IoT Based Low Cost and Intelligent Module for Smart Irrigation System using Artificial Intelligence

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ABSTRACT: Agriculture contributes to a major share in the Indian economy and most of its people are dependent on it for their livelihood. This makes water an important resource that needs to be preserved using the latest available technologies. Apart from being fundamental in industry 4.0, IoT also extends its capability to smart farming. Work proposed here targets to develop a low cost intelligent system for smart irrigation. It uses IoT to make devices used in the system to talk and connect on their own, with capabilities like: admin mode for user interaction, one-time setup for irrigation schedule estimation, Timer and Event based water pumping control for remote data monitoring using BLYNK server.

The aim of proposed project is to implement real time atomization of Modern Agricultural System using IOT protocol method. These projects ensure the pumping system in agricultural sector to be a valuable process with low cost, low power, efficiency, compactness, etc. In this project, IoT have been developed for environmental agricultural monitoring and management of the crop field. This system was designed to monitor the status of temperature, humidity and soil moisture using android mobile phone. The IoT does not require any external power supply as it obtains its energy from a solar panel which is a renewable source of energy. Various nodes in different places are connected via IoT which transmits and receive the data in a node that transmits the status of the crop field to the user through IoT (blynk server) to control the pumping system. The system uses MQTT and HTTP to keep the user informed about the current crop situation even from a distant location. The proposed system proves beneficial with its intelligence, low cost and portability, making it suitable for greenhouse, farms, etc.

Keyboard—BLYNK, IOT, Zigbee, Arduino.

I.INTRODUCTION

IOT based monitoring system for the agriculture was developed for automation. Temperature, humidity, and moisture measurements were considered for study. For temperature and humidity integrated sensor was used and for moisture measurement self-developed sensor based on electrical conductivity was developed and calibrated. Zigbee protocol was used for collection of field data at centre node and for user interface Global System for Mobile communication (GSM) service was used as it is reliable and easy to reach for most of the people. Data gathered was stored locally in memory for analysis purpose in the future.

In recent years, the desire to connect all electronic computing devices together has increased. Although they can be connected through wired lines, it is more convenient and effective to use wireless links when we consider the large number of pervasive devices in the environment. In the coming years, it is expected that the IOT will be commonly used in applications in consumer electronics, PC peripherals, home automation, home security, personal healthcare, toys and games, industrial control and monitoring, asset and inventory tracking, intelligent agriculture and so on. Most of the developments and experimental deployments of IOT are inclined to be achieved for citizen in towns. However, there are some researches to share the technology with people in a farming village reported the result of deployments in a vineyard. The contributions of our paper are organized as follows. The system architecture system is presented from sensor/actuator node hardware in the bottom to management sub-system in the top and is evaluated in the real deployment.

II.AIM & OBJECTIVE

The objective of this work is to Interacts with user and gets planted crop details. Estimates beforehand the irrigation. schedule for complete season. Gets ambient and soil statistics. Performs evapotranspiration and neural based irrigation decision. Alerts irrigation unit to enable zone-wise watering. Sends sensor data to MQTT broker to allow remote data monitoring.

III.EXISTING SYSTEM

The management of these farms which are in greenhouses will require a data acquisition to be located in each greenhouse and the control room where a control unit is located. These are separated from the production area. At present, the data is transferred using wired communication called field bus. This data is transferred between greenhouses and control room. Different communication technology has been developed for communication between network and its element. ZigBee, WI-FI, Bluetooth,

Existing wireless sensor networks that monitor agriculture infrastructure measures different soil parameter and environment conditions. This WSN is composed of node with software and hardware units. Node has control unit which control sensors and communicate with base station. At mega and ARM are frequently used as control unit. ZigBee, Bluetooth, Wi-Fi used for transceiver in WSN.

IV.PROPOSED SYSTEM

In the Internet of Things (IoT) pattern, all things which are everywhere will be on the network in one form or another.

There are two sections in our project one is transmitter section which is placed in farm as sensors and another section is receiver section is users PC. Soil moisture sensor is used to measure the amount of moisture content present in soil. Moisture sensor data are fed to the microcontroller. Microcontroller acts according to the control algorithm. Sensor output is analog in nature in the range of 0-5v. Microcontroller converts analog data to digital data. When the moisture content present in the soil is dry, then water flow in a tank starts to flow in a pipe by turn ON the motor.

When the moisture content in the soil is high, then the water flow in a tank stops to flow in a pipe by turn OFF the motor. The same moisture content and flow level will be displayed in LCD display of micro-controller. The sensor values are transmitted to IOT mobile phone. Microcontroller transmits the data's using internet this project offered stable remote access to field conditions and real-time control and monitoring of the variable-rate irrigation controller. The main purpose of this project is to monitor the paddy crop field in a wireless manner. Here we sense the temperature, moisture and water level in the well using temperature, humidity and flow sensor respectively. The analog value from the sensors is converted to digital format by the ADC. The AT-mega controller gets the output from the ADC.

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V.BLOCK DIAGRAM

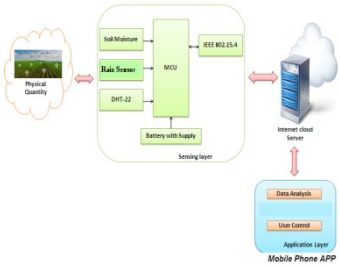

Fig 1 Block Diagram

VI. WORKING PRINCIPLE

Currently, various types of sensors are used to collect agricultural information, such as the moisture of soil, temperature and humidity in air. However, such sensors can only perform environmental monitoring and data collection; they lack an integrated computing platform, so obtained data cannot be effectively used or analyzed. To solve this problem, an agricultural intelligence platform is researched and developed here. This work develops a smart agricultural platform that integrates communication and multi-functional sensing components.

VII.IMPLEMENTATION AND RESULTS

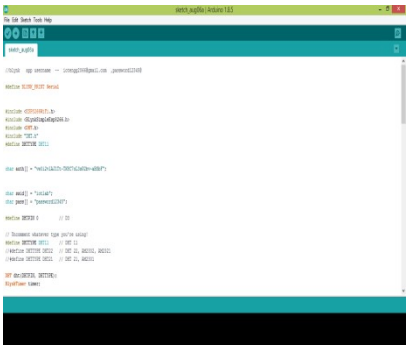

Fig 2 Arduio IDE CODE

VIII.CONCLUSION

This project presents a farm monitoring and automatic irrigation system that has three modules: low cost and intelligent IoT based module, rrigation unit (IU), and sensor information unit (SIU).

For user access, USP initially remains for some time in admin mode where it gets crop, plantation date and soil data, which it uses in one-time setup mode for evapotranspiration and irrigation schedule computation. Finally, it goes into a continuous monitoring mode where it senses the data, uses it for NN based decision making, sends the decision to IU and sensor data to SIU.

REFERENCES

[1] Allen, R.G., Pereira, L.S., Raes, D., Smith, M., et al., 1998. Crop evapotranspirationg uidelines for computing crop water requirements-fao irrigation and drainage paper 56. FAO, Rome 300 (9), D05109.

[2] Ashton, K., 2009. That internet of things thing. RFiD J. 22 (7), 97–114.

[3] Barcelo-Ordinas, J.M., Chanet, J.-P., Hou, K.-M., García-Vidal, J., 2013. A survey of wireless sensor technologies applied to precision agriculture. In: Precision Agriculture'13. Springer, pp. 801–808.

[4] Baronti, P., Pillai, P., Chook, V.W., Chessa, S., Gotta, A., Hu, Y.F., 2007. Wireless sensor networks: a survey on the state of the art and the 802.15. 4 and zigbee standards. Comput. Commun. 30 (7), 1655–1695.

[5] Bogawski, P., Bednorz, E., 2014. Comparison and validation of selected evapotranspiration models for conditions in poland (central Europe). Water Resour. Manage. 28 (14), 5021–5038.

[6] Brouwer, C., Heibloem, M., 1986. Irrigation water management: Irrigation water needs. http://www.fao.org/docrep/s2022e/s2022e00.htm#Contents.

[7] Chaudhary, D., Nayse, S., Waghmare, L., 2011. Application of wireless sensor networks for greenhouse parameter control in precision agriculture. Int. J. Wireless Mob. Netw. (IJWMN) 3 (1), 140–149.

[8] Coale, A.J., Hoover, E.M., 2015. Population Growth and Economic Development. Princeton University Press. Dong, X., Vuran, M.C., Irmak, S., 2013. Autonomous precision agriculture through integration of wireless underground sensor networks with center pivot irrigation systems. Ad Hoc Netw. 11 (7), 1975–1987.

[9] Dursun, M., Ozden, S., 2011. A wireless application of drip irrigation automation supported by soil moisture sensors. Sci. Res. Essays 6 (7), 1573–1582.

[10] Dutta, R., Morshed, A., Aryal, J., D'este, C., Das, A., 2014. Development of an intelligent environmental knowledge system for sustainable agricultural decision support. Environ. Model. Softw. 52, 264–272.

[11] FAO, Rome, 2002. Crops and drops: Making the best use of water for agriculture. http:// www.fao.org/docrep/005/Y3918E/y3918e03.htm.

[12] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.

[13] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.

[14] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.

[15] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

[16] 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.

[17] 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.

[18] 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

[19] 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

[20] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007
[21] M Suganthi, N Ramesh, "Treatment of water using natural zeolite as membrane filter", Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022
[22] M Suganthi, N Ramesh, CT Sivakumar, K Vidhya, "Physiochemical Analysis of Ground Water used for Domestic needs in the Area of Perundurai in Erode District", International Research Journal of Multidisciplinary Technovation, pp: 630-635, 2019