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A PIC MICROCONTROLLER BASED DRIP IRRIGATIONSYSTEM USING PROTEUSSUPPORTED BY DUSTHUMIDITY SENSORS

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Abstract

This growth around the function of complications in cultivated immediate problems. There is widespread use of wireless sensing technology impending all across the globe today. Water properties can be used to irrigate farming areas in an enlightening manner. Because of the rapidly increasing demand for water, computerization knowledge and its conception of solar control, drip irrigation, sensors, and RF modules have been provided with the capability of maximizing use of water resources. Measurement and regulator systems, especially in large environmental areas, are complicated by outdated instrumentation based on separate and wired resolutions. The designed system has 3 units namely: Base position unit (BPU), Controller unit (CU) and Feeler unit (FU). In addition, the developed irrigation processconfiscates the need for workmanship for submerging irrigation.

Index Terms—solar power,RF module BPU, VU, SU.

I. INTRODUCTION

A. Elementary of Cultivation Irrigation

Agronomy is anthropology's all-encompassing major activity. 64% of all available land is devoted to agriculture, and it consumes 85% of all regenerable water and soil. Due to globalization and occupants' evolution, this figure is on the rise each year. An additional food restriction contest is visible in each state to drop the ranch's use of aquatic resources. The process of irrigation involves wetting the soil with water. According to Dust stuffs like soil humidity and dust temperature, water will be disordered by dust in the dust. In order for it to grow, it must cultivate in the soil. The manageable some organization working development system for few farming water consumptions but this some borders are occurring in the system. A decisive importance some irrigation by group of steam possessions in farming areas of the system. Considering the growing demand for freshwater, aquatic funds should have better practice by utilizing higher degrees of computerizing and their apparatus such as solar power, drip irrigation, sensors, and remote control. This composition, based on distinct and augmented resolutions, grants many difficulties on measuring and controlling systems with large terrain areas in particular. Moreover, the established technique does away with the need for labor-intensive swamping irrigation.

B. Irrigation Interrelated Exertion

An aquatic gratified of dust and irrigation resolution security wireless sensor network is proposed for low-priced wireless sensor networks. Solar power is used to determine the positions of controllers of irrigation regulators via wireless attainment using positioning techniques for data procurement. The intended organization has 3 units namely: Base Position Element (BPU), controller Element (CE) and feeler Element (FE). In addition to mitigating humidity anxieties that overgrowth and salinity create, the system provides a well-managed use of newly discovered aquatic resources.

C. Computerized Irrigation Structure

There are three different units which were designed: Base Position Element (BPU), controller Element (CE) and feeler Element (FE). In addition to RF segments as well as low-power microcontrollers, all of these are included in each unit. A low power and low price requirement was implemented for the automated strategies, devices, and solenoid controllers in the system. The elements used in the tender were considered as a transferrable expedient. It agrees these parts should be must leisurely and measured.

D.Wireless Component

UFM-M11 is a model twisted by Expertise Inc. / promoted by Expertise Inc. The dust wetness device uses RF components. 234 MHz smallauthority wireless components and UGPA-234 Omni-direction projectionwasassociated. FSK variation is used with the module, and the maximum output power is 8 dBm. During reception mode it consumes 17 mA and while communicating it consumes 30 MA. Has a different statistics presentation to communicate with the other segments, based on the statements that were made with RF wireless components and MCUs. Interactions and receptions are part of each segment. For connection to occur, certain possessions must be fulfilled. These are suitable overall data in RS232-TTL level, 8 data bits and one stop bit. General data format. MCUs can send the exciting distance data set by radio frequency (RF) matching by a 60-byte data set sent by the spreader component. Also, the component tolerates ideal working incidence.

II. EXISTING METHOD

We propose to build an automatic irrigation system that turns the impelling motor on and off based on the soil moisture content detected by this development on "Instinctive Irrigation Structure on Detecting Dust Moisture Content. In agriculture, irrigation is a very important means of water supply. As long as these methods are retained, humans are less likely to be impacted while still well-irrigated. A humidity detection structure installed within the mechanized irrigation system collects input signals of variables of soil moisture using an Arduino board ATmega328 micro-controller.

III.PROPOSAL METHOD

It is now widely recognized that irrigation can be accomplished in cultivated areas through stream possessions. Computerization expertise, so-called drop irrigation, sensors, and distant controls have contributed to the efficient use of freshwater incomes by providing optimum utilization of water incomes through extremely cumulative freshwater demand. Organizing measurement and control organizations in large areas over large terrestrial areas can be complicated by outdated arrangements based on distinct and reinforced solutions.

It describes a wireless feeler system that provides accurate readings of dust water content in real time and low-cost wireless irrigation resolution. Solar powered wireless attainment position devices are used to gain data for irrigation valve control resolution through solar powered wireless attainment. The designed system has 3 units namely: Base Position Element (BPU), controller Element (CE) and feeler Element (FE). The industrialization of irrigation technique makes it unnecessary for submersible irrigation to require workmanship. A submersible irrigation system using industrialized technology does not require any hand work.

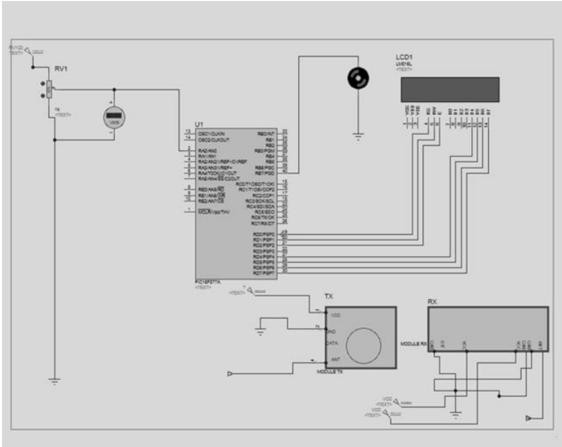

Fig.1 Architecture of Proposal Method

A. Transmitter Circuit

The transmitter circuit in this suggestiontechnique is the keytrip that the main neutral of the organization is used to intelligence and controller the temperature, moistness, moisture of the plant and open the water for irrigation. The transmissioncoursecontain of solar panel for the power supply and it cover RF transmitter that transmit the identifiedindication to the receiver conclusion.

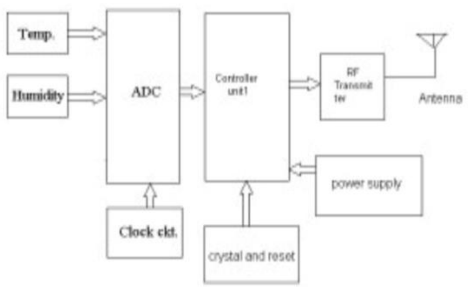

Fig.2 Transmitter Circuit

B. Receiver Circuit

The receiver circuit is used to screen the spreaderexpedientprocesses. The receiver tripobtains the observedstatistics to the movable through using RF receiver submission. The receiver circuit that uninterruptedlysupervised the device and controller the statisticsregularly on the transportable.

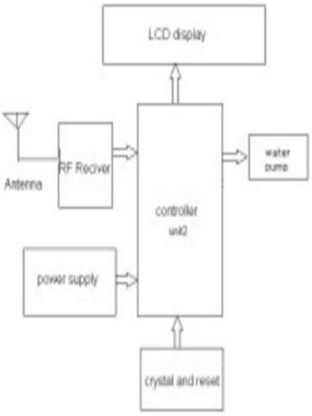

Fig.3Receiver Circuit

IV. SYSTEM DESIGN

Movement in the deliberate organization is divided into two methods, top-down and bottom-up. The structure of the proposed system is divided into five levels.
For the proposed system, there are five design sequences.

- obligation Level
- structural design level
- module level
- defense level
- function level

A. obligation Level

First of all, the planned involuntary irrigation structure is divided into two types and they are as follows:
1. Practical requirement

A detection device senses dust moisture, temperature, and dampness. Functional requirements include procedure details, data management and processing, sensing, and indicating.
2. Non- practical requirement

A similar restriction is found in its functional condition. The proposed system consists of monitoring and supervising the level of dust in the water, temperature, and humidity.

B. structural design Level

This program includes quantified hardware expedient partitioning, presentation and troubleshooting. Node 1 called as detection node and Node 2 called as receiver node. The headset node production an important role in an automatic irrigation system. A lecture of the journey's end is set on the receiver node in Node 1. The sensor on node 1 sensed the information and transmitted it to the ADC. Analog data is converted to digital by an ADC, then sent to a UART for serial communication. An ADC is built into the PIC Microcontroller 16F877a. It uses RF to transmit data wirelessly. RF transmits data from Node 1 to the receiver node. This Receiver node sends the data to PIC 16F877a microcontroller and information display on the LCD of receiver node.

C. Module Level

Keeping track of occupations is an essential part of planning and completing the system. This level is the most crucial in the process of determining the system's design. During its design, hardware components and software components are brought together.
1. Hardware component
Hardware component may be a corporeal expedient that's a neighborhood of the system which attaches the opposite constituent, provide input and output to and from the appliance. The proposed system hardware components are solar array, Temperature sensor, humidity sensor, soil moisture sensor, RF, PIC Microcontroller 16F877A, Fan, Motor pump, Buzzer, Relay.
2. Software component
Proteus, Keil, and hardware are all interconnected by it. During a structure already inbuilt software application in control by software component.

D. Defense level

Organization of a corporation through involving all its machineries and building a suitable structure. Additionally, it includes trouble shooting tasks to ensure that the organization runs efficiently. A problematic stage occurs as we have to figure out why the system isn't functioning properly. In the organization planned, there is an instrument that conveys information to the microcontroller. The temperature device, dust humidity sensor, and moisture sensor all have three channels, respectively. Sensory information is converted into digital form by the ADC, and the digitized information is transmitted to the LCD to display it. Data should be transmitting to RF.

Through RF, data is transmitted to the node in the lead. Node1 assembles multiple sets of inputs from which values can be selected. The four sets are available depending on the type of harvest. Changes are made by connecting Port E to the resister. Relays are used for the timer, the fan, and the drive motor. Besides being connected to Pins RA0, RA1, RA2, BC547 controls more power generated by a coil of the relay and amplifies the signal of the PIC 16F877a microcontroller. The master node information to communicate the parameter displays from LCD.

E. Function Level

Rechargeable boards will be used to measure temperatures, voltage, and lightning to improve security at the tower.

V. PROJECT DESCRIPTION

A. Microcontroller (PIC 16F877A)

PIC, or Programmable Integrated Circuit, is a family of Harvard architecture microcontrollers invented by Microchip Expertise based on the PIC1650 formerly developed by all Devices' Microelectronics Division. The name PIC originally referred to the peripheral edge controller. Due to their low cost, wide availability, massive user base, free or low-cost development tools, and ability to re-program with flash memory, PICs are popular with both manufacturers and amateurs alike.

B. Eminent staging concentrated training position central processing unit

This chip has only 35 single expression orders. Program branches are the only ones that use two-cycles, as they have only one sequence direction each. In DC, the clock input is 200 ns and the PIC runs at 10 MHz. The PIC has 8K x 14 words of flashy Sequencer Reminiscence of statistics reminiscence.

C. Exterior Features

•Control 0: 8-bit control with 8-bit prescaler.
•Control 1: 16-bit control with prescaler.
•Control 2: 8-bit control with 8-bit period register, prescaler.
• This device is equipped with a Capture, Compare, PWM (CCP) module. With an extreme resolution of 12.5 ns, it is a 16-bit capture. Pulse Width Inflection has a maximum determination of 10-bits, while comparison has a 16-bit determination and a 200ns exciting determination.
•8 control analog-to-digital converter with 10 bit each of the parameter.
• Featuring a synchronous sequential port (SSP) with SPI (Master/Slave) and I2C, along with USART with 9-bit detection.

D. Cmos Technology

A PIC processor is equipped with CMOS FLASH technology with a low power and high speed. It is extremely energy-efficient and is suitable for industrial and commercial applications. It is extremely energy-efficient and is suitable for industrial and commercial applications.

E. High temperature Sensor

Temperature sensors LM35 are precision integrated circuits that produce a linearly proportional voltage in relation to the Celsius (Centigrade) temperature. In contrast with rectilinear temperature sensors adjusted in Kelvin, the LM35 can thus save the operator time and resources by allowing for Centigrade scaling without requiring continuous energy withdrawal from its operations. For typical accuracy of Celsius room temperature. The range of temperatures from 55 to +150 °C, the LM35 doesn't require any exterior finish or decorating. By adding extras and calibrating each wafer, low costs are guaranteed. Due to the LM35's low output resistance, rectilinear output, and use of essential standards, it is particularly straightforward to interface it to readouts and controllers. This product can be operated with either a single power supply or a plus and minus supply. It has almost zero self-heating due to the low current draw, less than 0.1 C in still air. A temperature range of *55 - 150 °C is specified for the LM35, while the LM35C is specified for a range of *40 - 110 °C (*10 with improved accuracy). There is also a plastic TO-92 package available for the LM35 series, while LM45C, LM44CA, and LM35D are available in hermetic TO-46 packages. There is also a plastic TO-220 package available for the LM35D, which comes in an 8-lead small outline surface mount package.

F. Humidity Sensor

Water is present in the air as moisture. Water in the air has impacted industrial development and social comfort to a great extent. In addition, water vapor influences a variety of bodily, chemical, and biological processes.

In manufacturing, moisture content is a critical consideration because it can determine how much a product costs as well as whether or not it is healthy or safe for the peoples. It is therefore vital to detect humidity, especially in controlling industrial processes and comforting humans. For many industrial & domestic applications, controlling or monitoring humidity is crucial. It is important to measure and observe moisture levels when water is processed in the semiconductor industry. Moisture regulators are used in medical equipment's, sterilizers, incubators, therapeutic products, and curative dispensaries. As well as chemical gas purification, dryers, ovens, shriveling films, paper and textile production, as well as food processing, moisture control is necessary. Agriculture uses the measurement of dampness for farm protection (dew anticipation), dust moisture intensive care, etc. It is mandatory for buildings to control moisture for the citizens' wellbeing, microwave ovens to control cooking moisture, etc.

G. Moisture Sensor

The dryness of dust is measured by dust wetness instruments. Due to the hydrometric techniques of determining free dust moisture, a sample must be removed, ventilated, and allowed to hydrate, so dust moisture sensors measure the volumetric water directly by some other property of the soil, such as electrical contact, insulator constant, or neutron interaction, to substitute moisture content. The relation between the measured property and soil moisture must be standardized and may vary contingent on conservational factors such as soil type, temperature, or electric conductivity. Reproduced microwave radiation is exaggerated by the soil moisture and is used for remote perception in hydrology and cultivation. Moveable probe instruments can be used by farmers orgardeners. Dust moisture sensors typically refer to sensors that approximation volumetric water content. Another class of sensors quantity another possessions of moisture in muds called water potential; these sensors are usually referred to as soil water potential sensors and include densitometers.

VII. SYSTEM ANALYSIS

PROTEUS MODELS AND RESULTS

A.Proteus Module

The stimulation software used in the proposed system is Proteus Design groups. It is mainly used for electronic design computerization that Proteus Design Collection offers. Software for creating representations and automated patterns for printed circuit boards in the industry is mainly used by electronic design technologists and specialists.

B.Representation Capture

In Proteus Design Suite, schematic capture is used to recreate projects as well as plan the layout of PCBs. The basic component of all production methods, it is consisted of all forms of production.

C. Prototype Microcontroller Recreation
With Proteus' microcontroller simulation, either a curse file or the correct file is spread over the part of the graphic that shows the microcontroller. In addition to that, any analog or digital electronics that are connected to it are also simulated. This makes it possible to prototype a wide variety of projects in areas such as motor control, temperature control and user interface design. It can also be used as a teaching or training tool since no hardware requirements are needed.

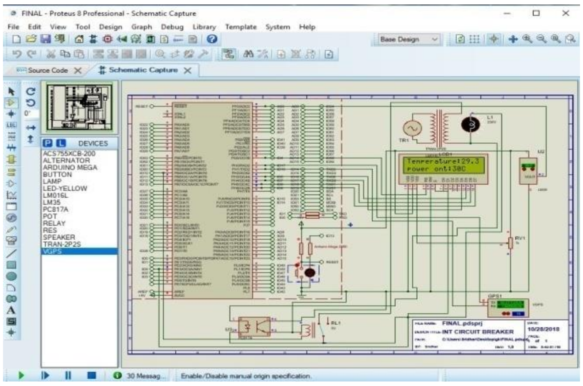

Fig.5 Microcontroller simulation output

VIII. RESULTS&CONCLUSION

A. Simulation Output

The heat, humidity, and dust moisture experienced by worth harvest are normal when irrigation is not in place. During irrigation, a threshold value for crop heat, humidity and dust moisture was reached.

- The master node displays a signal on the LCD and the mobile phone when the moisture rate crosses the beginning rate of the crop.
- If the Temperature rate crosses the threshold rate for harvesting, then the enthusiast will turn ON and display the result on the master node LCD and mobile.
- When the Dust moisture rate reaches the threshold rate for the crop, then the drive gets on and the LCD and mobile display get exhibited. In view of the above result, we tentatively conclude that it operates as expected without the need for any main power, and it also measures soil content, takes precise readings of the current situation, and is capable of utilizing the available power in the best way possible.

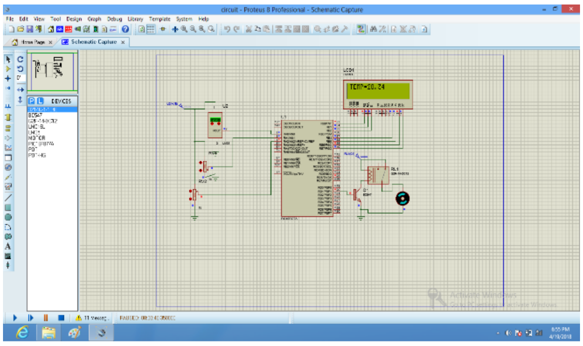
Fig.7 Simulation Output

Sensor statistics are viewed on the LCD display of the controlling node and can be manipulated by the grower while at home. A microcontroller is used to set the pH, temperature, humidity, moisture and other criteria required for particular harvests. The agriculturalist can specify which harvest type they wish to use. Sensor set for real-time sensor information on dust moisture, temperature, and humidity. Comparisons with the threshold standards are made using these standards. As soon as a threshold value is reached, the pump, fan, or signal according to the rate will be activated. After the grower has selected harvest type rice in the node that controls rice, authentic standards of moisture, temperature and dampness for rice will be presented for comparison. The data will then be moved through Mortal and compared without the grower intervening.

B. Conclusion

Water resources for cultivating conception are enhanced with the involuntary irrigation system executed because it is reasonable and cost-effective. In places where there is a lack of water, this irrigation system helps cultivate sustainability through agriculture. Water use for fresh biomass creation can be reduced by using a programmed irrigation system, according to the research. For farmers who grow biological crops and other agricultural harvests that are inaccessible organically, solar power can make a substantial difference compared to the conventional electric power source, which is limited. Water is conserved at its lowest level with an irrigation system that is variable and can be tuned to the changing needs of a particular crop. Computerized irrigation systems allow for expansion to better fit conservatories and open fields because they are modularly constructed. The economic savings in water use are not the only reason to use this type of irrigation systems, since the conservation of this naturally occurring resource is another reason.

References

[1] Soledad Escolar Díaz, JesúsCarretero Pérez, Alejandro CalderónMateos, Maria-Cristina Marinescu, BorjaBergua Guerra, “A novel methodology for the monitoring of the agricultural production process based on wireless sensor networks,” Computers and Electronics in Agriculture , no.76, pp. 252–265,2011.

[2] Aqeel-ur-Rehman, Abu Zafar Abbasi, Noman Islam, Zuba Ahmed Shaikh, “A review of wireless sensors and networks' applications in agriculture “,Computer Standards & Interfaces, pp.xxx– xxx,2011.

[3] W. Su, Y. Sankarasubramaniam, E. Cayirci, I.F, Akyildiz, ” Wireless sensor networks: a survey,” Computer Networks , no.38, pp- 393–422,2002.

[4] R. Challooa, A. Oladeindea, N. Yilmazera, S. Ozcelikb, L.Challoo, “An Overview and Assessment of Wireless Technologies and Coexistence of ZigBee, Bluetooth and Wi-Fi Devices,” Procedia Computer Science, no.12, pp.386 – 391,2012.

[5] Francesca Cuomo , Anna Abbagnale, EmanueleCipollone, “Cross-layer network formation for energy-efficient IEEE 802.15.4/ZigBee Wireless Sensor Networks”, Ad Hoc Networks, no. 11, pp.672–686, 2013.

[7] Cost Irrigation System Using ZigBee Technology.” International Conference on Networks Security W. A. Jury and H. J. Vaux, “The emerging global water crisis:

Managing scarcity and conflict between water users," Adv. Agronomy, vol. 95,pp.1–76, Sep. 2007.
[8] G. Yuan, Y. Luo, X. Sun, and D. Tang, "Evaluation of a crop water stress index for detecting water stress in winter wheat in the North China Plain," Agricult. Water Manag., vol. 64, no. 1, pp. 29–40, Jan. 2004.
[9] S. B. Idso, R. D. Jackson, P. J. Pinter, Jr., R. J. Reginato, and J. L. Hatfield, "Normalizing the stress-degree-day parameter for environ-mental variability," Agricult. Meteorol., vol. 24, pp. 45–55, Jan. 1981.
[10] Y. Erdem, L. Arin, T. Erdem, S. Polat, M. Deveci, H. Okursoy, and H. T. Gültas, "Crop water stress index for assessing irrigation scheduling of drip irrigated broccoli (Brassica oleracea L. var. italica)," Agricult.WaterManag., vol. 98, no. 1, pp. 148–156, Dec. 2010.
[11] W. A. Jury and H. J. Vaux, "The emerging global water crisis: Managing scarcity and conflict between water users," Adv. Agronomy, vol. 95, 1–76, Sep. 2007.
[12] X. Wang, W. Yang, A. Wheaton, N. Cooley, and B. Moran, "Efficient registration of optical and IR images for automatic plant water stress assessment," Comput. Electron. Agricult., vol. 74, no. 2, pp. 230–237, Nov. 2010.
[13] G. Yuan, Y. Luo, X. Sun, and D. Tang, "Evaluation of a crop water stress index for detecting water stress in winter wheat in the North China Plain," Agricult. Water Manag., vol. 64, no. 1, pp. 29–40, Jan. 2004.
[14] S. B. Idso, R. D. Jackson, P. J. Pinter, Jr., R. J. Reginato, and J. L. Hatfield, "Normalizing the stress-degree-day parameter for environ-mental variability," Agricult. Meteorol., vol. 24, pp. 45–55, Jan. 1981.
[15] Y. Erdem, L. Arin, T. Erdem, S. Polat, M. Deveci, H. Okursoy, and H. T. Gültas, "Crop water stress index for assessing irrigation scheduling of drip irrigated broccoli (Brassica oleracea L. var. italica)," Agricult.WaterManag., vol. 98, no. 1, pp. 148–156, Dec. 2010.
[16] K. S. Nemali and M. W. Van Iersel, "An automated system for con-trolling drought stress and irrigation in potted plants," Sci. Horticult., vol. 110, no. 3, pp. 292–297, Nov. 2006.
[17] S. A. O'Shaughnessy and S. R. Evett, "Canopy temperature based sys-tem effectively schedules and controls center pivot irrigation of cotton," Agricult. Water Manag., vol. 97, no. 9, pp. 1310–1316, Apr. 2010.
[18] R. G. Allen, L. S. Pereira, D. Raes, and M. Smith, CropEvapotranspiration-Guidelines for Computing Crop Water Requirements—FAO Irrigation and Drainage Paper 56. Rome, Italy:FAO, 1998.
[19] S. L. Davis and M. D. Dukes, "Irrigation scheduling performance by evapotranspiration-based controllers," Agricult. Water Manag., vol. 98, no. 1, pp. 19–28, Dec. 2010.
[20] Deepa A., Marimuthu C.N., "Design of a high speed Vedic multiplier and square architecture based on Yavadunam Sutra", Sadhana - Academy Proceedings in Engineering Sciences, Volume 44, Issue 9 , September 2019.
[21] Muthukumar M., Karthikeyan P., Vairavel M., Loganathan C., Praveenkumar S., Senthil Kumar A.P., "Numerical studies on PEM fuel cell with different landing to channel width of flow channel", Procedia Engineering, Volume 97, Pages 1534-1542, December 2014