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IOT BASED SMART AGRICULTURAL MONITORING SYSTEM

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ABSTRACT
Agriculture is one of the important sectors contributing to the Indian economy. Agriculture sector is providing the work to more than 60% people in India. With developments in electronics and the microcontroller based systems, many applications are developed by the researchers and designers to perform the agriculture operations. Internet of Things (IoT) has opened doors of opportunities to design agriculture systems with accuracy of performing task. Arduino based systems are reliable and can be used widely for agriculture applications. Authors have proposed the implementation of Arduino based IoT system for agriculture monitoring. The parameters monitored are moisture, humidity, temperature, flow etc. The hardware prototype is developed by the authors and the system is found suitable to develop for Indian agriculture sector.

Keywords: IoT, Sensors, Wi-Fi module, ZCD, Optical Isolator, TSOP Receiver, IR Remote, etc.

INTRODUCTION
Agriculture sector is one of the major contributors to Indian economy with 18% share and growing further with the technological reforms. The growing economies like India are looking forward for the growth in the sector in coming years with improvements in effectiveness of processes. Many people living in the cities can do the farming with IoT based systems [1].
The agriculture sector affects the Indian economy to great extent. Automation with IoT enabled technology can enhance the performance of the agriculture sector [2]. Drones are commonly used now days for surveillance. Crop monitoring can help in making decisions about the operations to be performed in farm [3]. Smart agriculture systems are needed to more extend in order to enhance per hector cultivation of the crop [4]. Farming related operations such as cultivation, processing, transportation, storage and sale are to be made smart with technology to enhance the earnings of farmers [5].
Traditional methods in farming are not so efficient and most of them are manually performed and has the scope for reforms [6]. The sector is developing with application of technology, IoT enabled pumps are now days used by many farmers [7]. The moisture of the soil according to the type of crop needs to be maintained in order to get maximum turnover for agriculture [8]. The proposed system is capable to handle the challenges in farming. The smart system for crop monitoring and control is the need of time. With IoT technology the cost of such system will be less and it can be implemented on field. Authors have developed the prototype for agriculture monitoring system. The results obtained from monitoring system are presented in this paper and found suitable.

OBJECTIVES OF PROPOSED WORK:

The work presented in this paper is carried out to achieve following objectives:

- Design the monitoring system for agriculture applications.
- Develop the prototype for the system.
- Observe the performance of the prototype and verify the results.

BLOCK DIAGRAM

The block diagram for the monitoring system in agriculture applications is shown in the figure below. The different sensors are used in the system to monitor the real time situations along with controlling the flow of water to be supplied to the crop.

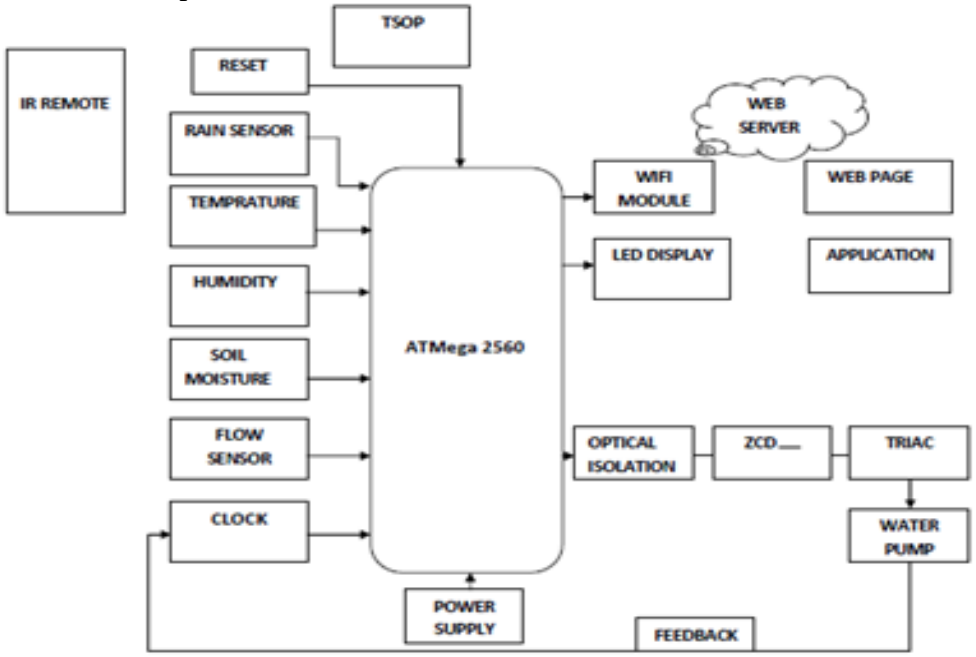

Fig.1: Proposed System for IoT based Agriculture Monitoring System

Table1: Components used in proposed system

Sr. No.	Components	Specifications
1	ATmega 2560	8Bit, 54 digital Input/ Output pins, 16 analog inputs, 4 UART
2	ESP8266 Wi-Fi Module	Wi-Fi Direct, 1MB Flash Memory, SDIO 1.1/2.0, SPI, UART, Standby Power Consumption of <1.0mW.
3	Temperature Sensor-DS18B20	1-Wire Interface; Measures Temperature from -55 ºC TO +125ºC; Coverts temperature to 12-bit digital word in 750ms
4	Soil Moisture Sensor	3.3V to 5V; Analog Output; VCC external 3.3 V to 5V
5	GSM Module RS-232	900/1800 MHz.
6	Humidity Sensor	3.5V to 5.5V, Analog Output; VCC external 3.3 V to 5V

Hardware Development and Results

Arduino based system is developed to monitor the parameters such as temperature, humidity, moisture, water level, and rain.

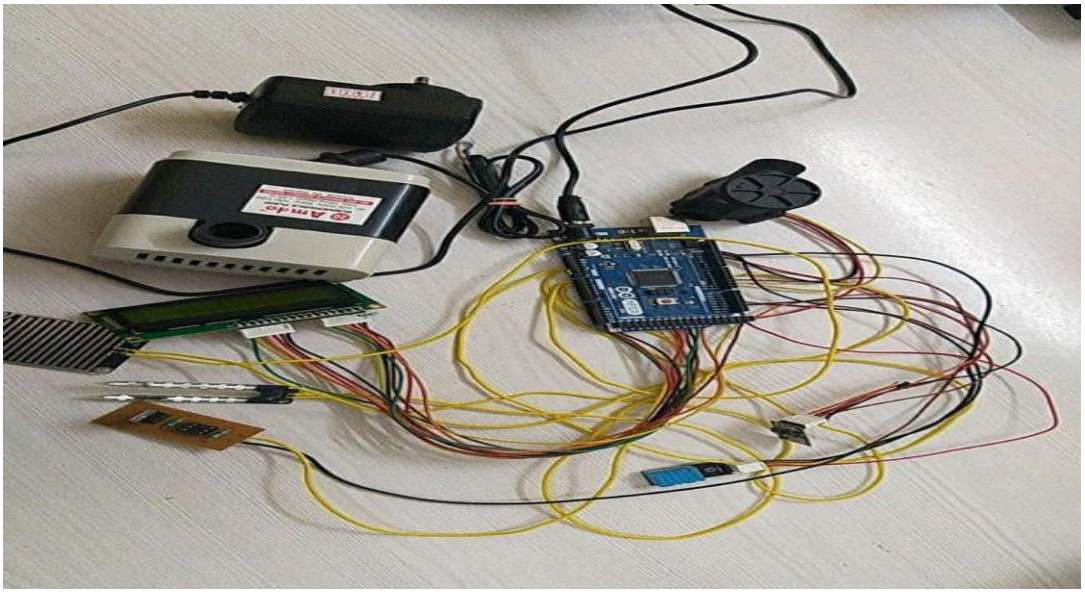

Fig.2: Arduino based monitoring system for agriculture applications

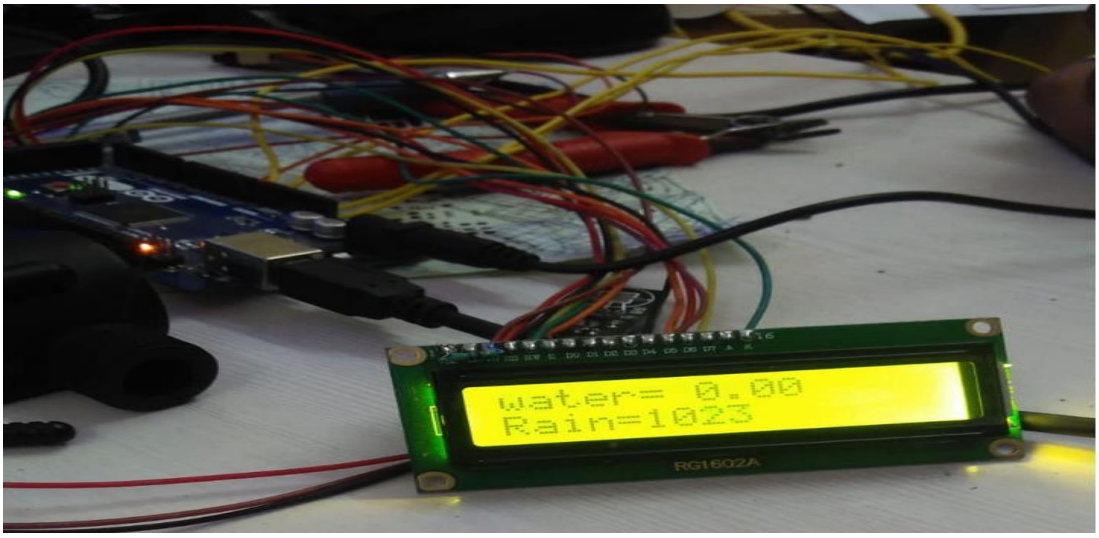

Fig.3: Output of the system showing rain conditions.

Fig.3: Output of the proposed system showing the water level of soil

Table 2: Output of the parameters monitored

Sr. No.	Temperature	Humidity	Soil Moisture	Rain	Flow Rate	Total Water	Date	Time
1	1	2	3	4	5	7	04/09/2020	05:33:10 pm
2	1	2	3	4	5	7	04/09/2020	05:33:11 pm
3	1	2	3	4	5	7	04/09/2020	05:33:12 pm
4	1	2	3	4	5	7	04/09/2020	05:33:14 pm
5	1	2	3	4	5	7	04/09/2020	05:33:15 pm
6	1	2	3	4	5	7	04/09/2020	05:33:16 pm
7	1	2	3	4	5	7	04/09/2020	05:33:17 pm
8	1	2	3	4	5	7	04/09/2020	05:33:18 pm
9	1	2	3	4	5	7	04/09/2020	05:33:19 pm
10	1	2	3	4	5	7	04/09/2020	05:33:21 pm
11	31.00	65.00	0	0	0	0.00	04/09/2020	09:18:03 pm
12	31.00	67.00	0	0	0	0.00	04/09/2020	09:18:25 pm
13	31.00	65.00	772	710	0	0.00	05/09/2020	01:07:59 pm
14	31.00	81.00	635	677	0	0.00	05/09/2020	01:08:21 pm
15	31.00	65.00	1023	1023	0	0.00	05/09/2020	01:08:43 pm
16	31.00	64.00	429	346	680	0.00	05/09/2020	01:09:05 pm
17	31.00	64.00	969	912	0	0.00	05/09/2020	01:09:27 pm
18	31.00	64.00	1023	1023	0	0.00	05/09/2020	01:09:49 pm
19	31.00	64.00	825	877	0	0.00	05/09/2020	01:10:10 pm
20	31.00	64.00	0	0	0	1.00	05/09/2020	01:10:32 pm
21	31.00	64.00	1023	1023	0	1.00	05/09/2020	01:10:54 pm
22	31.00	64.00	566	637	0	1.00	05/09/2020	01:11:16 pm
23	31.00	64.00	0	0	0	1.00	05/09/2020	01:11:38 pm
24	31.00	64.00	1023	1023	0	1.00	05/09/2020	01:12:00 pm
25	31.00	64.00	0	0	0	1.00	05/09/2020	01:12:22 pm
26	31.00	64.00	0	0	0	1.00	05/09/2020	01:12:44 pm
27	31.00	64.00	912	855	0	1.00	05/09/2020	01:13:06 pm

CONCLUSION

IoT based agriculture monitoring system is useful to monitor various parameters of the farm such as soil temperature, humidity, water flow to be maintained etc. This has made it possible to improve the performance in farming operations. This system helps in utilizing the resources like water as per requirement in controlled manner. IoT based system is developed by the authors and the results are presented in this paper. It is observed that, system is capable of real time monitoring the soil conditions and according to the requirement. Agriculture sector in developing countries is one of the major sectors contributing to the economy. With the developing technology the agriculture sector is growing to the good extend.

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