

Automatic Monitoring and Controlling environmental Parameters for Agriculture Application by Using Intel Galileo

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Abstract— This paper discuss the design, development and construction of low power consumption wireless sensors for an agriculture environment. Intel Galileo device used to monitor and control some of agriculture parameter such as temperature, humidity, moisture and light sensor. For analysis and archiving purpose, the data can be transferred over GSM and received data to mobile application. The system provides a mobile application in which farmers continuous monitors and control the irrigation system.

Key words: Intel Galileo, Sensors, DC motor, GSM, LCD and Android Application

I. INTRODUCTION

The major problem faced in many agriculture areas in that lack of mechanism in agriculture activities .In India agricultural activities carried out by manual labor, using conventional tools. We can reduce lot of manual work in the field of agriculture using automation. The main idea of the project is to automate the agriculture activities. So in our project to plan to monitor and control some agriculture activities using multisensors[1].We proposed use of temperature and moisture sensor at suitable locations for monitoring of crops. The sensing system is based on a feedback control mechanism with a centralized control unit which regulates the flow of water on to the field in the real time based on the instantaneous temperature and moisture values. The sensor data would be collected in a central processing unit which would take further action. Thus by providing right amount of water we would increase the efficiency of the farm. The farmer can also look at the sensory data and decide course of action himself [2].

II. SYSTEM DESIGN

The system is divided into two main parts Transmitter section and receiver section. Transmitter section mainly consist of the sensor circuit, Intel Galileo unit, the LCD display unit and GSM module. The sensor circuit contains the temperature sensor, Humidity sensor, moisture sensor. These sensors directly connected to the Intel Galileo. Those measured parameters displayed in an LCD display. Block diagram shows overall system of in fig 1.Recevier section consisting of GSM unit which is interfaced to mobile application.

A. Transmitter Section:

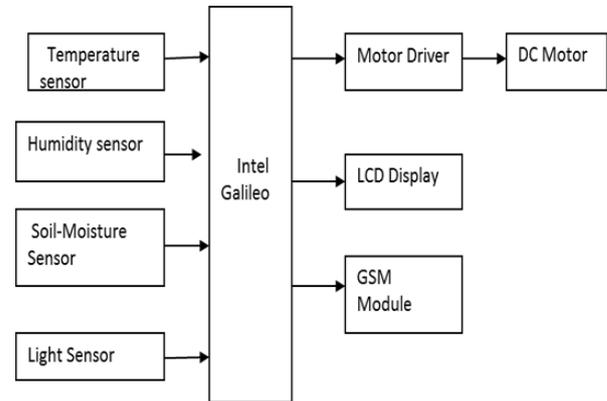


Fig. 1: Block Diagram

1) Temperature sensor:

LM35 is precision IC temperature sensor with its output proportional to the temperature .The sensor circuitry is scaled and therefore it is not subjected to oxidation another process .It also possesses the self heated and does not causes more than 0.1°Ctemperature rises in still air .The operating temperature range is from -55°C to 150°C.The output voltage varies by 10 mv in response to every °C rise/fall in ambient temperature ,i.e its scale factor is 0.01v/°C.

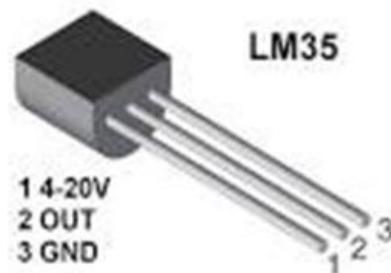


Fig. 2: LM35 Temperature sensor

2) Moisture sensor:

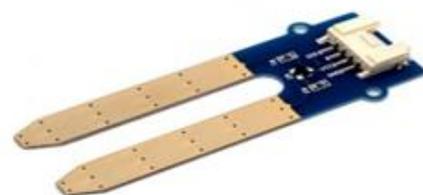


Fig. 3: Moisture sensor

This sensor is used to measure the moisture level of the field.It measures the volumetric water contain of the soil.Soil wetness is important agriculture development to help farmers for controlling their irrigation work. In this sensor we are using two probes to be dipped into the soil .As per moisture we will get analogue output variation from 0.60 volts-5 volts.

3) *Humidity sensor:*

Humidity sensor is used to measure the moisture level present in the atmosphere. Measures the relative humidity in the ambient environment. It is important to measure the moisture level in the atmosphere.

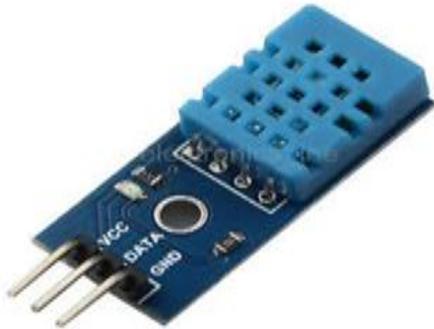


Fig. 4: Humidity sensor

4) *Light sensor:*

A light sensor generates an output signal indicating the intensity of light by measuring the radiant energy that exist in a very narrow range of frequencies basically called “Light”, and which range in frequency from “Infra-red” to “Visible” up to “Ultraviolet” light spectrum.

5) *Intel Galileo:*

Intel Galileo is a developer board designed to have powerful functionality and consumes less power. As a developer board, it has many peripherals for various applications [1]. The Intel board comes with default loaded Linux OS on SPI Memory like other boards which are usually used to boot the board. Intel Galileo can be used in much application. Intel Galileo operating software can programmed through OS X, Linux, Microsoft windows. Both hardware and software of this board that can be interfaced with the Arduino screen system Intel Galileo has the Intel Quark SOC X1000 processor which is the first product from the Intel Quark technology family of low power, small-core products.

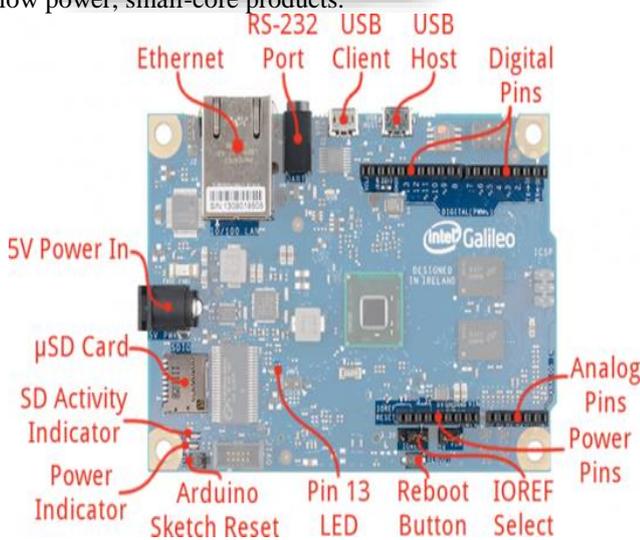


Fig. 5: Intel Galileo

Intel Galileo products challenge to participate within markets such as the Wearable computing and Internet of things. It was ingenious in Ireland, and it is a Pentium instruction set architecture, single-thread, compatible CPU, single core, 32-bit,. Its working speed is capable of 400MHz. The reason for choosing the Intel Galileo is to easily interface the multi sensors that are all required for our project.

6) *F. LCD unit:*

The 16 x 2 LCD display is capable of displaying different characters and symbols. It is used to display the measured parameters such as moisture, temperature, relative humidity.

7) *G.GSM module:*

GSM/GPRS TTL -Modem from rhydoLABZ is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3/5V TTL interfacing circuitry, which allows you to directly interface to 5V microcontrollers as well as 3V3 Microcontrollers .The baud rate can be configurable from 9600-115200 through AT command. Initially Modem is in Auto baud mode. This GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as data transfer application in M2M interface.

B. *Receiver Section:*

It mainly consists of GSM unit which is interfaced with mobile application.

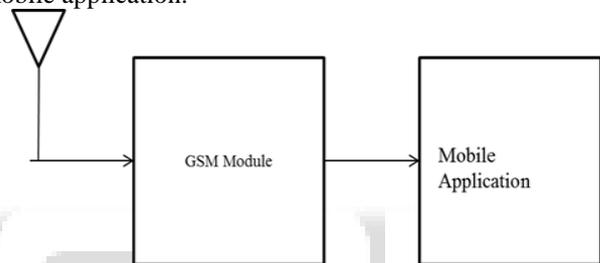


Fig. 6: Receiver section

C. *Software implementation:*

Arduino IDE1.6.0 window software-This is the latest version of the integrated development environment. Galileo can be programmed with the Arduino software. When you are ready to upload the sketch to the board, program Galileo through the USB Client port by selecting "Intel Galileo" as your board in the Arduino IDE. Connect Galileo's port labeled USB Client (the one closest to the Ethernet) to your computer. Rather than requiring a physical press of the reset button before an upload, Galileo is designed to be reset by software running on a connected computer.

When the board boots up two scenarios are possible:

- If a sketch is present in persistent storage, it is executed.
- If no sketch present, the board waits for upload commands from the IDE.

Flowchart:

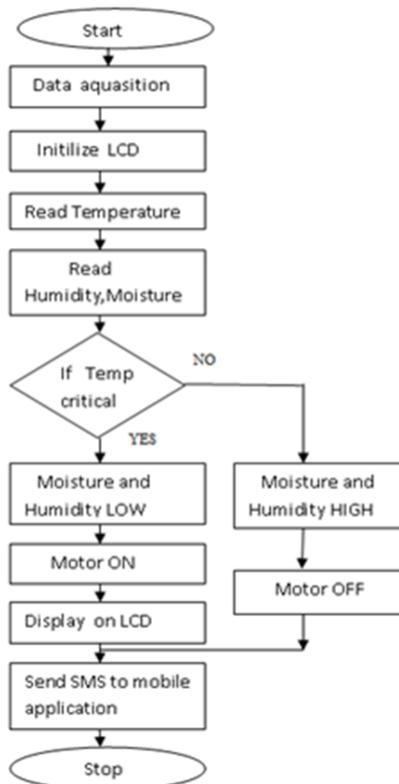


Fig. 7: Flowchart

The Intel Galileo, which controls the operation of peripheral devices and measure the input data from sensor connected to it is programmed by using arduino 1.6.0. Temperature, Humidity and moisture are sense sequentially by the sensor. These data are displayed on LCD and the data are transmitted to receiver by using GSM module.

III. RESULT AND DISCUSSION

The reading that are collected by the various sensors are all fed to the Intel Galileo board ,then the current level of the temperature, humidity, moisture content in the soil and also if there is the light produced in the light sensors will be displayed on the LCD as well as mobile application.



Fig. 8: output work

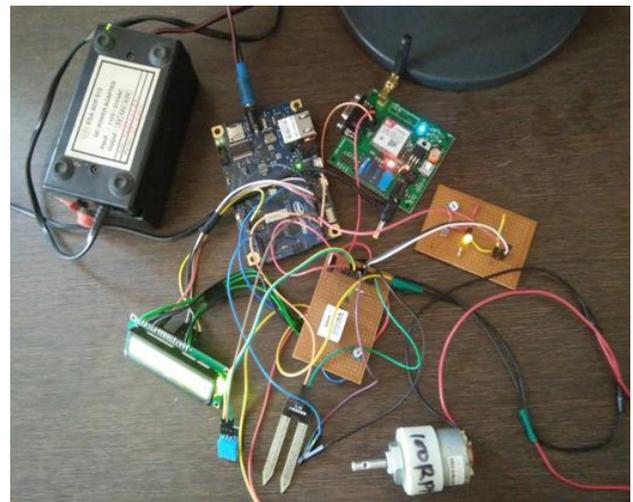


Fig. 9: our work

IV. CONCLUSION

A step-by-step approach in designing the Intel Galileo based system for measurement and control of the four essential parameters that is temperature, humidity, moisture and light sensor it has shown that the system performance is quite reliable and accurate. In traditional agricultural system the farmer needs to monitor the field condition every hours or minutes for the control of the irrigation. In future this work can also be extended with different platforms such as Lab VIEW and also additional sensors to increase the efficiency of monitoring and the parameters can also be monitored through internet with the help of HTML server.

ACKNOWLEDGMENT

We thank the Department of Electronics Engineering of Shivaji University (PVPIT,BUDHGAON),for permitting us to utilize the software and hardware product that are available in research lab.

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