Real Time Based Precision Agricultural Monitoring System

[1]Srruthilaya.T, [2]V.Sreeram, [3]Mrs. V.Uma

[1]Student, [2]Student, [3]Assistant Professor,
[1]Electronics and Communication Engineering,
[1]SCSVMV, Enathur, Kanchipuram, Tamil Nadu, India.

Abstract : *Agriculture is the most significant industry which is responsible for the development of the country. This industry has to be modernized to increase the yield and quality of the production especially in a developing country like India. Farmers still use very primitive methods for Agriculture. They are unable to control their losses and problems faced due by over irrigation and water logging. The water requirement is different for different crops and on different soil types. This paper gives a solution to the farmers where everything is automated and the crop yield can be increased substantially. This can be achieved using the concept of Internet of Things (IoT) in Farming Sector which includes smart irrigation with intelligent decision making systems based on the real time data. All the operations are controlled by remote smart devices which are interfaced to many Sensors, Cameras, Wi–Fi Modules, Raspberry pi, etc….*

IndexTerms **- IoT, WI–Fi, Sensors, Raspberry Pi, Smart Farming.**

II. INTRODUCTION

Currently, agricultural population is decreasing year by year. It is a cause of the collapse of the domestic crop of market balance because of import liberalization of agricultural products. To Test the nature and condition of the soil in agricultural land using various sensors and to maintain certain parameters of the soil, whenever it is beyond the threshold. Agriculture is the most important aspect of human life and it decides the growth of the country's gdp. But unfortunately most of the farmers in india still use the old traditional methods for farming. This does not help in increasing the yield and quality of the crops. To overcome this perennial problem we have to implement new and advanced scientific methods combined with the new technologies. In this paper, we are developing a low-cost weather data acquisition system where a single board computer runs on only battery power. In addition, we describe the application to help the users view the weather data in the android device such as smart phone to reduce the construction cost. The single board used here is raspberry pi. We attach sensors for measuring the temperature, humidity and for knowing the status of the soil. And we have created a system for uploading images and weather data obtained by the sensor to a server automatically.

III. METHODOLOGY

A. Internet of Things (IoT)

The Internet of things (IoT) is the inter-networking of physical devices. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The role and scope of IoT in Agriculture is enormous. This includes Soil Monitoring maintenance, water management for irrigation, Temperature & Humidity monitoring, Supply & Storage. The role of Precision Farming is to take into account of the crop & field conditions and on nutrient depleted areas and to automatically irrigate the land based on the wetness of the soil.

Fig 1: The IoT Model

B. RASPBERRY-PI

The Raspberry Pi 3 Model B belongs to the category of third generation Raspberry Pi. This single board computer can be used for many applications and dominates the performance of Raspberry Pi B+ and Raspberry Pi 2 'B'. This Raspberry Pi 3 B' provides a more powerful processer in standard board format, 10 times speeder than the first generation Raspberry Pi. Moreover it provides wireless LAN & Bluetooth connectivity making it suitable for powerful design.

Fig 2: Raspberry Pi 3

III. ARCHITECTURE

The system which is to be developed for Precision Farming should meet the following requirements – Scalability, Affordability, Sustainability etc…

The proposed system intends to place many different types of Sensors to measure various parameters.

The following Sensors are used:

a) Temperature Sensor
b) Leaf Sensor
c) pH Sensor
d) Light intensity sensor
e) Nitrogen sensor

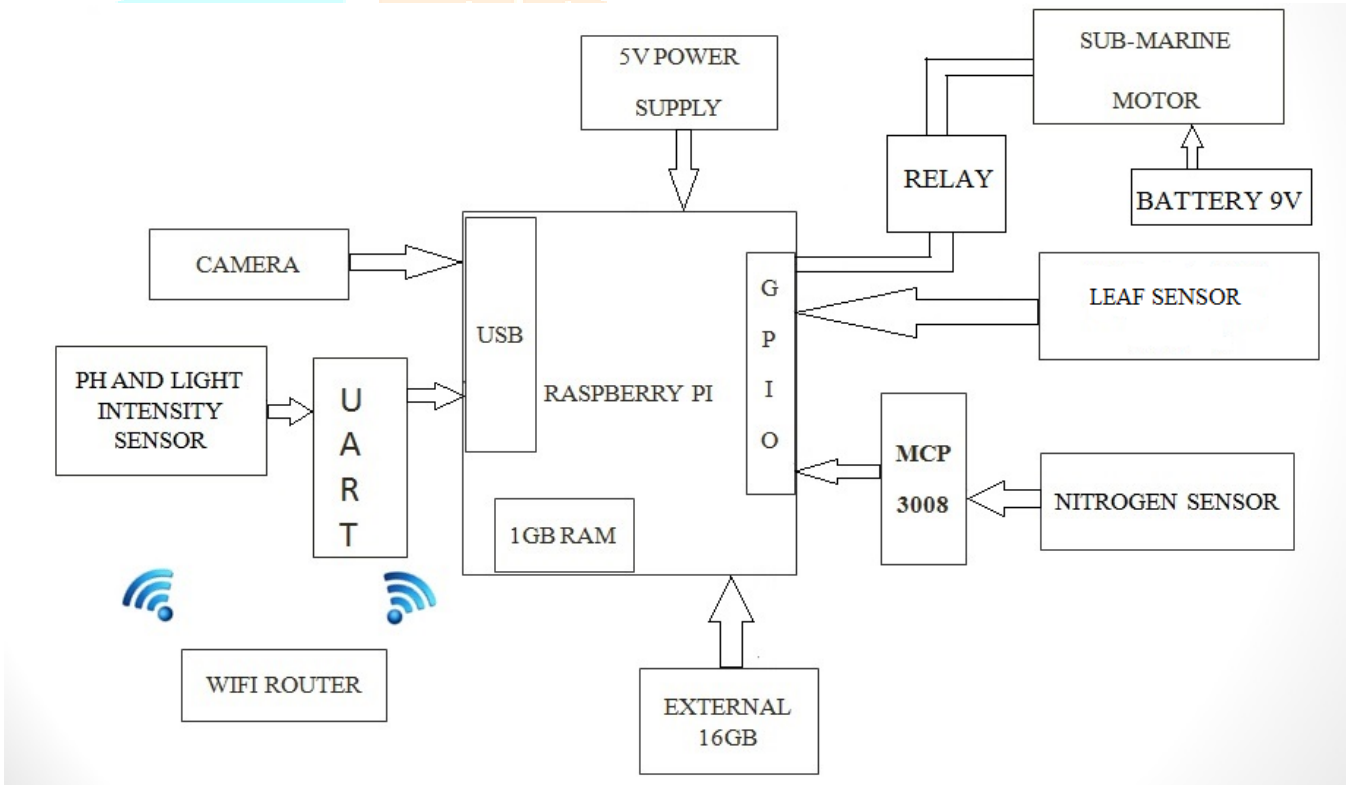

Fig 3: Block Diagram of the Proposed System

In this paper, Raspberry Pi is interfaced to the Wi-Fi router and camera Temperature, pH, Nitrogen, Light intensity and leaf sensor are interfaced with the Raspberry pi using MCP-3008 Measured data values of sensors and images are uploaded to the server using Wi-Fi router. Android device in turn communicates with the server to get the required data. The Sensors are placed in the soil and also very close to the plants to get accurate data. The information hence collected is transmitted through Wireless Networks and it is stored in the main Server. The data hence received is then analyzed carefully and necessary actions are taken. A leaf sensor is a phytometric device (measurement of plant physiological processes) that measures water loss or the water deficit stress (WDS) in plants by real-time monitoring the moisture level in plant leaves. It was designed to help monitor and control agricultural water demand.

Fig 4: Leaf sensor

Fig 5: Nitrogen sensor

The Nitrogen Sensor (MQ2) module is useful for nitrogen gas detection. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer

Pin Configuration

1. AO - Channel (ADC)
2. VCC - 5V
3. Gnd - Ground

pH and light intensity sensors measure the level of PH in sample solutions by measuring the activity of the hydrogen ions in the solutions. This activity is compared to pure water (a neutral solution) using a pH scale of 0 to 14 to determine the acidity or alkalinity of the sample solutions. Additionally interfaced components are Light intensity sensor, Temperature sensor and Water Level sensor. This module can measure the amount of water level and temperature range and light intensity. pH and light intensity sensor consist of Transmitter and Receiver pin. Transmitter pin transmit the four sensor values continuously. Using Tx pin we can measure the pH data through port terminal. This module works with a speed of 9600 baud rate.

Fig 6: pH Sensor

Pin Configuration

1. VCC – 5V
2. Gnd – Pi pin 6
3. Tx – UART Rx

The MCP3008 is a low cost 8-channel 10-bit analogue to digital converter. The precision of this ADC is similar to that of an Arduino Uno, and with 8 channels we can read quite a few analogue signals from the Pi. This chip is a great option if you just need to read simple analogue signals, like from a temperature or light sensor. The MCP3008 connects to the Raspberry Pi using a SPI serial connection.

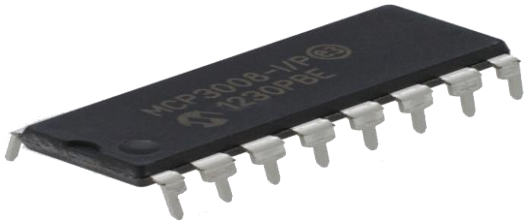

Fig 7: MCP 3008

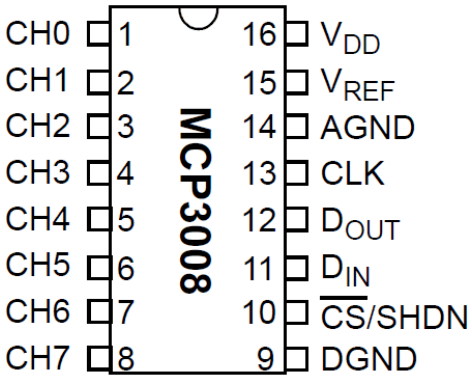

Fig 8: Pin Diagram of MCP 3008

Pin Configuration

1. MCP3008 VDD - Raspberry Pi pin 1(3.3V)
2. MCP3008 VREF - Raspberry Pi pin 17(3.3V)
3. MCP3008 AGND - Raspberry Pi pin 9(GND)
4. MCP3008 DGND - Raspberry Pi pin 39(GND)
5. MCP3008 CLK - Raspberry Pi pin 23(GPIO 11)
6. MCP3008 DOUT - Raspberry Pi pin 21(GPIO 9)
7. MCP3008 DIN - Raspberry Pi pin 19(GPIO 10)
8. MCP3008 CS/SHDN - Pi pin 24(GPIO 8)

A submersible pump (or sub pump, electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitations, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps.

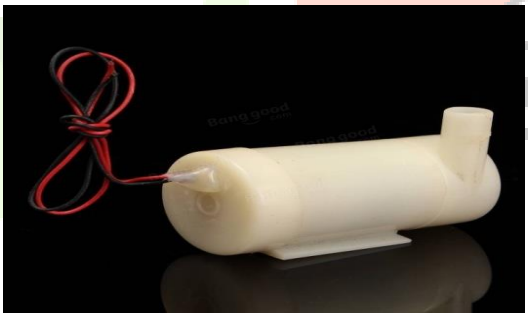

Fig 9: Submersible Motor

IV. CONCLUSION

Precision Agricultural monitoring system would support the farmers and would help them to view the land and to know certain essential parameters required for cultivation. Since it uses a single board computer of minimal cost and the android application is as simple as that a farmer can easily understand and do accordingly. Smart agriculture is an inevitable trend, accurately monitoring information from agriculture environmental and to control the crop growth process to achieve high yield with good quality harvests.

V. ACKNOWLEDGMENT

Authors are thankful to SCSVMV,their financial support during the period of this research took place is greatly acknowledged.

REFERENCES

[1] Modelling and Characteristics of Microwave Backscattering From Rice Canopy Over Growth Stages Yu Liu, Member, IEEE, Kun-Shan Chen, Fellow, IEEE, Peng Xu, and Zhao-Liang Li, Senior Member, IEEE.

[2] Migdall, S.; Klug, P.; Denis, A; Bach, H., "The additional value of hyper spectral data for smart farming," Geosciences' and Remote Sensing Symposium (IGARSS), 2012 IEEE International, vol., no.,pp.7329, 7332, 2227 July 2012.

[3] Qiang Wang, Terzis A. and Szalay A., "A novel soil measuring wireless sensor network," Instrumentation and Measurement Technology Conference (I2MTC), 2010 IEEE , vol., no., pp.412,415, 3-6 May 2010.

[4] G. Picard, T. Le Toan, and F. Mattia, "Understanding C-band radar backscatter from wheat canopy using Multiple-scattering coherent model," IEEE Trans.Geosci. Remote Sens., vol.41,no.7,pp. 1583–1591, Jul. 2003.

[5] T. Le Toan et al., "Rice crop mapping and monitoring using ERS-1 data based on experiment and modelling results," IEEE Trans Geosci. Remote Sens., vol. 35, no. 1, pp. 41–56, Jan. 1997.

[6] Tanaka, K.; Suda, T.; Hirai, K.; Sako, K.; Fuakgawa,.R.; Shimamura, M.; Togari, A, "Monitoring of soil moisture and groundwater levels using ultrasonic waves to predict slope failures," Sensors, 2009 IEEE ,vol., no., pp.617,620, 25-28 Oct. 2009.

[7] Jhuria, M.; Kumar, A; Borse, R., "Image processing for smart farming: Detection of disease and fruit grading, "Image Information Processing (ICIIP), 2013 IEEE Second International Conference on , vol., no.,pp.521,526, 9-11 Dec. 2013.

[8] Richard Beckwith, Daniel Teibel, Pat Bowen, "Report from the Field: Results from an Agricultural Wireless Sensor Network", First IEEE Workshop on Embedded Networked Sensors, *2004.*

[9] A. K. Fung, F. T. Ulaby, "Scattering from a Vegetation Layer", IEEE Transactions on Geoscience Electronics, vol. 17, pp. 1-6.

[10] **Samuel Madden, Michael Franklin, Joseph Hellerstein, Wei Hong. TAG, "A Tiny Aggregation Service for Ad-Hoc Sensor Networks", In 5th Symposium on Operating Systems Design and Implementation, pp. 131-146, December 2002.**