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Wireless Environmental Control and Monitoring System for Green House Farming

S.V.Abinaya Devi[1] | K.Deepa[2] | T.Jeyahshree[3] | R.Sreevidya[4]

[1,2,3] UG Scholar, Department of EEE, TRP Engineering College, Trichy, India.
[4] Assistant Professor, Department of EEE, TRP Engineering College, Trichy, India.

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ABSTRACT

The Greenhouse based agriculture techniques are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled which the make a suitable environment for the plants to grow.This project uses a smart Agriculture System that can analyze an agriculture environment and intervene to maintain its adequacy. The system deals with general agriculture challenges, such as, temperature, humidity, and light and soil moisture. This project has soil moisture sensor, temperature sensor, and light sensor, humidity sensor which correspondingly sense soil moisture, temperature, humidity and light. PIC microcontroller is used and coded with a certain range for sensors. If soil moisture and temperature increases or the certain range exceeds the motor will operate and irrigate the soil. If humidity decreases fan will operate for exhaustion. Light sensor is used to indicate day time and night time inside the greenhouse.MAX 232 is used to convert signals from the sensor for monitoring. ZigBee is for a suite of high-level communication protocols by which we can use wireless communication.

Keywords: *Humidity sensor, Light sensor, Temperature sensor, Soil moisture sensor, MAX232, Zigbee, Proteus*

I. INTRODUCTION

Humidity and temperature measurement are used to control the elements for the survival of plants. They are necessary for the weather analysis and forecasts, especially for agriculture. A soil moisture sensor is used to detect the water level in the soil of the plants. The pump is used for irrigation as soon as the pump has started, the water will go through the water hose and then through the water sprinklers. Depending on the plant humidity, the pump will continue or stops working. A motor is used for the automated shading. The motor drives the shutter to reduce or increase the amount of sunlight inside the greenhouse; depending on the measured needs of the plant. In the existing system the performance was controlled using short message service(SMS) of cell phone messaging that the motor performances depend on turning ON/OFF remotely using mobile phone from any brand and also by send message when it started or done its performance. This system uses sensor devices coupled with wireless technologies to monitor the important parameters. The details of this idea are having a wireless sensor that connects through a Wi-Fi to a central monitoring station through general packet radio station. In addition to that it also connects with global positioning system GPS) to send message to the central monitoring station.

Figure no 1 Greenhouse based agricultural system

II. EXISTING SYSTEM

Humidity and temperature measurement are used to control the elements for the survival of plants. They are necessary for the weather analysis and forecasts especially agriculture. Monitoring and controlling the humidity and temperature of the environment is a must to save the plants from drought and extremes temperature. A soil moisture sensor is used to detect the water level in the soil of the plants. It has two output configurations, namely, high and low.The pump is inside the single available tank in the prototype. The pump is used in irrigation and also in the cooling system. For the irrigation part, and as soon as the pump has started, the water will go through the water hose and then through the water sprinklers. Depending on the plant humidity and the water level sensors, the pump will continue or stops working. For the cooling part, the water needed to spray among the straw and by the fan, it helps in cooling the plant. Ultimately, a motor is used for the automated shading. The motor drives the shutter to reduce or increase the amount of sunlight inside the greenhouse; depending on the measured needs of the plant.Also, anyone can check the state of the farm remotely. The user is able to access the measurement and see the values of the sensors. The receiver system allows manual control.

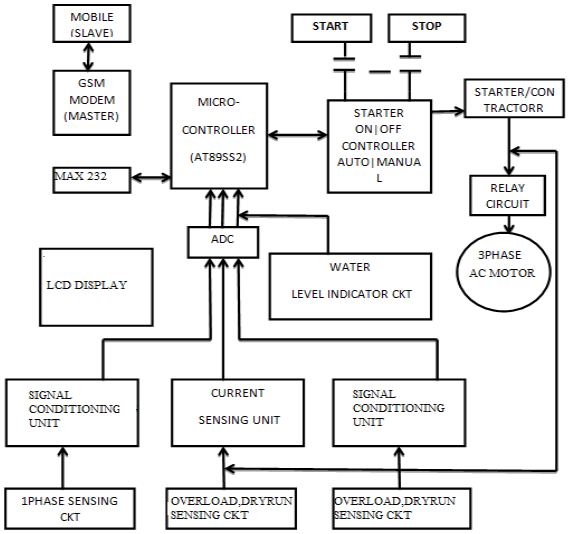


Fig no.2 Existing block diagram

III. PROPOSED SYSTEM

The system deals with general agriculture challenges, such as, temperature, humidity, and light and soil moisture. This project has soil moisture sensor, temperature sensor, and light sensor, humidity sensor which correspondingly sense soil moisture, temperature, humidity and light. PIC microcontroller is used and coded with a certain range for sensors. If soil moisture and temperature increases or the certain range exceeds the motor will operate and irrigate the soil. If humidity decreases fan will operate for exhaustion. Light sensor is used to indicate day time and night time inside the greenhouse. MAX 232 is used to convert signals from the sensor for monitoring. ZigBee is for a suite of high-level communication protocols by which we can use wireless communication.

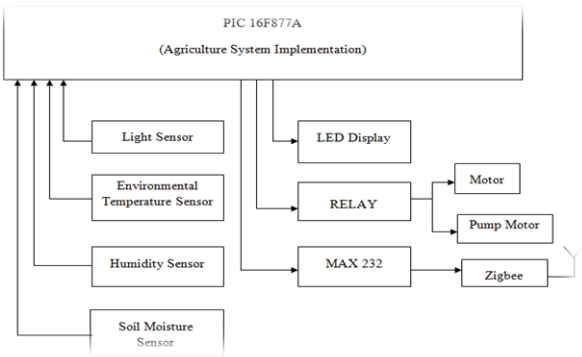


Figure no.3 Transmitter block diagram

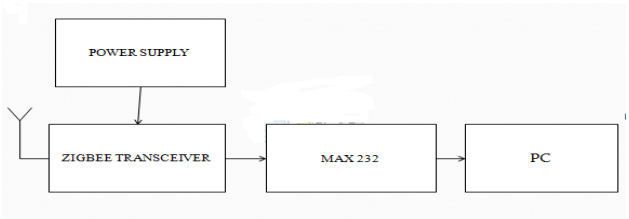


Figure no.4 Receiver block diagram

A. PIC16F877A MICROCONTROLLER

It is a 40 pin 8-Bit CMOS FLASH microcontroller. The microcontrollers are similar to microprocessors, but they are designed to work as a true single-chip system by integrating all the devices needed for a system on a single-chip. The timing and control unit will generate the necessary control signals for internal and external operation of the microcontroller. Microcontrollers with internal ADC can directly accept analog Signals for processing.

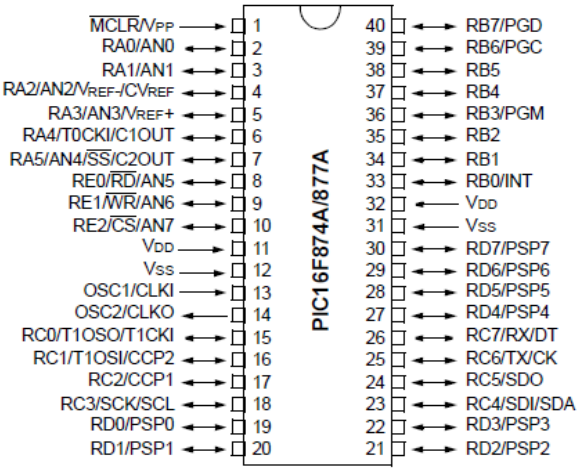


Figure5.Pin diagram

B. LIGHT DEPENDANT RESISTOR

A light-dependent resistor alternatively called an LDR, photo-resistor, photoconductor, or photocell, is a light-controlled variable resistor. It has a (variable) resistance that changes with the light intensity that falls upon it i.e. the resistance of photo-resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo-resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits

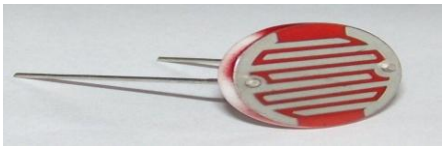


Figure no.6 LDR

C. TEMPERATURE SENSOR

A temperature sensor is a device which is designed specifically to measure the hotness or coldness of an object.LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C).With LM35,the temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C.The LM35's low output impedance,linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.It has find its applications on power supplies,battery management,appliances,etc.

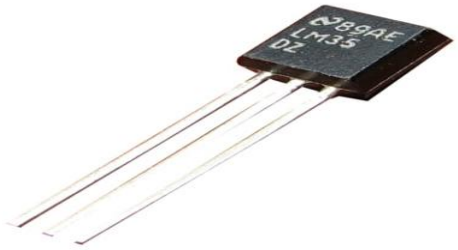


Figure no.7 Temperature Sensor

D. HUMIDITY SENSOR

Humidity is the presence of water in air. The amount of water vapor in air can affect human comfort as well as many manufacturing processes in industries. The presence of water vapor also influences various physical, chemical, and biological processes. Humidity measurement in industries is critical because it may affect the business cost of the product and the health and safety of the personnel. Hence, humidity sensing is very important, especially in the control systems for industrial processes and human comfort.

Figure no.8 Humidity sensor

E.SOIL MOISTURE SENSORS

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the

volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type,temperature, or electricconductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

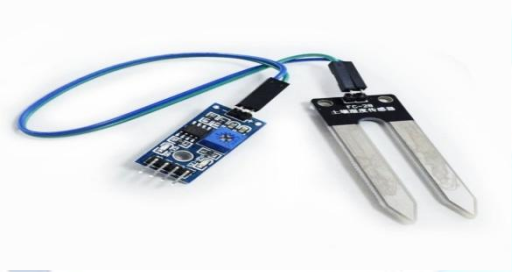


Figure no.9 Soil moisture sensors

F. LCD (LIQUID CRYSTAL DISPLAY)

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD, The data register stores the data to be displayed on the LCD

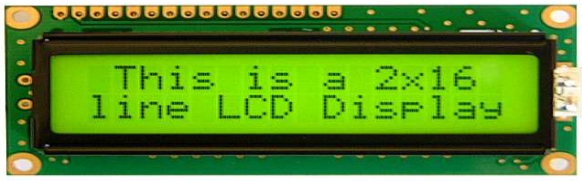


Figure no. 10 LCD Display

G. MAX232

The MAX232 is an integrated circuit first created in 1987 by Maxim Integrated Products that converts signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver that typically are used to convert the RX, TX, CTS, and RTS signals.

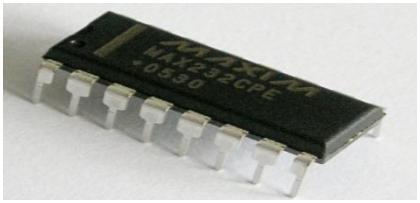


Figure no.11 MAX232

H. ZIGBEE TRANSCEIVER

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.

Figure no.12 ZigBee

I. PROTEUS SOFTWARE

Proteus (***PRO****cessor for* ***TE****xt****E****asy to* ***US****e*) is a fully functional, procedural programming language created in 1998 by Simone Zanella.

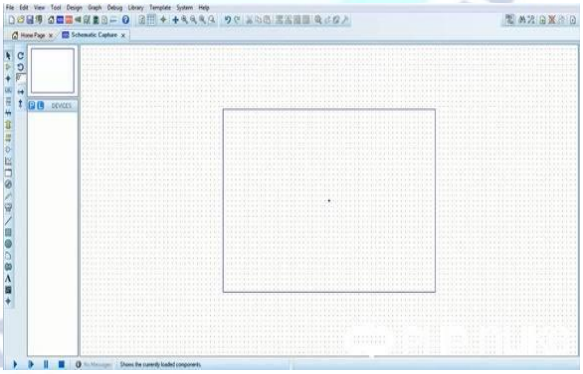


Figure No.13 Command window

Proteus incorporates many functions derived from several other languages: C, BASIC, Assembly, and Clipper/dBase; it is especially versatile in dealing with strings, having hundreds of dedicated functions; this makes it one of the

richest languages for text manipulation. Proteus owes its name to a Greek god of the sea (Proteus),

IV.Simulation Model

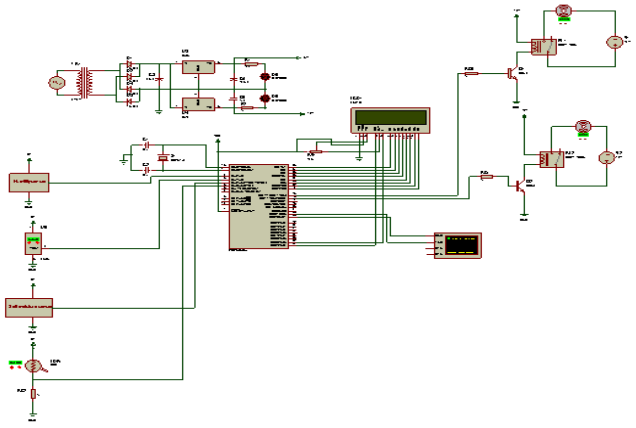


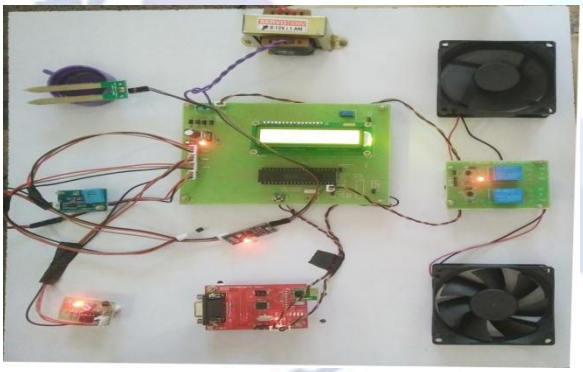
Figure.no.14 Simulation model

J. SIMULATION RESULT

SENSOR	RANGE	RESULT
Temperature sensor	>40Degree	Fan operates
Soil moisture sensor	>31	Motor operates

Table No.1 Simulation Result

V.Hardware Diagram with Result



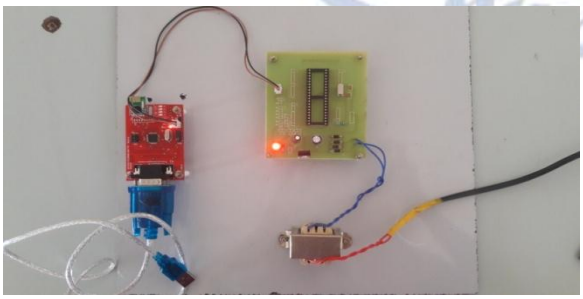


Figure No.15 Hardware Result

VI.Conclusion

In the proposed system, we propose a smart Agriculture System (AgriSys) that can analyze an environment and intervene to maintain its adequacy. The system has an easy-to-upgrade bank of inference rules to control the agricultural environment. AgriSys mainly looks at inputs, such as, temperature, humidity, and soil moisture. In addition, the system deals with desert-specific challenges, such as, dust, infertile sandy soil, constant wind, very low humidity, and the extreme variations in diurnal and seasonal temperatures. The system provides increased productivity, enhanced safety, instant interventions, and an advanced life style. The system is ubiquitous as it enables distant access. AgriSys is an addition to the current state-of-art Internet-of-things.

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