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IOT Based Automation and Monitoring of Induction Motor

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Abstract- *In rural areas water pumps may get damage due to the low water level in the tank as well as the three phase supply is not available such problem can be avoided by using "IOT". Due to frequent power cuts and abnormal voltage conditions in India, it is necessary to distribute water efficiently to the field during normal conditions. This is carried out by exchanging the information between the user phone and IOT in the form of messages. This system is developed with ATMega328 Microcontroller which is connected to the IOT and the motor. The microcontroller includes the protection against over-current, dry running and single phasing. It is expected that this application provides easy access of motor to a great extent.*

Keywords—*Microcontroller, moisture sensor, Wi-Fi module, dry run protection, LCD display, IOT*

I- INTRODUCTION

Now a day, most of the farmers use water from the wells and underground water resources for their farms and for this they need water pumps. To start and control this water pumps user require DOL starter. Presently the DOL starter is operated manually, but in 2014 GSM DOL starter are available in market. In some places the network connection is not available and there is another drawback in GSM based DOL starter and automatic starter if the water level is decreased below the required level then also water pumps are not turned off automatically this will damage the water pump. The Internet of Things (IOT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. The Internet of Things extends internet connectivity beyond traditional devices like desktop and laptop, computers, smart phones and tablets to a diverse range of devices and everyday things that utilize embedded technology to communicate and interact with the external environment, all via the Internet.

II- SYSTEM OVERVIEW

The main components are:

1. *Microcontroller*:

ATmega328 is an eight (8) bit Microcontroller. It can handle the data sized of up to eight (8) bits. Its built in internal memory is around 32KB. It operates ranging from 3.3V to 5V. It has an ability to store the data even when the electrical supply is removed from its biasing terminals. Its excellent features include the cost efficiency, low power dissipation, programming lock for security purposes, real timer counter with separate oscillator.

Fig 1: Microcontroller Atmega 328

2. *Moisture Sensor:*

This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. More water makes the soil conduct electricity more easily (less resistance), while dry soil conducts electricity poorly (more resistance).

Specification

- Power supply: 3.3v or 5v
- Output voltage signal: 0~4.2v
- Current: 35mA
- Pin definition: Analog output(Blue wire) GND(Black wire) Power(Red wire)

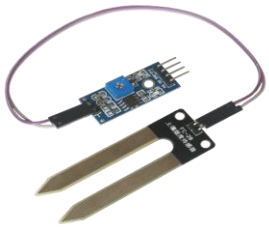

Fig 2: Moisture Sensor

3. *Wi-Fi Module:*

The ESP8266 WiFi Module is integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions.

Specifications:

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, LNA, power amplifier and matching network
- Power down leakage current of <10uA
- 1MB Flash Memory
- Integrated low power 32-bit CPU could be used as application processor
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

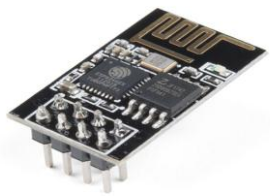

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Fig 4: Dry Run Protection

5. *Relay Switch*

It is an electrical switch. It uses solenoid mechanism that is operated mechanically. Microcontroller cannot directly control motor because power supplied by controller is not sufficient to drive motor. It is necessary to control a circuit by a separate low power signal.

6. *LCD Display*

LCD is used for displaying the sensor values and for every certain period of time, value form sensor are updated into webpage, whenever there is need to change the threshold value, according to climate and stage of crop we can tap a threshold limit button, corresponding to the situation. It displays reading of

moisture sensor, 3 phase indicator and dry run protection.

Fig 5: LCD Display 16x2

Software used

Arduino 1.8.8

The open-source Arduino software makes it easy to write code and upload it to the microcontroller board. It runs on Windows, Mac OS X, and Linux. The environment is written Java and based on processing and other open source software.

IOT (Internet of things)

IOT is a shared network that can interacts with objects through internet connection. This smart work helps in effective usage of resources like water, fertilizer, electricity. This system is developed for monitoring and maintaining the situation at farm field with sensors. Mobile networks i.e. 3G and LTE, together with smart phones have made tremendous growth in technology. Where objects like microcontroller and other are connected to internet with an IP address.

Web page

It is a document that is suitable to act as a web resource on the World Wide Web. When accessed by a web browser it may be displayed as a web page on a monitor or mobile device.

Webpage is password protected as for logging in username and password is requires. Password for log in can change in the website. In this webpage have options after log in.

Motor control- It is used for switching on/off the motor.

Motor Schedule- From this we can set the timer for start and stop the motor on the basis of daily weekly or monthly.

Status- It will show the three phases of the motor ON/OFF, shows moisture sensor reading and dry run protection reading. It also shows time and date of the motor started.

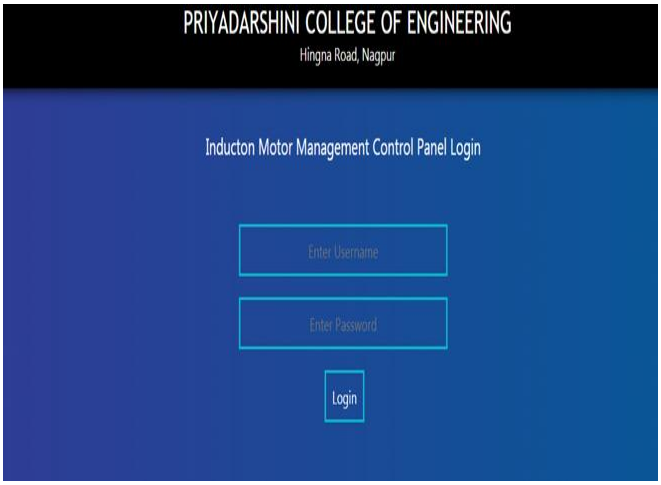

Fig 6: Log in page shown on website

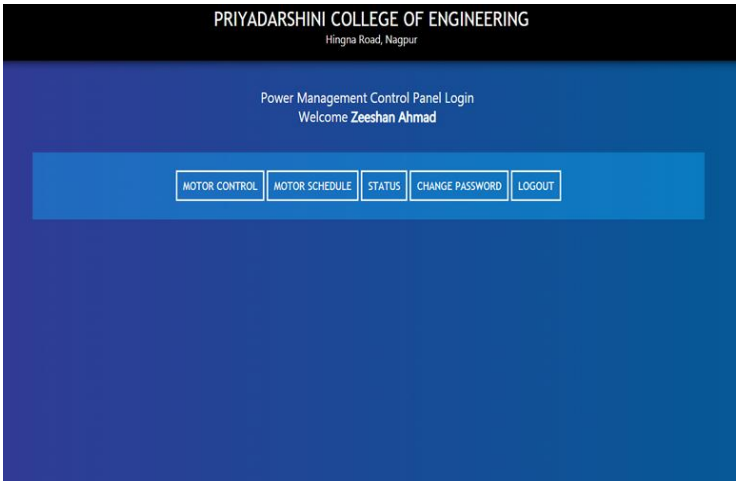

Fig 7: After log in 5 options shown

III. Methodology

1. Overview:

The AC supply 230V will be passed on the transformer which step down to 12V and it is given to microcontroller after rectifying and regulating at on 5V DC supply. Signal to ON/OFF the motor is send through the webpage through web browser which is password protected. Microcontroller sense that signal through Wi-Fi module and give command to the starter contactor and contractor closes the circuit and start the motor. Moisture senses the dry or wet condition of soil. Motor can also start by using time setting which can be set daily, weekly or monthly. Dry run protection protect the motor when well is dried. Motor also protected from single phasing and overloading.

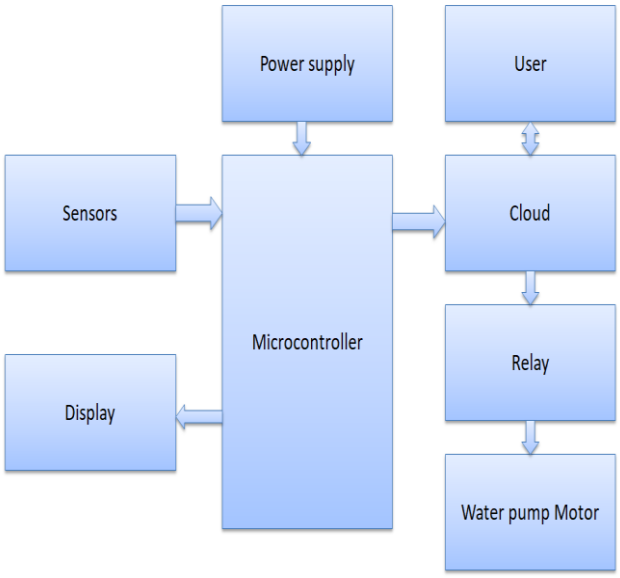

Fig 8: Block Diagram of system

2. Test Results

Motor is started after tapping on the website for ON/OFF. It takes 1 to 2 seconds to start. After starting motor works normally and shows the status on the website. If any of the phases cut-out motor will turn off automatically and shows result on the LCD and website. Moisture sensor senses the soil and shows reading on the both LCD and website

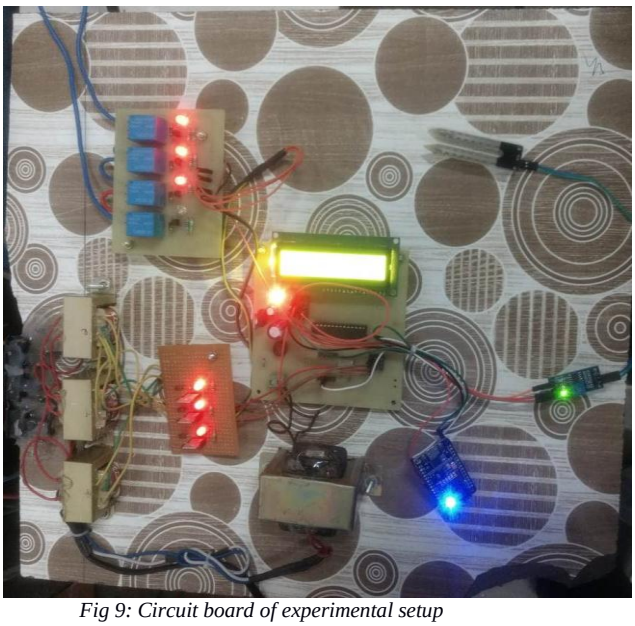

Fig 9: Circuit board of experimental setup

Result on the LCD screen

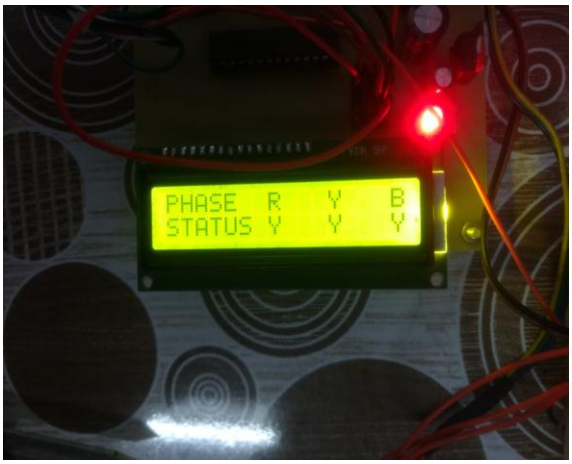

Fig 10: Shows 3 phases on LCD

Fig 11: Soil moisture reading shown on LCD

Result on website

Sr.No.	FAULT [R]	FAULT [Y]	FAULT [B]	DRY RUN	SOIL MOISTURE	TIME	DATE
1	N	N	Y	YES	0	05:58 PM	11-03-2019
2	Y	Y	Y	YES	0	05:57 PM	11-03-2019
3	Y	Y	Y	YES	0	05:57 PM	11-03-2019
4	Y	Y	Y	YES	0	05:57 PM	11-03-2019
5	N	N	Y	YES	0	05:57 PM	11-03-2019
6	N	N	Y	YES	0	05:56 PM	11-03-2019
7	Y	Y	Y	YES	0	05:56 PM	11-03-2019
8	Y	Y	Y	YES	0	05:56 PM	11-03-2019
9	Y	Y	Y	YES	0	05:56 PM	11-03-2019
10	N	Y	Y	YES	60	05:56 PM	11-03-2019
11	N	N	Y	YES	47	05:56 PM	11-03-2019
12	Y	Y	Y	YES	43	05:55 PM	11-03-2019
13	Y	Y	Y	YES	49	05:55 PM	11-03-2019
14	Y	Y	Y	YES	20	05:55 PM	11-03-2019
15	N	Y	Y	YES	0	05:55 PM	11-03-2019
16	Y	Y	Y	YES	51	05:55 PM	11-03-2019

Fig 12: Status shown in website

IV. Advantages

1) Motor can be controlled from long distances.
2) Economical design.
3) Can be easily implemented in homes.
4) Elimination of timer circuit since using online timer
5) Can be used by everyone with just the knowledge of text.
6) Installation of app not necessary the user can operate the water pump by using and website there is no need to install the application.

V. Conclusion

IOT based system transmit readings over wide distance at low cost. Working model of water pump controller integrated with sensors protect the motor and supplying water is done automatically by microcontroller based IOT. Automation in agriculture reduces labour, and difficulties as most important in irrigation. Our main objective was to construct a controlling of water pump using website. By continuously monitoring the status of the soil, we can control the flow of water and thereby reduce the wastage. System and operational flexibility: As desired, any valve can be controlled along with the pump and increases the efficiency of water use. If water is stored in tanks at irrigation lands, one can get the status of the status of the water level, temperature sensor and moisture content in soil through SMS generator by microcontroller present at the irrigation land.

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