WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Novel Method for Using Automation Modules in Precision Irrigation Systems

N.Akash[a], J.Joseph Dolphin Nithin[b], V.Pravin Kumar[c], R.Archana[d], C.Milton[e]

[a]*Student, Stella Mary's college of engineering, Ganapathipuram, Tamilnadu*
[b]*Student, Stella Mary's college of engineering, Ganapathipuram, Tamilnadu*
[c]*Student, Stella Mary's college of engineering, Ganapathipuram, Tamilnadu*
[d]*Student, Stella Mary's college of engineering, Ganapathipuram, Tamilnadu*
[e]*Assistant Professor, Stella Mary's college of engineering, Ganapathipuram, Tamilnadu*

A B S T R A C T

This extend centers on an IOT based shrewd water system framework which is taken a toll successful and can be utilized by a center lesson agriculturist in cultivate field.Exactingness farming is the unused trending term within the field of innovation with primary rationale to diminish the workload of the agriculturists and increment the efficiency of the ranches by utilizing innovations like I.O.T, WSNs, Inaccessible Detecting, Ramble observation and numerous more. By our reliable device we can irrigate fields only when there is a need of water and to provide information. The information is sent to the farmers by using cloud website called Adafruit IO. The farmers can monitor their farm's field using simply by just browsing the channel link of Adafruit IO.After all in last the water savings is compared in different soils like sand, clay and sandy clay. In comparison we can see the reduction of water from this system as of traditional process.

1. Introduction

Horticulture has an antiquated history about dates back to thousands of a long time. In addition, its progression has been pushed by executing the a few unused frameworks, hones, advances, and approaches with the time. It utilizes over one-third of the worldwide workforce. The farming is the spine of an economy for numerous nations and executes a noteworthy commitment to the improvement of the economy for immature nations. Other than, it steers the method of financial thriving in created nations. A few inquire about considers concluded that by and large world farming employments roughly seventy percent per year accessible new water to water as it were seventeen percent of the land. Another side, the whole accessible watered arrive is slowly diminishing due to the quickly expanding of nourishment prerequisites and impacts of worldwide warming. In other words, agribusiness is managing with modern fundamental noteworthy challenges. Foote said FAO detailed that world nourishment generation must be expanded byseventy percent to supply adequate nourishment generation for the fast-growing populace and urbanization. The anticipated world populace development for the half of the display century is overwhelming. In any case, depending on the gauge, it can be anticipated to rise over the nine billion individuals by midcentury. As numerous ponders detailed that the populace is expanding exceptionally quick, the worldwide populace was one billion in 1800,and it increased to seven billion people in 2012. However, studies report feared that at the end of the current century, it could be expected to reach eleven billion people and there could be many, many more mouths to feed soon. Thus, the rapid increase of the population, alongside the decrease in agriculture land, intensification of global climate changes, and exacerbation of water resources, declines labor force and energy crunches are posing tremendous challenges and hurdles to the agriculture sector. Furthermore, the developing and developed countries will deal with substantial water crises and issues due to rapid urbanization and industrialization. The available fresh water for irrigated agriculture land is supposed to decrease in future. Besides, the unpredictable climate changes include extreme weather conditions, intense storms, heat waves, and floods will have a substantial

* *Corresponding author.* Tel.: +0-000-000-0000 ; fax: +0-000-000-0000.
E-mail address: author@institute.xxx

adverse impact on world agriculture sector. We need more production from agricultural systems to meet the growing food demands. Otherwise, we will suffer from food insecurity problems which will be the biggest threat. Moreover, Quid and coworkers revealed that the progress of the agriculture production is not only significant for to producing food to feed the population, but it is also essential for the industrial sector. Similarly, the agriculture is the main source to produce the raw material for many industrial sectors. Therefore, it must be understood that industrial and agricultural developments are not alternatives.

1.1. The Aeroponic System

The aeroponic system is one of the techniques of the soilless culture, where the plant grows in the air with the assistance of artificial support instead of soil or substrate culture. It is an air-water plant growing technique where lower portions such as the roots of the plant are hanged inside the growth chamber under complete darkness in controlled conditions. However, the upper portions of the plant such as leaves, fruits, and crown portion are extending outside the growth chamber. Usually, the artificial supporting structure (plastic or thermoform) is provided to support and divide the plant into two parts (roots and leaves). In the system, plant roots are openly exposed in the air and directly irrigated with a small droplet size of the water nutrient at interval basis. The nutrient solution is supplied through different atomization nozzles with or without high air pressure. Moreover, several studies considered aeroponics as a modern-day agricultural activity which is practiced in an enclosed growth chamber under entire controlled conditions, as it could eliminate the external environmental factors as compared with traditional agriculture activity. Hence, it is no longer dependent on large-scale land use, and it could be set up in any place, a building that has lifted global climate without considering the current climate such as rainy season and winter. Buer et al. reported that atomization nozzle uses the tiny amount of the water nutrient solution and provides an excellent growth environment for the plant. Zobel and Lychalk said it is a modern-day agricultural research tool which provides several agricultural research opportunities for a researcher with significant results by providing artificial growth conditions. However, Table 1 shows the essential monitoring and control parameters in the aeroponic system. Hessel et al. and Clawson et al. studies discovered that aeroponics contributes to the advances and developments in many areas of plant root studies. It provides an excellent chance for plant researchers to deeply study the behavior of plant root under different conditions and without any complications. Until now, many researchers had conducted plant root research and experimental studies root response to drought, effects of different oxygen concentrations on plant root development, root microorganism, arbuscular mycorrhizal fungi production, and legume-rhizobia interaction. Furthermore, studies also practiced the technique by growing vegetables, fruits, herbs, and medicinal root-based plant such as tomato, potato, soybean, maize, lettuce, Anthurium andreanum, and Acacia mangium.

1.2. Key Problems And Difficulties Of The Aeroponic System

Aeroponic cultivation is performed in an outdoor and indoor installation and or in a greenhouse under controlled conditions. It may be carried out within a facility that includes the provision of light for plant growth, the centralized delivery of nutrient solution, and electrical power. The growing plants are set in a growth chamber and periodically soaked with nutrient solution small mist ejecting through atomization nozzle. In addition, the aeroponic system gives the chance to control the entire growth chamber environment precisely. The aeroponic system is the modern technique of the agriculture which is still under development. Until now, limited studies have been performed, and conducted studies concluded that the system has some problems and issues. Studies suggested that aeroponics is performed without soil or any solid media; thus, the main observed problems are water and nutrient buffer, any failure of the water pumps, nutrient solution distribution and preparation, atomization nozzle clogging, and so on, which lead to rapid death of the grown plant. Kernahan and Cupertino reported that the aeroponic system provides better control of the plant growth and nutritional availability and prevents the plant from various diseases and root rot. However, during plant growth from sowing to harvest time, the methods adopted in the aeroponic system require a little hand-operated contribution, interference regarding physical presence, and expertise in domain knowledge of plants, environment control, and operations to maintain and control the growth of the plant.

1.3. Sensor Network

In recent years, early fault detection and diagnosis using an intelligent agricultural monitoring system is considered as the best tool to monitor plant without any complicated operations and laboratory analysis which required domain expertise and extensive time. The development of these convenient features has attracted much attention in the agriculture. The system is based on a wireless sensor network which comprises of a data server, a wireless convergence node, a plurality of wireless routers, and a plurality of wireless sensor nodes. However, the wireless sensor nodes are used as thesignal input of the intelligent agricultural monitoring system and are used to collect each selected parameter of farming operations to be monitored. Park et al. stated that wireless sensor network-based systems could be a significant method to fully automate the agriculture system, because the sensors provide real-time significant information and believed to eliminate the considerable costs of just wiring. Another study by Kim said that in agriculture, sensor network technique helps to improve existing systems installed in the greenhouse efficiently and smoothly by forwarding real-time collected information to the operator through the radio signals. The system optimizes the transmission protocols more accurate and quick and maximises the application of energy to save the energy and reduce the consumption. Pala and team suggested that the utilisation of artificial intelligence techniques in the aeroponic systems could lead not only to find early fault detection but also to fully automate the system without any or small interventions of human operators. The aeroponic system could gain more popularity among local farmers by deploying this technique in a system for monitoring and controlling purpose. However, it will conserve resources and minimise impacts on the environment. The farmers could start to understand their crops at a micro scale and able to communicate with plant through accessible technology. Therefore, in this article, we explored how wireless sensing technologies wove into the aeroponic system. Thus, the primary motivation of this review article was to provide an idea about different intelligent agriculture monitoring tools used

for early fault detection and diagnosis for plant cultivation in the aeroponic system. Additionally, it would be helpful for the local farmer and grower to provide timely information about rising problems and influencing factors for successful plant growth in the aeroponic system. The adoption of the intelligent agriculture monitoring tools could reduce the concept of unsuitable for the amateur.

1.4. Existing system

The Smart Farm Monitoring System is a mixture of hardware and software additives. The hardware part includes embedded systems and software program is the Arduino IDE. The Arduino IDE displays readings from sensors are inserted using the hardware. The special sensors used are temperature and humidity sensor and soil moisture sensor. The facts gathered with the aid of the sensors are sent to the Arduino UNO microcontroller ATmega328.The gathered information may be displayed in an Arduino screen. A GSM module is hooked up with the Arduino to facilitate messaging service which updates the farmers each 10 seconds approximately the climate conditions of the subject.

2. Proposed System

In this section, we discussed the state of art contributions by other researchers in this field. More of the work had been done on Controlled Environment Agriculture which mainly focused towards cultivating on minimal or no land of which the few contributions are discussed below: Kadge.et.al proposed Wireless Control System for Agriculture Motor in which he designed a system to control the throughput utilizing the SMS feature of the mobiles. The communication can be through SMS, i.e. the farmer can get message when the motors are ON or when they are OFF. This project implementation has been done in India successfully and helped during non-deterministic weather conditions. The motor is turned off whenever the farmer receives an alarm about single phasing. He emphasizes there is a need for personal GSM connection for this type of implementation. Finally, the author points out that GSM can be used with the digital mobile phone system and it compresses the information basically and transfers it down the channels with other two stream of the user's data with the intervention of service providers.

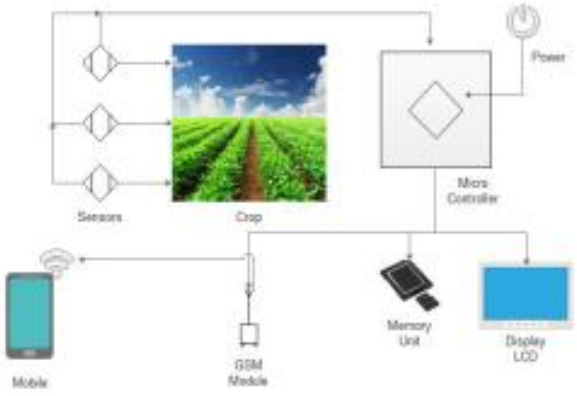

Fig. 1 -model diagram for proposed work.

3. Functional Requirement

The successive requirements specify the functions and units of the proposed system. They characterize the behavior of the system relating to necessity:

- Measure Temperature.
- Gauge Humidity.
- Quantify the water level.
- Estimate the light intensity.
- Sense the Air Toxicity.
- Display the sensor readings on the LCD screen
- Allow user to modify the optimal values for the sensor.
- Respond to sensor readings and send alerts to the user.

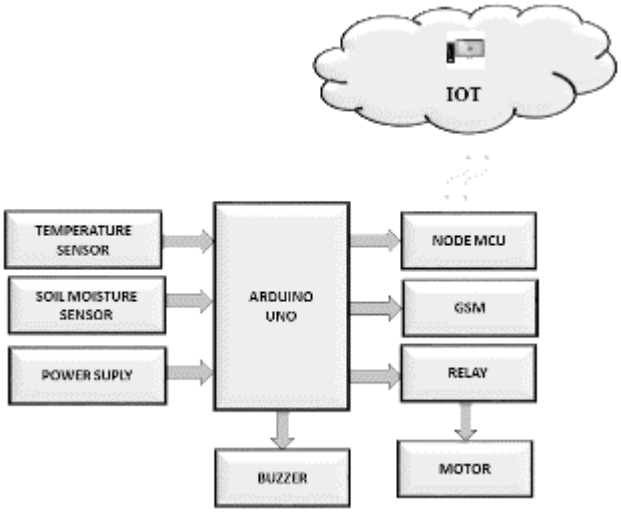

Fig. 2 - block diagramfor proposed work.

4. System Architecture

The proposed system is modelled using Arduino mega development kit which connects to light sensor for measuring the light intensity environment temperature/humidity sensor for getting the temperature and humidity in the sounding al mature sensor for volumetric water level, and air toxicity sensor for mean carbon monoxide and level. Moreover, them and can oxygen be undo continuously analyses the temperature, water level and the amount of light reaching the plants which is vital for greenhouse systems.

Conclusion

The Smart Farm Monitoring System, which employs a cutting-edge technique for precise watering, might be considered one of agriculture's determining variables. Farmers would be relieved because it lightens their workload in terms of manual labour. The project provided an opportunity to examine the current buildings, together with their benefits and drawbacks, and led to the construction of a device to monitor soil moisture levels. The aforementioned device can be used to automate irrigation, which is one of farming's most time-consuming tasks, by turning on and off water sprinklers based on soil moisture levels. One of the most labor-intensive hobbies is agriculture. To irrigate soil, the device uses information from soil moisture sensors. Similar to this, experiments are conducted with live knowledge (Temperature, Moisture) of farm measurements. Through intelligent farming, the method aids farmers in raising average crop production ratings and plant quality.

REFERENCES

Dmitrii Shadrin;Alexander Menshchikov;Andrey Somov;Gerhild Bornemann;Jens Hauslage;Maxim Fedorov,2020, “Enabling Precision Agriculture Through Embedded Sensing With Artificial Intelligence”, IEEE Transactions on Instrumentation and Measurement, vol: 69, no: 7,pp. 4103 – 4113.

Francisco Yandun Narvaez;Giulio Reina;Miguel Torres-Torriti;George Kantor;Fernando Auat Cheein,2017, “A Survey of Ranging and Imaging Techniques for Precision Agriculture Phenotyping”, IEEE/ASME Transactions on Mechatronics, vol: 22, no: 6,pp. 2428 – 2439.

Fernando Auat Cheein,2016, “Intelligent Sampling Technique for Path Tracking Controllers”, IEEE Transactions on Control Systems Technology, vol: 24, no: 2,pp. 747 – 755.

Sen Wang;Xinxin Zuo;Runxiao Wang;Ruigang Yang,2019, “A Generative Human-Robot Motion Retargeting Approach Using a Single RGBD Sensor”, IEEE Access, vol: 7,pp. 51499 – 51512.

Ayan Chaudhury;Christopher Ward;Ali Talasaz;Alexander G. Ivanov;Mark Brophy;Bernard Grodzinski;Norman P. A. Hüner;Rajnikant V. Patel;John L. Barron,2019, “Machine Vision System for 3D Plant Phenotyping”, IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol: 16, no: 6,pp. 2009 – 2022.

Vincent Bonnet;Philippe Fraisse;André Crosnier;Maxime Gautier;Alejandro González;Gentiane Venture,2016, “Optimal Exciting Dance for Identifying Inertial Parameters of an Anthropomorphic Structure”, IEEE Transactions on Robotics, vol: 32, no: 4,pp. 823 – 836.

Mary B. Alatise;Gerhard P. Hancke,2020, “A Review on Challenges of Autonomous Mobile Robot and Sensor Fusion Methods”, IEEE Access, vol: 8,pp. 39830 – 39846.