

Wi-fi based Aquaponic system using ARM LPC2148

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Abstract: Applications related to the web, different databases and multiple advanced mobile platforms can enable real-time data acquisition for effective monitoring on smart agriculture. To produce new facilities for aquaculture production automation and to achieve greater efficiency, this project presents an application for wireless network and Android platform that unites with an advanced control system to collect and monitor variables applied in aquaculture. The test and application shows that it is stable, has a high price-performance ratio, great mobility and easy to operate, It has a strong practicality and application possibility.

Keywords – Agriculture, Applications, Aquaponics, Aquarium, Monitoring, Wsm

I. INTRODUCTION

One of the most important changes in the parts of the world is the switch from traditional Aquaculture to comprehensive Aquaculture. For this type of Aquaculture, it is important to use exceptional techniques to improve automation and efficiency. Wireless Sensor Networks (WSNs) represent a developing technology that provides flexibility in sensor installation and network robustness, while reducing both maintenance complexity and the associated cost. Previous work has contributed to industrialized aquaculture through the implementation of intelligent monitoring system based on Wireless Sensor Networks. [1] The various technologies such as the computer controlled technology, the GSM and the GPRS technology are used to develop and design a range of facilities environment, remote monitoring and control systems, which have played positive roles in encouraging the development of aquaculture facilities.[1]-[2]. However, current trends are switching on mobile technologies. Smartphones are a common and important part of our daily life primarily because they are portable, universal, small and light. In recent years, the Android operating system and Android Smartphone have developed rapidly, especially since the launch of the Android 3G Smartphone fewer than 10,000 INR. The Android operating system is open source and free, it not only minimizes the system development costs, but also has a better human computer interaction technology because of object-oriented Java language supporting. Therefore, many applications based on Android platform are underdevelopment in several science and engineering fields. Similarly, Aquaculture is adopting such changes, and several Aquaculture applications have been generated describing real-time mobile phone applications. [4]-[5]

II. LITERATURE SURVEY

In hydroponics basically the roots of the plants are submerged into the water along with the chemical nutrients. A major difference between aquaculture and hydroponics is that there are no fishes used in hydroponics whereas on the opposite hand the breeding of the fishes along with the plants takes place in aquaculture and hence it provides two products and is more efficient. [3]

Aquaponics are of many types but the most major aquaponic type is the Chinese aquaponic system which can be implemented in lakes, reservoirs, ponds and streams. This system would help when there was a shortage of food in China. Aquaculture has a very productive result as it gives better product output rate and also there is no need of chemicals because the ammonia present in the effluents acts as a fertilizer for the vegetables. Aquaponic system can also be made from the recycled items such as plastic bottles, pans, containers. [3]

The best fish which is used for aquaponics is Tilapia and Yellow perch. These fishes can adapt to all kinds of climate and they can even grow big at times. [3] In conclusion, aquaponics is good for the environment as well as fast and easy to use. Without aquaponics some people today wouldn't have food. Also aquaponics would help the world grow, have more food, and help have less pollution when growing plants. The best part is that the fishes produce their own fertilizer that helps the plant grow faster. [1][3] Aquaponics is a method which provides sustainable food production system in which aquaculture and hydroponics accompany each other to make the growing of different crops possible. By using the two-in-one process, the effluents that fish leaves in the water filter make the latter grow. Aquatic effluents refer to the remains or natural waste matters of the fish raised in a fish tank. These waste materials make the tank water develop toxicity which could be harmful to the fish therein, but these are nutrients vital to the growth of the plants in the Aquaponic system. Hence, the system calls for a component that would remove the waste materials and pump out the water into the vegetable section

for plants. The fish waste provides various essential nutrients needed for the plant growth out of the thirteen nutrients.

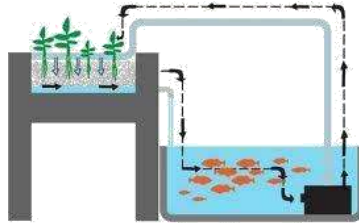


Fig 1: Traditional Aquaponic Methodology

III. PROJECT DESCRIPTION

1.1 Components Used:

- i. ARM LPC2148: An ARM LPC2148 is a family which totally belongs to the RISC architecture developed by Advanced RISC Machines (ARM). RISC processors perform a smaller number of computer instructions so that they can operate at a much higher speed and hence they can perform millions of instructions per second (MIPS).
- ii. Temperature Sensor LM35: It is an integrated-circuit temperature sensor, has its output voltage which is linearly proportional to the Celsius (Centigrade) temperature. It supports both single value and plus and minus supplies.
- iii. Optoisolator: It uses light to transfer the electrical signals between two isolated circuits. Here it is used to indicate the level.
- iv. Wifi Module ESP8266: It is a UART transmission Wifi module with ultralow power consumption. It supports antenna diversity and in this particular project it is the main component through which the system will be connected to the Android device.
- v. Relay driver: It is an electromagnetic switch which performs the on and off operation on its own. It is basically used when there is no need for a person to move the switch practically.
- vi. Motor driver L293D: It is a H-bridge motor driver integrated circuit. It acts as current amplifiers as they take a low current control signal and a higher current signal.
- vii. DC motor: A DC motor is a device which converts electrical energy into mechanical energy.

1.2 Softwares Used:

- i. B4A (BasicforAndroid): Basic4Android is a rapid application development tool for native Android applications, developed and marketed by Anywhere Software Ltd. B4A is an alternative to programming with JAVA and Android SDK.
- ii. Keil ARM Programming: Keil MDK is the complete software development environment for a wide range of Arm Cortex-M based microcontroller devices. MDK contains the μ Vision IDE, debugger, Arm C/C++ compiler, and essential middleware components.

IV. FLOW OF THE PROJECT

- This project will be performing the automation of a fish tank
- A level sensor will be used in order to detect the level of water in both the vegetable garden and the aquarium.

- A Temperature sensor is used to monitor a particular temperature in fish tank. If the temperature rises beyond the threshold value then the notification will be sent to user.
- Also, two pumps are used to control water and oxygen. The user will give the command from android app to ARM controller to on/ off the pumps.
- A dc motor is used to feed food into fish tank.
- All functions are done after giving manual commands from android application.

V. BLOCK DIAGRAM

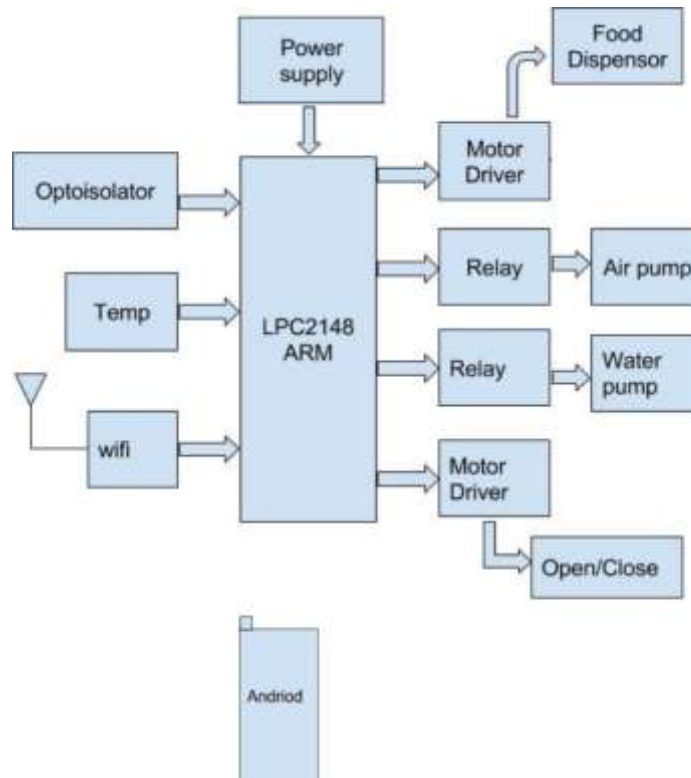


Fig 2: Block Diagram

VI. APPLICATIONS

- Aquaponics directly can be linked to a resort, especially on water deficient islands where fresh vegetables are difficult to source.
- Aquaponics can also be used as a visitors attraction or an organic/local produced shop/cafe or restaurant.
- Can be used for education and social development purposes in small institutions.

VII. ADVANTAGES & FUTURE SCOPE

1.1 Advantages:

- Efficiency of water use.
- Independence from soil.
- Reduced labour and improved working condition.
- Two for the price of one.
- Cost effective.
- User friendly Android application.

1.2 Future Scope:

- Aquaponics can be used for large scale purposes where both vegetables and fishes can be produced in multiple numbers.
- It can also be implemented in shopping malls where some of the floors are vacant.
- As traditional farming is becoming less popular, the implementation of Aquaponics will yield 100% organic product in the near future.

VIII. CONCLUSION

Aquaponic system is certainly the best solution for growing organic vegetables at homes in crowded cities as the space and water requirement for this system is less. It is an eco-friendly technology which can be improvised and made energy efficient at an individual's convenience and pattern of usage. It is necessary that we as society should look forward to produce better foods. If the society continues to ignore the current situation and uses the inefficient way to grow food then the future of both the environment and agricultural industry may see a downfall. There are many methods to increase efficiency but aquaponics is one of the most easy and environmentally friendly method that could easily satisfy the needs of all the people throughout the world.

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