture and hydroponic. These methods ultimately help us to cultivate fish and crops without the vicinity of soil . The growth performance of a fish along with certain leafy vegetables will be tested and the result will be estimated during the recirculation of the system with respect to the temperature and the effective use of the fish excretion. Arduino usually acts as the brain of the system and that being used in aquaponic helps us to receive the information from the sensors and reciprocate as instructions with respect to feedback. Later, actions will be initiated based on the systems actuator. Aquaponics is an inexpensive symbiotic cycle between the living organism and the crop. In this system Fish excretion (ammonia) is incorporated into the plant bed which in turn acts as the biofilter and grasps the nitrate that is crucial for vegetation. Then the fresh water is returned to restart the cycle. The Fish is fed with pellets that contains 30% of the crude proteins that enhances almost all the nutrients that are required for efficient plant growth.

Keywords- Aquaponics,Aquaculture,Arduino,Internet-Of- Things,Indoor farming

INTRODUCTION

Aquaculture is a method through which the waste that is excreted from farmed fishes and other aquatic organisms which in turn supplies for the green plant to grow hydroponically along with the purification of water. It is an symbiotic ecosystem for the living organism and the plant. Aquaponic system continuously detects and estimates the state of the symbiotic ecosystem and lay holes of the restorative activity to stabilize the abnormality depending on the source given & diverge out of the accumulated source to upgrade the circumstances and risks towards the arrangement of the fish. The parameter in aquaponics include condition of the temperature , quantity of food , intensity of light etc. Hence , light and the feeder for the fish are managed by the user.

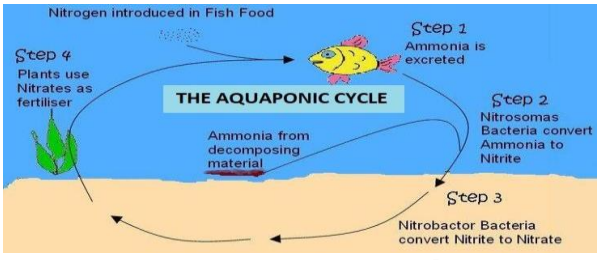


Fig 1._Aquaponic_cycle

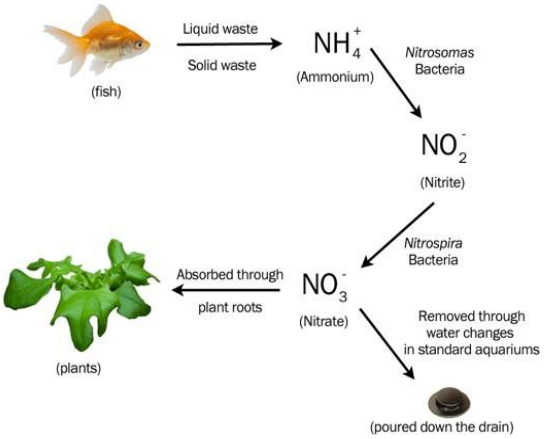


Fig 2. Aquaponic equation cycle

LITERATURE SURVEY

The existing systems employ different techniques in aquaponic system .[1] The rush in the inhabitants/ residents & the ultimatum through which there's an increase in the supply for food , agriculture (Urban) is on the hike constantly throughout the years along with the population. The scientists and the agriculturalists have been trying to find alternatives to expand solutions for the aquaponic culture . This paper particularly tells us about the systems & infusions of IOT & aquaculture .The final output is where the sensors is placed & is constantly observed and the reports are set aside in the google sheets which can be viewed for the future inspections . [2] aquaculture structure is an infusion of aquaponics + hydra culture. This system differentiates the characteristics of aqua by using PIC 16F877A mc along with another innovative intentions of internet of things . This particular method incorporates a lot of methods which also supports the parameters .[3] Aquaponics using the agricultural techniques with internet of things concept can be used control and access the applications that are installed on the mobile device using internet connection . The indoor aquaponic technique using the agricultural method is completely different from the normal farming method and can be useful to a person to do business as an acceptable source of income without the usage of the usual land for cultivation. [4] The growing of plants in indoor farming techniques using the internet of things is carried out to minimize the usage of chemical substances on plants . The fertilizer used is the crap fish nutrient to grow the plants . The measurement of pH is noted often to ensure the roots are well maintained from being damaged . The internet of things is implemented in this technique to control various factors and applications and to store the data in a database .

PROPOSED SYSTEM :

The primary agenda is to successfully design an aquaponics methodology that monitors & controls the potential of the parameter that will be more enhanced with Arduino nano implementation in the system .

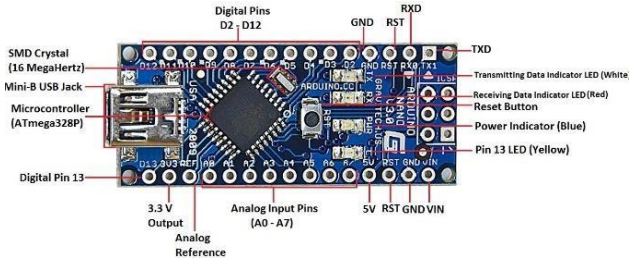
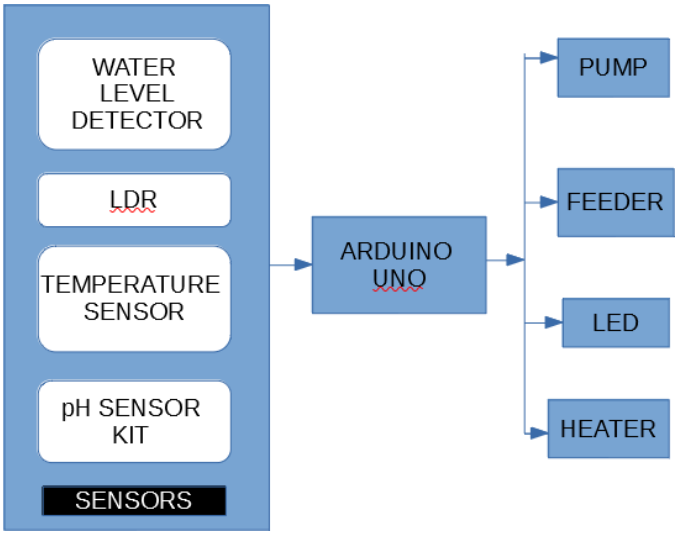


Fig 3. Arduino Nano

The system includes parameters like quantity of water , the alkalinity level of water along with the water conditions and intensity of the illumination inside the aquarium.

Fig 4. Aquaponic system using Arduino

SYSTEM ARCHITECTURE :



The model hardware is developed on an Arduino uno board consisting of the following sensors

1)Water level detector

2) LDR

3) Temperature sensor

4) pH sensor kit

The above four types are the hardware components that are controlled by the sensor. Along with these four components , there are four other components which will be functioning in an Arduino uno.

They are,

1) Pump

2) Feeder

3) LED

4) Heater

HARDWARE IMPLEMENTATION

The hardware implementation shows the desired final product of an Arduino uno. It describes about all the inner parts of this product, can be also called as the heart of an Arduino uno.

TEMPERATURE SENSOR

As the name suggests this is an temperature detection tool, which is used to detect the temperature of an Arduino uno. The main reason why we are using this in this product because this is very useful when wet conditions are required for this device. This sensor can work properly up to an temperature of 125 degree Celsius , but since the cable is covered in PVC, it is suggested to keep the temperature of the device below a 100 degree Celsius for the proper functioning of the device.

LDR

LDR stands for LIGHT DEPENDENT RESISTOR. It is also called as an photo resistor or an photocell. It is an type an tool which is used to control the amount of light that appears on the device. The resistance decreases when the LDR is used for an large amount of time, and exhibits a process called photo conductivity. It can be really useful in devices which are sensitive to light, and dark and light activated searching circuits. The sensitivity of an photo resistor can significantly change among different devices.

WATER LEVEL DETECTOR

The main use for this tool is to control the overflow of the water. The water level detector has three probes, the first probe is completely immersed in water, the second probe is semi-immersed and the third probe is not immersed in the water atall. These are marked as down, middle and up respectively. When the water is in the low and in the medium level the water does not go into the plant bed, but when the water reaches the top of the aquarium, it goes to the plant bed.

pH Sensor KIT

The use for an pH sensor kit is used to detect the pH of an solution. It explains whether it has an acidity or an alkaline nature.

FISH FEEDER

The fish feeder is present in the corners of the tank just above the water. It has an container which contains the food required for all the fish present there. It is connected to an DC motor, which can be used

to rotate the container so that the food required for all the fish can be provided. It has a specific mechanism where it explains the time interval between each time the food is given to the fish so that all the fish present there will be healthy, and for the amount of food dispersed also.

WATER HEATER

Water heater is a tool which is used to maintain a suitable temperature for the fishes to live. It is used to increase the temperature of the system. Normally the accurate temperature for all the fishes to live is 31 degrees Celsius. So when the temperature is below the required temperature, with the help of this tool we can bring the temperature to the desired number, which is 31 degrees Celsius.

WORKING:

Aquaponics is a catchall term used for farming on a large scale, The proposed work simplifies the system to be used for indoor farming with less human involvement.

The plant body is submerged in water rather than in soil.
The aquaculture system helps the fishes to grow. Nitrifying bacteria helps to break down the nitrogen in fish poop to be absorbed by plants, thus purifying the water to be sent back to the aquaculture system. Hence, fishes, plants, bacteria, and water are the critical components of the aquaponics system. A standpipe is used in the center of the plant bed as a fixation pipe. The standpipe is for the sole purpose of preventing the intervention of pebbles in the drainage. The fish pond is supported beneath the plant bed. Pipes are set for the transmission of water between the plant bed and the fish pond. The water containing the fish waste is then moved to the plant bed and the filtered water is moved from the plant bed to the fish pond..

ALGORITHM:
STEP 1: The aquaponics system is well understood using the system architecture
STEP 2: Firstly, the Water level detector is used to check whether there is any overflow of water and it is used to control the overflow of water in our setup.

STEP 3: A LDR or an Light Dependent resistor, is used for the Photoconductivity process to take place.
STEP 4: The Temperature sensor as the name suggests, is used to detect the temperature of the aquaponic system. Normally it can be used till 125 degree Celsius, but since they are made by PVC wires, it is suggested to keep the temperature below
100 degree Celsius.
STEP 5: The pH sensor kit is used to detect the concentration of the hydrogen ion.
STEP 6: The ARDUINO UNO acts as an interface between the sensors and the pump,feeder,led and heater.
STEP 7: pump facilitates the motion of solid, liquid or gas particles using mechanical action.
STEP 8: Next, the fish feeder is usually fixed at the corner of the pond , just above the water. By the use of DC motor when it is rotating at regular intervals, food is dispensed to the water so that the fish present inside gets enough food to live.
STEP 9: Next, the Led is used to give artificial light to the system when natural light is not present in the surroundings.
STEP 10: Finally, the Heater is used in the system to maintain a suitable temperature of about 31 degrees for the well survival of the fishes in the pond.

CONCLUSION AND FUTURE WORKS:

Aquaponics favors indoor vegetation of house-hold plants with less human intervention. This method will gain large scale attention in the future for its urban-friendly methodology and effortless vegetation technique.
It is usually implemented on a large scale industry level, But out proposal makes it possible to implement it efficiently in even a square foot width area under urban settings.

The proposed system uses arduino uno to control the automatic flow of the system with less human intervention.
The future work will include an IOT system to control the working of the system remotely.

The IOT system is integrated with almost every blooming technology and used Machine Learning algorithms alongside.

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