Advanced Polyhouse Farming Technology

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Abstract -*In* India, agriculture is the main profession for the majority of its population. By combining technology with agriculture, a new approach, known as Polyhouse Cultivation is being developed to achieve good crops with less labor cost. It lessens dependency on rainfall and makes optimal use of land and water resources. Polyhouse is a structure that is made up of polyethylene sheets having a semi-circular or rectangular shape to grow crops in a controlled environment even in unfavorable conditions. By using an automated system, crucial parameters like temperature, humidity, and water level necessary for the growth of plants can be maintained automatically.

I.INTRODUCTION

Even in the modern era of industrial development, cultivation plays a very vital role in the overall socio-economic growth of India. The pillar of the Indian Economy is Agriculture.43% of India's sector comes under agricultural domains. Around 52% of India's people are getting employment only because of agriculture along with other associated fields like forestry and logging.Farming also accounts for 8.56% of the country's entire exports. As per the investigation made in 2007, agriculture accounts for 16.6% of India's Gross Local Product Polyhouse is supreme for proper plant growth and high vintage of the crop, where the climatic parameters can be controlled automatically. Polyhouse farming is currently, one of the most intensive, and is considered a highly fruitful and environment-friendly cultivation practice.Polyhouses are built using an ultraviolet plastic sheet of width 1501m which goes on for a least 5years. Bamboo or iron pipes are used to build it.

Overall the width of 4-5 feet and the length of poly houses is 25-30 feet. The size of the polyhouse may differ according to the condition. Typically the polyhouses are always focused towards East to West which allows the polyhouse to consume extreme sunlight. Independent of the period the moistness and temperature levels can be consequently controlled in the polyhouse hence bringing about appropriate plant development and high yield of the harvest. The prevailing variations in the demand and supply of off-season fruits and vegetables can be dropped by adopting modern technology.

II. LITERATURE SURVEY

There are several methods to provide the solution for the effective use of agricultural automation. In most of the paper Zigbee, WSN, and GSM technologies are used. But these technologies have certain limitations related to cost, troubleshooting, and human intervention. The curtailment of the polyhouse automation system with Arduino and other microcontroller are the speed is less, does not work with PID (Proportional-integral-derivative) control and it's difficult to launch it and make it available for the users. In this section, the related work of polyhouse automation is explained. There are several types of techniques that gives the solution for use of polyhouse automation.

Lijun Liu and Yang Zhang have designed of polyhouse environment monitoring structure based on Wireless Sensor Network. The system is designed using to Zig-Bee sensor network technology, and wireless transmission of information, to solve the issue of complex wiring. When any problem occurs in zig-bee-compliant outdoor appliances then replacement cost will be high. Coverage is limited and hence used in indoor wireless applications.

Zhaochan Li1, Jinlong Wang, Russell Higgs, Li Zhou, and Wining Yuan studies the intelligent management of agricultural greenhouses designed on the Internet of things. In this paper the idea of the Agricultural IOT makes effective use of networking technology in agricultural production, the hardware part consist of temperature, humidity, and light sensors and processors with a large data processing capability. The drawback of this paper is the hard designing and overall realization of system requires human intervention.

G. Sahitya, Dr.N.Balaj, Dr.C.DNaidu, S.Abinaya implemented the Wireless Sensor Network for PrecisionAgriculture using Zig-bee. For precision agriculture, the WSN system is developed. Precision agriculture constitutes of applying the right inputs at the right period to get extra cultivation with less power and work. The whole network doesn't affect by the single node of damages or malfunctioning.

LUO Quan, QIN Linlin, LI Xiaofeng, and WU Gang has been successfully established a control system and wireless sensor based on Zigbee in polyhouse. If the temperature changes of each node, users can be very intuitive to see the variation of temperature and control the fan to open or stop through the PC software. This system takes the modern greenhouse as the research object and studies the wireless sensing and control network created with the help of the Zigbee protocol.

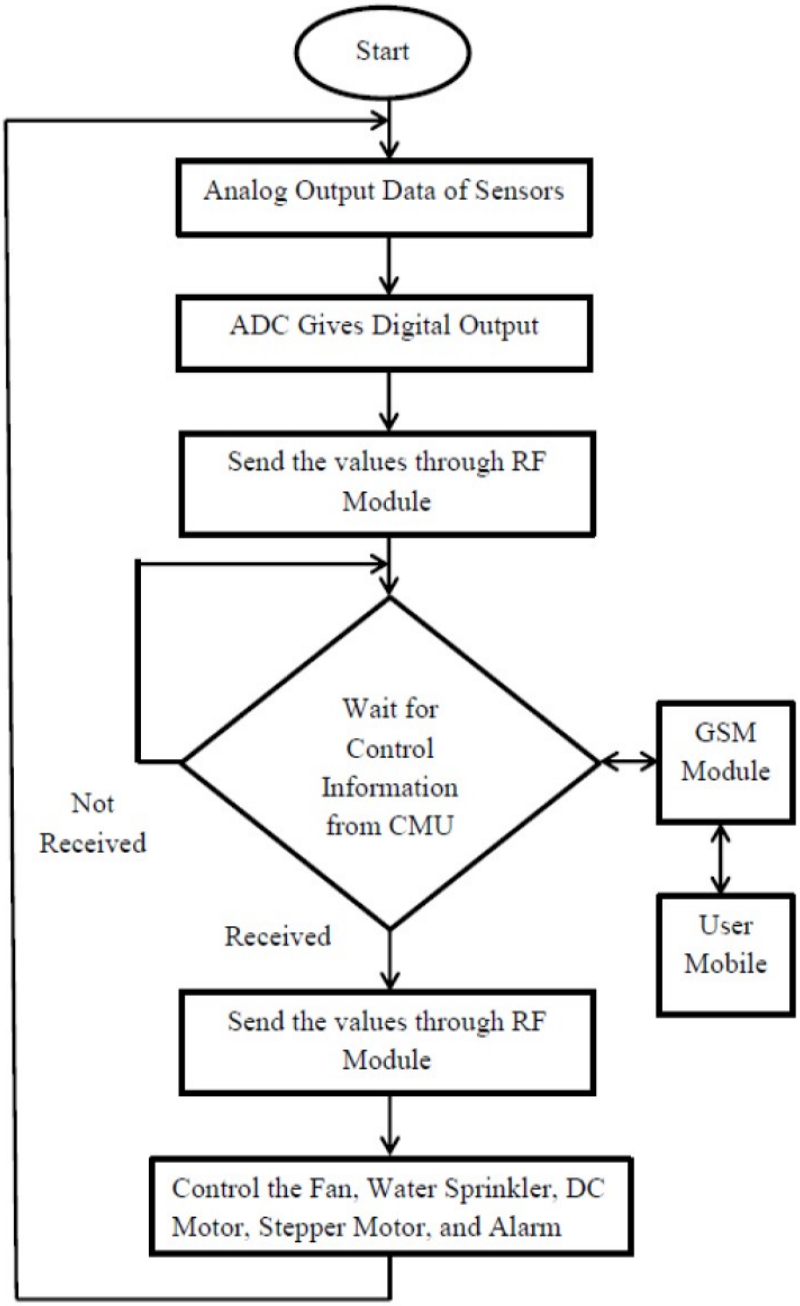
Ahmad Ashraf Abdul Halim, Ammar Zakaria, Altaha MunirahKamaruddin, Asyraf Hakimi Abu Bakar and ,Najmuddin Mohd Hassan they have worked on polyhouse Management System for automated Scheduling established on Plant Growth. In this examination the use of administration on every period of the product cycle and improving scheduler for steady observation. Can operate without human intervention. Need to develop a multi-hop network between the sensor nodules inside the polyhouse.

Marwa Mekki, Osman Abdallah, Magdi B. M. Amin, TafaoulAbdalfatah, Moez Eltayeb and Amin Babiker have presented a system which is constructed to read different parameters in greenhouse like temperature, humidity, light, harmful gases, and moisture. The system core is Arduino-compatible technology and the WSN based on Wi-Fi is used for short-distance communication and GSM for global system communication. Designing a GUI panel to monitor and control the sensor node components and devices is done with the help of LabView software. But the system is verified in a lab, and a field test could be achieved for field authentication.

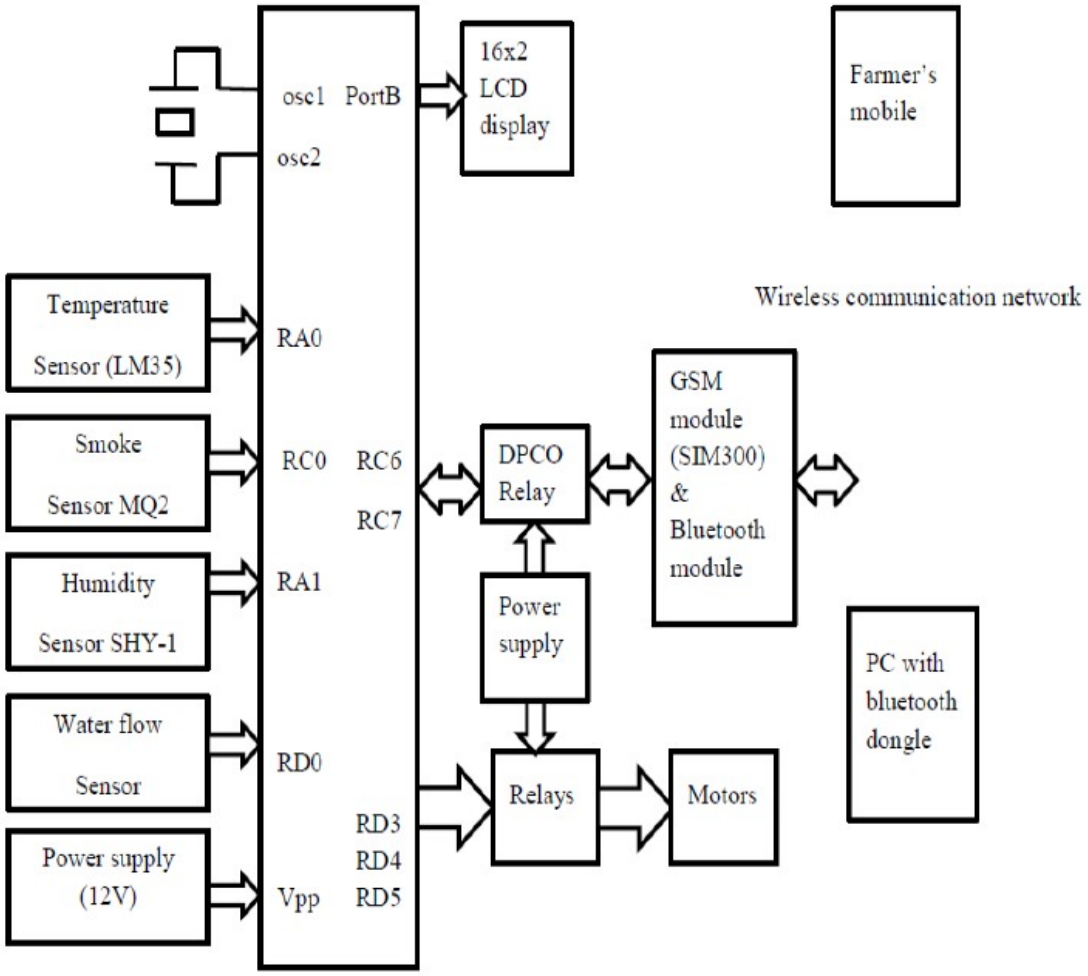
PrathibaJonnala and Abdulla Shaik executed the model ofpolyhouse automation in which continuous observation and control of environmental parameters inside the polyhouse using mobile communication is proposed. The proposed system reduced human effort. The provision of automatic control of fans providing cooling environment inside the polyhouse makes the farmers work easy and it can be done by using the proposed system with less hardware and using simple operations.

III.PROPOSED SYSTEM

Few surrounding parameters like ambient temperature, humidity percentage, and light intensity range and soil moisture content inside polyhouse are controlled. The atmospheric conditions are different during day time and night time. Therefore the threshold values for the sensors are programmed according to that in the CMU and the necessary actions are performed at actuator node to maintain the required environmental conditions. Wireless transmission of sensors data using Zigbee module makes the system automatic and human efforts also get to reduce.



Working Algorithm



Block Diagram

EC Sensor-

EC sensor is measures the electrical conductivity in asolution. It is used to calculate the amount of salts, impurities and nutrients of freshwater.

Specification-

- Operating temperature for EC sensor is 5-40

Degree Celsius.

- Measuring range is 1ms/cm-20ms/cm.

Humidity Sensor-

Humidity sensor senses, reports and measures togethermoisture and air temperature. The proportion of moisture in the air to the maximum amount of wetness at a certain air temperature is called relative humidity.

Specification-

- Measuring ranges between 0- 100 % RH.
- Output range 0-100 %RH.
- Power voltage is 24V AC +10%, 50/60 Hz+/-2% 24V DC +/-10%.

Temperature Sensor-

We used thermocouple as temperature sensor. Commercial thermocouples are low cost. The main drawback of thermocouples is accuracy.

Specification-

- Self-powered.
- Can measures wide range of temperatures.

Advantages:

1. The system has more flexibility.
2. Power consumption is low, therefore cost effective.
3. Wireless transmission of data using Zigbee module.

IV .CONCLUSION

In India traditional farming is popular but Polyhouse farming has come forward to replace this traditional farming. It provides better crop in a short period of time with less manual labor. It reduces reliance on rainfall & apex usage of land & water resources. Polyhouse farming help the farmers for their living by growing multiple crops. Polyhouse cultivation avoids over & under irrigation and reduces the wastage of water. The main advantage is that the system'saction can be changed according to the situation for different types of crops, extreme weather conditions like floods & draught. A stand by battery or solar cell can be used for reducing the power consumption and to avoid the power failure.

REFERENCES

[1] *Fujita, K. "Green Revolution in India* and Its Significance in Economic Development: Implications for Sub-Saharan Africa". Retrieved September 29, 2013, from

[2] http://policydialogue.org/files/events/Fujita_green_rev_in_india. pdf.

[3] Kalyan Mohan Goli, et al. "Integration of Wireless Technologies for Sustainable Agriculture," International J. of Computer Science and Technology 2, no. 4, (2011): pp.83-85.

[4] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. "Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with Boost Converter" Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.

[5] C. Nagarajan, G.Neelakrishnan, R. Janani, S.Maithili, G. Ramya "Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay" Asian Journal of Electrical Science, Vol.11 No.1, pp: 1-8, 2022.

[6] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[7] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, "Perfromance Investigation of T-Source Inverter fed with Solar Cell" Suraj Punj Journal for Multidisciplinary Research,2021, Volume 11, Issue 4, pp:744-749

[8] PrathibaJonnala, Sadulla Shaik "Wireless Solution for Polyhouse Cultivation Using Embedded System" 978-1-4799-2075-4/13/$31.00©2013IEEE.[4]https://en.m.wikipedia.org/wiki/Programmable_logic_controller

[9] http://www.kronotech.com/PLCAdvantages.htm[6] Lijun Liu, Yang Zhang,"Design of Greenhouse Environment Monitoring System Based on Wireless Sensor Network" 2017 3rd International Conference on Control, Automation and Robotics©20 17 IEEE.

[10] Zhaochan Li1, Jinlong Wang, Russell Higgs, Li Zhou, WenbinYuan4,"Design of an Intelligent Management System for Agricultural Greenhouses based on the Internet of Things", IEEE International Conference on Computational Science and Engineering (CSE) and Embedded and Ubiquitous Computing(EUC),2017

[11] G. Sahitya, Dr.N.Balaj , Dr.C.DNaidu, S.Abinaya," Designing a Wireless Sensor Network For Precision Agriculture Using Zigbee ",IEEE 7th International Advance Computing Conference 2017.

[12] LUO Quan, QIN Linlin, LI Xiaofeng, WU Gang." The implementation of wireless sensor and control system in greenhouse based on ZigBee" Proceedings of the 35th Chinese Control Conference July 27-29, 2016, Chengdu, China.

[13] Ahmad Ashraf Abdul Halim ,Najmuddin Mohd Hassan , Ammar Zakaria ,Latifah MunirahKamaruddin , Asyraf Hakimi Abu Bakar ,"Automated Scheduling Based on Plant Growth For Greenhouse Management System Ahmad ", 3rd IEEE International Conference on Electronic Design (ICED) 2016.

[14] Marwa Mekki, ,Osman Abdallah, Magdi B. M. Amin, Moez Eltayeb, TafaoulAbdalfatah, Amin Babiker," Greenhouse monitoring and control system based on wireless Sensor Network" International Conference on

[15] Computing, Control, Networking, Electronics and Embedded Systems Engineering, 2015, IEEE 2015.

[16] PrathibaJonnala, Sadulla Shaik," Wireless Solution for Polyhouse Cultivation Using Embedded System" 2013 International Conference on Renewable Energy and Sustainable Energy [ICRESE'13], ©2013 IEEE.

[17] Reza Ezuan Samin, Lee Ming Jie, Mohd. Anwar Zawawi," PIDImplementation of Heating Tank in Mini Automation Plant UsingProgrammable Logic Controller (PLC)" International Conference on Electrical, Control and Computer Engineering Pahang, Malaysia, June 21-22, 2011, ©2011 IEEE. G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation ofcascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal forMultidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[18] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. "Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with BoostConverter" Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.

[19] C. Nagarajan, G.Neelakrishnan, R. Janani, S.Maithili, G. Ramya "Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay" Asian Journal of Electrical Science, Vol.11 No.1, pp: 1-8, 2022.

[20] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[21] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, "Perfromance Investigation of T-Source Inverter fed with Solar Cell" Suraj Punj Journal for Multidisciplinary Research,2021, Volume 11, Issue 4, pp:744-749

[22] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, “Perfromance Investigation of T-Source Inverter fed with Solar Cell” Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp: 744-749.
[23] C.Nagarajan and M.Madheswaran - ‘Experimental verification and stability state space analysis of CLL-TSeries Parallel Resonant Converter’ - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372,Dec.2012.
[24] C.Nagarajan and M.Madheswaran - ‘Performance Analysis of LCL-T Resonant Converter with Fuzzy/PIDUsing State Space Analysis’- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
[25] C.Nagarajan and M.Madheswaran - ‘Stability Analysis of Series Parallel Resonant Converter with FuzzyLogic Controller Using State Space Techniques’- Taylor & Francis, Electric Power Components andSystems, Vol.39 (8), pp.780-793, May 2011.
[26] Nagarajan and M.Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T SeriesParallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal ofElectrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.