International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

Vertical Farming With Smart Robotics

Mukund Mange[1], Komal Nale[2], Gayatri Yerawar[3]

[1,2,3]*Student, Dept. of Electronics and Telecommunication Engineering, D. Y. Patil College of Engineering, Akurdi, Pune, Maharashtra, India*

Abstract - *Due to the huge population, the rate of urbanization of modern cities increases very rapidly. Deforestation, acquisition of farm land for urbanization, which leads to insufficient water sources and affect on climate change, superbly unavailability of food. As land resources for agriculture decrease, the rate of natural food production from a farm also decreases. To improve the production and quality of farm product(specially in vertical farming)"Farming with Swarm Robotics" is the effective solution for massive food production in a less space of land without human interference. In this project, we are developing a system which will automatically monitor the farm, smart irrigation, temperature control, moisture control, Disease reorganization and resolution. It also take necessary action, provide Alerts/Alarms on web page to report the condition and solution. By using a swarm robotics with the concept of UAV drone the small size multiple robots is able to perform multiple farm tasks. All swarms are control through Node MCU ESP8266 wifi module; it helps to acquisition the farm data. The base station is work on microcontroller 328 and always connected to active swarms and network.. A superficial irrigation with swarm and cognitive robots play an important role to facilitated concept spreading of evolving vertical cropland and disease control in accordance with required pesticide for plant species with robust solution. It also includes the sense of IOT and AI platform. This study definitely answers the question regarding correlation between proximity to urbanization and transmission from horizontal to vertical farms.*

Key Words: Swarm robots (Drones), IOT, ATMEGSA328, Node MCU, Bernoulli's principle, vertical farm, irrigation system

1. INTRODUCTION

Future concern is the increased population whereas cropland are becoming smaller in landscape and sudden environmental changes. So that living organism will fill hard to cope up with this situation. So to overcome this problems we come up with robust solution of vertical farming which will implicate to achieve originality of crop at home level, at offices, at multistoried building, gardens, between bridges etc. Concept of vertical farming with swarm robotics is the one step toward herbal and oxygen abundant world. In this type of farming methodology, vertical stacks with different species of tree are planted vertically and swarm robots are one which are monitoring bodies of farm. Vertical stacks are arranged with superficial irrigation system. This irrigation system is innovated from Bernoulli's principal of fluid mechanism.

1.1 Vertical Farm

This consist of vertical stacks arranged in order such that each consist of different species of tree that might be fruit, vegetable, flower, etc.

1.2 Base station

This is actual electronic circuit which work in collaboration with farming structure. It has ATMEGA328 as controller body. Which has analog inputs as temperature sensor, moisture sensor, and wifi module. To communicate with swarm robots. Similarly its interfaced with LCD display to achieve real time readings to sensor.

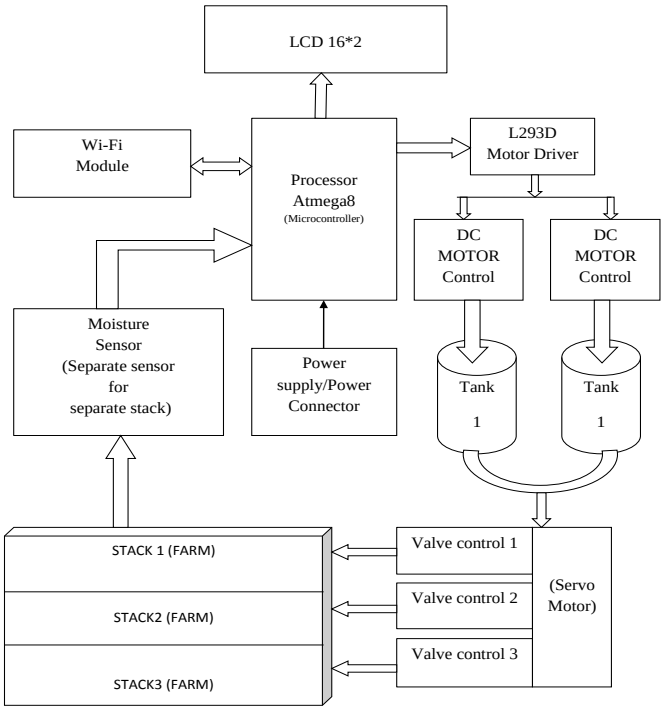


Fig -1: Base Station

1.3 Master-Slave Drone

Drone is master – slave module of swarm robots, where master (drone) is programmed to capture information in accordance with farming performance; like disease occurrence, temperature maintenance etc. other slave drones receives instruction to cope up with updated information to work accordingly. Slaves are other drone to perform chain of operations as seed sowing, water dropping, cultivating and so on. Master scan whole farm to monitor disease occurring probability; and request base station to provide fertilizer if any disease occur.

1.4 Irrigation System

Irrigation system is core of vertical platform. This contain the water tank open at both side above and below only above orifice has cap to open or close and below is opened. Once tank filled then above orifice will open and due to increased atmospheric pressure. This will start draining from below orifice. This is provided with multiple piping based on number of stacks and if above orifice then closed to closed water supply throughout. This is adapted as one of the application of Bernoulli's principle.

1.4.1 HOW DOES IT HAPPENED?

If water tank has opening from both side then pressure acting on water inside tank is

$$P(open) = h\rho g + \text{atmospheric pressure}$$

P = pressure inside tank

ρ = density of water

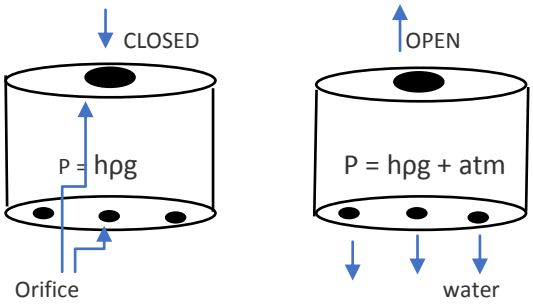
g = acceleration due to gravity

if above orifice is closed then pressure will be

$$P(close) = h\rho g$$

$$P(open) >> P(close)$$

Hence when pressure p(close) is act on water then water doesn't Come out of tank. If p(open) is acting then water starts draining



a) Closed tank *b) Opened tank*

1.5 Bernoulli's Principle

In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. The principle is named after Daniel Bernoulli who published it in his book Hydrodynamica in 1738. Although Bernoulli deduced that pressure decreases when the flow speed increases, it was Leonhard Euler who derived Bernoulli's equation in its usual form in 1752. The principle is only applicable for isentropic flows: when the effects of irreversible processes (like turbulence) and non-adiabatic processes (e.g. heat radiation) are small and can be neglected.

3. BACKGROUND

At beginning ATMega328 is start working and check the moisture readings. This readings are then displayed on LCD display. Then according to the water requirement of the stacks irrigation system is triggered. This tends to start dc motor to open and close water tank. As per requirement of the particular stack servo motors are start to run or stop. Once this is done at base station this all report of humidity and irrigation done at particular stack is then sent to web. Sent data on web can be accuse by owner of farm. After all procedure done at base-station it gives instruction to monitoring system which is on drone. This happened with help of wifi connectivity of nodeMCU at both hardware system. Then at drone motors start running clockwise and counter clockwise to take off drone. Drone is made so it can cover given area it has provided with to cover three vertical stacks. Now while scanning vertical stacks its temperature sensor sense the environmental and send it to web as well as base station to acknowledge the information regarding water requirement on basis of temperature measurement.

Image sensor keep capturing images at different time interval and give information regarding farm, plant, leaves etc. This collective information gathered from image sensor is able to conclude if farm is growing properly or if condition 0f any unknown disease has occurred. This is the system with memory to compare previous data with newer acquired data, so that we system understand if any defected information has arrived and this is then sent to web and base station as well as. If any disease has occurred then on web there is all information available for particular disease. This information captured on web is sense by owner of farm and which fertilizer is to be used is also shown on web itself. This make user to understand which solution is there for regaining farm normal. After owner can bring that required fertilizer from market and at what quantity he need to mix it with water and to give farm is also shown on web itself.

4. FUTURE SCOPE AND CONCLUSION

4.1 Future Scope

It makes the farming smarter, more accurate, and more productive. If we see the graph of the population growth, after few years the food will be very demanding parameter for man-kind. Some time due to the weather condition, or due to the unfortunate diseases on crops they will be protected.

4.2 Conclusion

It can be concluded that, by using this system the productivity of vertical farming can be increase. With the help of swarm robotics the farm monitoring and controlling become easier.

REFERENCES

1. H. Goldstein, "The green promise of vertical farms [Blueprints for a Miracle]," in IEEE Spectrum, vol. 55, no. 6, pp. 50-55, June 2018.
2. S. Vaishali, S. Suraj, G. Vignesh, S. Dhivya and S. Udhayakumar, "Mobile integrated smart irrigation management and monitoring system using IOT," 2017 International Conference on Communication and Signal Processing (ICCSP), Chennai, 2017, pp. 2164-2167.

BIOGRAPHIES

MUKUND BHAURAO MANGE
Electronics & Telecommunication Engineering , DYPCOE, akurdi

KOMAL PURUSHOTTAM NALE
Electronics & Telecommunication Engineering , DYPCOE, akurdi

GAYATRI AVINASH YERAWAR
Electronics & Telecommunication Engineering , DYPCOE, akurdi