Smart Irrigation Monitoring System Using Using Raspberry PI

Mr.P.Palanikumar[1], Dr.S.Geetha[2]
[1] Dept of Computer application
[2]Assistant Professor, Dept of Computer application
[1, 2] BIT Campus, Anna University,Tiruchirappallli.

Abstract- *Wi- The Internet of Things (IOT) has been denoted as a new signal of Information and Communication Technology (ICT) advancements. The main objective of this paper explains how various new technologies in farming to yield higher growth of the crops with minimum water supply. Automated control features embedded with various sensor implementation using raspberry pi, which turns the pumping motor ON and OFF on detecting the dampness content of the earth. Moreover the microcontroller embedded with GSM which helps to extract the data from sensors, after measuring the temperature, humidity, soil moisture, ultrasonic sensor and these data uploaded for distributed process. The proposed work focus on automated electric water motor reading process has implemented to estimate the amount of water used for irrigation. These sensors are helps to monitor the plant growth using webcam and can also watch live streaming of farm on PC by using Fi.*

Keywords- Raspberry PI, Temprature Sensor, Humidity Sensor, Soil Moisture Sensor, Ultrasoinc Sensor, Webcam, Wifi, electric motor.

I. INTRODUCTION

There are many techniques available for the precision agriculture to monitor and control, environment for the growth of many crops. Due to unequal distribution of rain water, it is very difficult to requirement needed farmer to manage the water equally to all the crops in whole farm it requires some irrigation method that suitable for any weather condition, soil types and variety of crops [1][2][3]. Irrigation management is a important factor in agriculture allows the farmer to improve the cultivation in a way the plants need.

According to the requirement of the crops the threshold will be set, if the any environmental condition like temperature, soil conditions and humidity goes below or above the threshold value, then IOT sense the changing in parameters are monitored simultaneously and all the data will be transmitted to farmers, according to that farmer will take the controlling decision and send to the system. The system will run the actuator and control the parameter [4][5][6][7]. Types of sensor used and controlling action that are taken according to them Temperature control - Growth of plantation depends on photosynthesis methods that is depends upon the radiation from the sun [8]. Humidity control –Water vapor is main problem that's affecting the growth of crops. Because of high humidity, chances of disease are increasing. Soil control- Soil water also affects the crop growth [9]. Therefore, the monitor & control of soil condition have a specific interest, because the good condition of a soil provides the proper yield. The Proposal of the project is to develop a smart irrigation monitoring system using Raspberry pi. Focus area will be parameters such as temperature and soil moisture.

İİ. LİTERATURE SURVEY

Nirdosh Kumar, Mrs. Shimi S. L, The authors said the main motivation behind this system is to conserve the wastage of water and to effectively manage the amount of watering of the plants. It also aims at reducing human labour, effort and errors due to human negligence. It uses solar panels to provide power to the system at daytime. Solar energy is used to run the system during daytime and charge the batteries to operate at night. It uses moisture sensors to sense the level of moisture in the soil. When the moisture content of the soil goes below a certain limit for a plant/crop, the pump system is triggered and the plant/crop is watered. The plants are watered efficiently till the desired value is reached and the pump is switched off automatically.[1]

Kavianand G, Nivas V M, Kiruthika R, Lalitha S, The Authors said the system ARM 9 processor is used to control and monitor the irrigation system. Different kinds of sensors are used. This paper presents a fully automated drip irrigation system which is controlled and monitored by using ARM9 processor.PH content and the nitrogen content of the soil are frequently monitored. For the purpose of monitoring and controlling, GSM module is implemented. The system informs user about any abnormal conditions like less moisture content and temperature rise, even concentration of CO2 via SMS through the GSM module. [2].

Prof C. H. Chavan, Mr.P. V.Karande, The authors said the main objective of the paper is to develop a smart wireless sensor network (WSN) for an agricultural environment. Monitoring agricultural environment for various factors such as soil moisture, temperature and humidity along with other factors can be of significance. A traditional approach to measure these factors in an agricultural environment meant individuals manually taking measurements and checking them at various times. This paper investigates a remote monitoring system using Zigbee. These nodes send data wirelessly to a central server, which collects the data, stores it and will allow it to be analyzed then displayed as needed and can also be sent to the client mobile. [3].

III. ARCHİTECTURE FOR SMART IRRİGATİON SYSTEM

The webcam is interface to Raspberry pi via wifi module. The architecture system consists of temperature sensor, humidity sensor, ultrasonic sensor and soil moisture sensor. Readings are collected with Raspberry pi 3. It stores collected data in the database and analyzes the stored data. These values are shown on the LED display after that the readings are display on PC using wifi connection. The Raspberry pi microcontroller module takes the data from the energy meter and performs the necessary control operations like breaking the circuit through Relay control unit and the required information to the mobile phone via the Raspberry pi 3 is a wonderful platform can be used to smart irrigation system. communication module GSM. The UART is a serial communication interface for the GSM modem for transmitting the data from the controller to the mobile phone. The recharge unit is stored in IC AT24C02 which is an EEPROM and has volatile memory and this recharge unit is display in Liquid Crystal display (LCD) and a message “recharge successful” also display balance reaches the below the emergency limit then the buzzer starts indicating that we should recharge our meter soon and the controller send the message to customers.

The types of sensor used to controlling and action taken to them. These sensors are connected to the Raspberry pi board given to resistance variation at the output. The different type of signal is applied to the comparator and signal conditioning circuit which has potentiometer to decide the moisture level to which the output of comparator goes high.

These sensor output signals are given to the Raspberry pi board. If the soil moisture value is high then the 3 phase induction motor will be off, where if the moisture level is low then the 3 phase induction motor will be on through the delay for monitoring the farm at night LDR is used which controls the light automatically. It needs electric motor to drive through relay. The use these sensors are available in low cost to make simple circuitry instrument. The farmers canpurchase the product in an affordable cost as well as best suited product in water scarcity environment

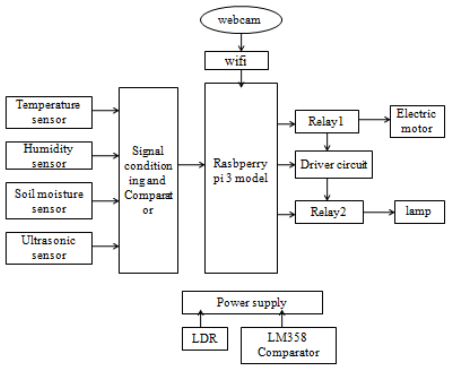

Fig 1: Architecture of smart irrigation System

IV. PROPOSED SYSTEM FOR SMART IRRİGATİON SYSTEM

4.1.Methodology for Proposed System

In this paper, webcam is interfaced with Raspberry Pi 3 via Wi-Fi Module. Raspberry Pi is the heart of the overall existing system. The Raspberry Pi Model 3 incorporates a number of enhancements and new features. Improved power consumption, enlarged connectivity and greater IO are among the improvements to this powerful, small and lightweight GPIO (General Purpose Input Output) pins.

It is 700 MHz ARM processor with 512 MB RAM with on-chip ADC, timer/counter module, PWM and UART module to interface a GSM modem and energy meter. The energy meter which generates the pulses as well as count the energy consumed is used. The digital energy meter is having a LED which blinks for a specific number of times to indicate the energy consumed (e .g. 1 Unit = 1600 pulses). These pulses are fed to ARM11 based system which is programmed to count these pulses. The system reads these pulses and after counting specific number of pulses it increments the internal counter by one which indicates the number of units consumed and LCD display is used to display the balance amount. To recharge the meter, consumer needs to buy electricity in advance according to his/her requirement. The consumer can buy electricity through recharge card. This will be in form of a scratch card with a code printed on it. The consumer punches the code into the meter using a key pad which is interfaced with the controller. The meter is credited with the amount of recharge bought and supply is switched on automatically at load side. As the consumer’s balance reaches the below the emergency limit provided by the utility, meter issues an alarm

and also send message to the consumer. The consumer needs to recharge the meter at this point. If recharged in time then the load is not disconnected. However, if even after warning, a consumer does not recharge their meter and all available balance is exhausted then meter automatically disconnects the supply at load side. The controller instructs the relay to disconnect load.Soil moisture sensor, humidity sensor, temperature detection sensor are connected to Raspberry Pi board through comparator circuit. Soil moisture sensor gives a resistance variation at the output. That signal is applied to the comparator and signal conditioning circuit.

4.2.Proposed Systen

The block diagram of the proposed system as consists of different types of sensing unit such as Soil Moisture Sensor used to measure water content of the soil, Temperature Sensor detects the temperature of the soil, Humidity Sensor to measure the presence of water in the air and Ultrasonic sensor used to measure the water level in the water tank.

The following sensors are used to help the growth of crops to monitoring the moisture absorbed by the plants.

- TEMPERATURE Sensor - Growth of plantation depends on photosynthesis methods that depend upon the radiation from the sun. Its temperature range is- 5^{o}C to 110^{o}C.If temperature <50^{o}C then no need to water supply and if the temperature level>80^{o}C then it need to water supply.
- Humidity Sensor - The high humidity is main problem that's affecting the growth of crops and also chances of disease are increasing. Humidity sensor can be used to sense the readings from the air moisture in the leaf. There are several quantities of parameters are extracted from the sensor data such as temperature and pressure.
- Soil Moisture Sensor - The soil moisture sensor is used to measure the soil water. The soil water is affects the crop growth. By monitoring the sensor value, the sensor gives analog output of 0V then 100% moisture, otherwise 5V for 0% moisture.
- Ultrasonic sensor - Ultrasonic sensor used to measure the water level in the water tank.

Relay control unit is used to shutting off the electric power supply when the due date is over. Whenever the user pays the bill the electric power supply is resumed by the relay module. The relay is driven by the raspberry pi controller. The user can monitor power consumption details on LCD. The control operations like breaking the circuit through Relay control unit.

These sensors are connected to raspberry pi board given to resistance variation at the output. The different type signal is applied to the comparator and signal conditioning circuit has potentiometer to make a decision the moisture level above which the output of comparator goes high. That digital signal is given to the raspberry pi board. If the soil moisture value is above the moisture level and humidity is high at the given value and also if the temperature is high then the water motor will be on, whereas if the moisture level, humidity, temperature is low the motor will be off through the relay. LDR is used for controlling light automatically, at night light will be ON automatically so that we can observe our farm at night also using mobile phones.

The proposed system provides real time information on the field irrigation. Here the water is supplied based on the actual needs for the crops. This automated irrigation system is cost reduction and resource optimization. It improves the environment quality and increases the irrigation. It also reduces water logging and water shortages. The system designed reduces the efforts of manual data collection of energy meter. The users are not bound to pay excesses amount of money, users have to pay according to their requirement. Prepaid energy meter is more reliable, accuracy and user friendly.

V. RESULTS AND DİSCUSSİON

This paper has implemented using Raspberry pi. Sensors are connected to Raspberry using jumping cables. The entire system is observed and controlled by power full credit card sized microcontroller Raspberry. The electric motor are used for automatic water supply.

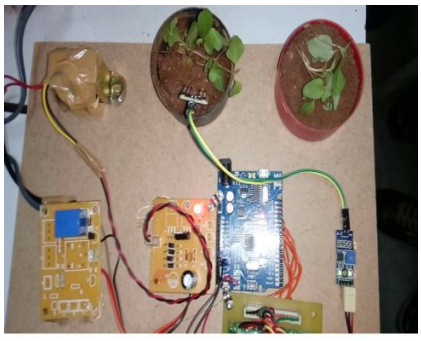

Fig 2. System model for Smart Irrigation System

5.1.Electric Motor ON Mode

Power supply is provided by using electric motor. Sensor values are displayed in monitor by using Raspberry pi operating system. For Connection establishment is provided by using IOT coding. Here electric motor automatically ON

and OFF based on Soil values. Here the Sensor values are evaluated and displayed in system monitor using Raspberrhy OS. The electric motor automatically will be ON based on readings.

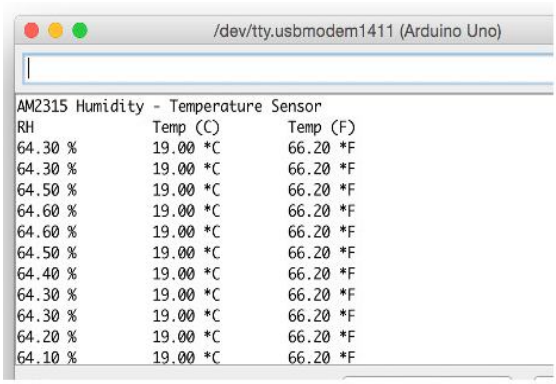

Fig 3. Soil moisture is dry and electric motor is in ON mode.

5.2.Electric Motor OFF

Here the Sensor values are evaluated and displayed in system monitor using Raspberry pi OS. The electric motor automatically will be OFF based on readings

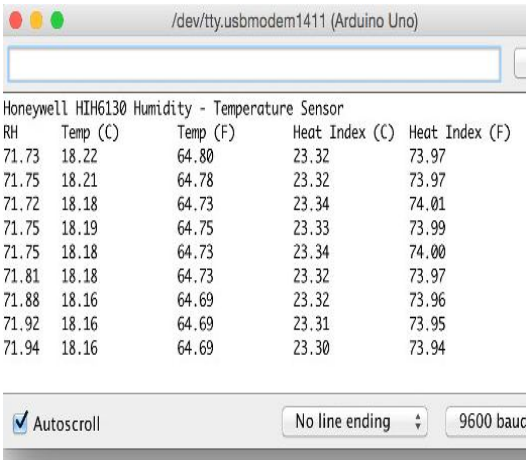

Fig 4. Soil moisture is wet and motor is in OFF mode.

VI. CONCLUSİON

In the present the farmers use irrigation approach through the manual control, in which the farmers irrigate the land at regular intervals. This process seems to consume more water and results in water wastage. Moreover, in dry areas where there is inadequate rainfall, irrigation becomes difficult. Hence, we require an automatic system that will precisely monitor and control the water essential in the field. Installing Smart irrigation system saves time and ensures judicious usage of water. Moreover, the proposed architecture uses micro-controller which promises an increase in system life by reducing power consumption. The entire system is monitored and controlled by the power full credit card sized micro-controller Raspberry pi. It provides with several benefits and can achieve with less manpower. The prepaid energy meter used to control the usage of electricity on consumer side to avoid wastage of power. Prepaid energy meter is a concept to minimize the Electricity theft with a cost efficient manner. From all these we can conclude that if we implement this prepaid energy meter then it can become more beneficial.

REFERENCES

[1] Nirdosh Kumar, Mrs. Shimi S. L, Smart Farming System for Indian Farmers using Arduino based Technology", International Journal of Advance Research, Ideas and Innovations in Technology, (Volume3, Issue1,pp:105-110), 2017.

[2] Kavianand G, Nivas V M, Kiruthika R, Lalitha S," Smart Drip Irrigation System for sustainable Agriculture", 2016 IEEE International Conference on Technological Innovations in ICT For Agriculture and Rural Development (TIAR 2016).

[3] Prof C. H. Chavan, Mr.P. V.Karande," Wireless Monitoring of Soil Moisture, Temperature & Humidity Using Zigbee in Agriculture", International Journal of Engineering Trends and Technology (IJETT) – Volume 11 Number 10 - May 2014.

[4] Ma Shuying et al, "Design of a new measurement and control system of CO2 for greenhouse based on fuzzy control", International Conference on Computer and Communication Technologies in agriculture engineering 2010, pp 128-131, May 2008.

[5] Ruiz-Canales, A., and M. Ferrández-Villena. "New proposals in the automation and remote control of water management in agriculture: Agromotic systems." Agricultural Water Management 151 (2015): 1-3.

[6] K.M. Larson, E.E. Small, E. Gutmann, A. Billich, P. Axelrad, and J. Braunn, "Using gps multipath to measure soil moisture fluctuations: initial results," GPS Solut., vol. 12, pp. 173–177, 2007.

[7] N. Roussel, F. Frappart, G. Ramillien, J. Darrozes, C. Desjardins, P. Gegout, F. Pérosanz, and R. Biancale, "Simulations of direct and reflected waves trajectories for in situ gnss-r experiments," Geosci. Model Dev., vol. 7, 2014.

[8] P. Beckmann and A. Spizzichino, "Scattering of electromagnetic waves from rough surfaces," Artech House Publishers, vol. ISBN 0-89006-238-2.

[9] Nikhil Agrawal , Smita Singhal "Smart Drip Irrigation System using Raspberry pi and Arduino" International Conference on Computing, Communication and Automation (ICCCA2015).

[10] Gajjala Ashok, Gogada Rajasekar, " Smart Drip Irrigation System using Raspberry Pi and Arduino" International Journal of Scientific Engineering and Technology for Technology,2016

[11] Hema N., Krishna Kant, "Local Weather Interpolation Using Remote AWSData with Error Corrections Using Sparse WSN for Automated Irrigation for Indian Farming", 978-1-4799-5173-4/14/$31.00 ©2014.

[12] Shahzadi, Raheela, et al. "Internet of Things based Expert System for Smart Agriculture." *IJACSA) International Journal of Advanced Computer Science and Applications* 7.9 (2016): 341-350.