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AUTOMATIC IRRIGATION AND EVACUATED BORE-WELL ACCIDENT ALERTING AND PREVENTION SYSTEM

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ABSTRACT: Efforts of human power for irrigation are increasing day by day and also humans or animals are falling in evacuated bore-wells are also happening frequently. To reduce the human efforts of irrigation in agricultural fields and to prevent humans and animals from falling into evacuated bore-wells, we implement an innovative idea, "**Automatic Irrigation and Evacuated Bore-Well Accident Alerting and Prevention System**". This paper aims two major things. One is automatic irrigation which is done by getting soil moisture values from the field and automatically water the field based on threshold levels. We can also monitor temperature, humidity, soil moisture, low water level indication of bore-well on IoT screen using thingspeak server. The second application is to alert and prevent unauthorized bore-well pump removals and alert the control room through IoT. We also provide local alerting system for safety. IoT communication is done by GSM module in GPRS mode and thingspeak server. We can also get alerts and updates as SMS by GSM module.

Keywords: Agriculture, irrigation, bore-well accidents, embedded systems, ARM7 LPC2148, sensors, motor pump, GSM module, IoT, thingspeak, Embedded C, KEIL.

1. Introduction:

Agriculture is one of the traditions which has been followed since ages. There have been lots of changes in agriculture as years passed. The modern day technologies are incorporated in agriculture to get better production with low cost, high reliability, easy means, less man human efforts etc. The major resource for agriculture is water. We provide water to farms by irrigation. Here we also use smart methods in irrigation with the use of modern technology. Embedded systems and Internet of Things are integrated and used to get desired output as per the requirements. For the source of irrigation, some of the farmers are using deep bore-wells for drifting water from the ground. When the water in that area becomes low, they are taking out pump, pipes and leaving the bore-well hole without closing completely or closing temporarily which indicates high risk. Any person, child or animal may fall in that deep hole. It is completely a sign of danger. We have seen lot of cases where children have fallen in that deep holes and later government authorities

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tried to rescue them. Sometimes the children have lost their lives. So we should avoid this in order to safeguard public/animals falling in those deep holes after the removal of bore-wells.We should maintain a regulatory committee to coordinate and monitor the bore-wells right from the installation to the decommission. Also we must have some alerting system about the removal of pump and leaving the bore-well hole without closing it completely. The alert must be local i.e), at the area of bore-well so that nearby public will be alerted and accidents can be avoided. Another alert must be sent to a local control room to take immediate action to avoid accidents. For this also we use Embedded Systems and Internet of Things to alert and prevent bore-well accident prevention.Using sensors, actuators, microcontroller, output devices and other communication modules we have developed this project which are explained in detail in this paper.

2. Existing system:

Here we take," Automatic Irrigation System using Soil Moisture Sensor and Temperature Sensor with Microcontroller AT89S52" as existing system.

2.1 Working Procedure:

Here this system consists of temperature sensor and moistures sensor to get the values from the farm. When the sensor value is low than threshold, motor is made ON automatically and made OFF when the sensor value is more than threshold. GSM modem is used to send SMS about the status of the system and MAX232 is used an interfacing unit between GSM and microcontroller.

2.2 Demerits:

1. Response time is low for AT89S52 microcontroller.
2. No humidity measurement.
3. No evacuated bore-well accident alerting and prevention system.
4. No low water level indicator.

3. Proposed System:

So our proposed system is **"Automatic Irrigation and Evacuated Bore-Well Accident Alerting and Prevention System."**

3.1 Implementations in Proposed System:

1. Here we use ARM 7 LPC2148 microcontroller which has high speed response.
2. We include temperature and humidity sensor to get both temperature and humidity.
3. Here we introduced evacuated bore-well accident alerting and prevention system.
4. Also low water level indicator is added.

3.2 Architecture and Working Procedure of Proposed System:

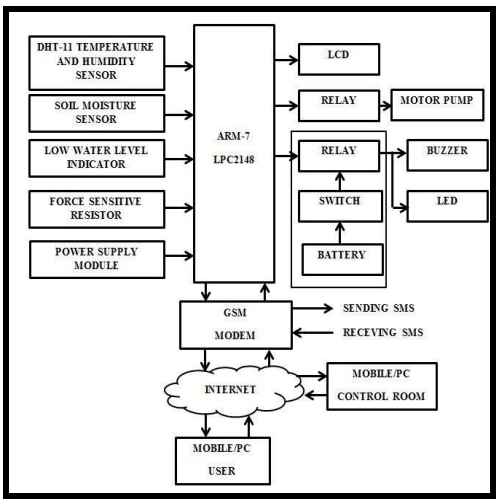

Fig 3.1 Block Diagram of Proposed System

Automatic irrigation and bore-well accident alerting and prevention system aims two major things. One is automatic irrigation. The entire system is controlled by ARM7 LPC2148 microcontroller. Here we are using temperature and humidity sensor and soil moisture sensor which are in the farm. When the soil moisture value is less than threshold value, motor pump is made ON by activating the relay automatically. When the soil moisture value is more than threshold value, motor pump is made OFF by deactivating the relay automatically. Low water level indicator is also used to know the presence of water in the bore-well. Temperature, humidity, soil moisture, low water level values can be monitored thingspeak screen using IoT communication. Another application of this project is bore-well accident alerting and prevention system on unauthorized removal of bore-well pumps and pipes without prior information. Here we use a force sensitive resistor to know the presence of pump. When pump is removed, force sensitive resistor value gets changed and indicates the problem to the control room through IoT. Thingspeak is used at control room whether all pumps are there or removed. Also local alerting system is present which alarms by light and sound signals when pump is removed. For IoT communication we use GSM module in GPRS mode and thingspeak server. We can also get alerts and updates as SMS by GSM module. Under emergency cases, we can make the motor OFF by sending SMS from remote location to the agricultural field. The entire system is programmed by the embedded C code.

4. Hardware Introduction:

4.1 ARM 7 LPC2148 Microcontroller: It has 512 KB FLASH of program memory and 32KB of SRAM. It has a clock frequency of 60MHz. It has high speed response and supports full duplex communication. It has 64 pins and 32 I/O lines.

4.2 GSM Module: Here we are using SIM800L GSM module which is used in two modes. One mode is for sending and receiving SMS. We can get alerts and updates through SMS. Another mode is for GPRS for sending and receiving data between microcontroller and thingspeak server for IoT communication.

4.3 DHT-11 Temperature and Humidity Sensor: It is a reliable sensor for getting temperature and humidity from the field. Temperature Range: 0°C to 50°C and humidity range is 20%-90%.

4.4 Soil Moisture Sensor: It is used to get soil moisture value from the field. Range: 0 to 45% volumetric water content in soil Accuracy: ±4% typical and operating temperature is –40°C to +60°C.

4.5 Low Water Level Indicator: It is a very simple indicator which has two probes. Based on the continuity we can know the presence of water in the bore-well.

4.6 Force Sensitive Resistor: It is used to know whether the bore-well pump is present or removed. When the bore-well pump is removed, it senses and changes the value of its output which gives clear indication that bore-well pump is removed. Actuation Force as low as 0.1N and sensitivity range to 10N.

4.7 Relay: Relay is an electromechanical switch which connects common to either NO or NC based on the control input. Here we use a DC control relay which operates with +5V DC.

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4.8 Motor Pump: Here we use a submersible water pump which works on 230 V AC, 50Hz frequency. It has high suction pressure and 500 l/hr flow rate. It is used to drift water from ground and pumps it to the field.

4.9 LCD: We use 16x2 LCD screen to display any information based on our project requirement. Here we can display temperature, humidity, soil moisture values on the LCD.

4.10 LED: LED is used to provide light signal for alerting purpose. We use multicolor LED in our project.

4.11 Buzzer: Buzzer is used to alarm by providing sound signal for alerting purpose. We use piezo buzzer in our project.

4.12 Power Supply Module: Power supply module gives constant +12V DC. It takes 230V AC, 50Hz and step-downs, rectifies filters and regulates it to +12V DC. This converted power is used for providing input power to the entire project.

4.13 Battery: Battery is used to give power to LED and buzzer for alerting purpose. Here we use +9V battery.

4.14: Switch: Here we use toggle switch to ON/OFF the battery which gives power to the alerting LED and buzzer.

5. Software Introduction:

5.1 Keil Software: We use Embedded C language as programming language. Here we use Keil software to translate embedded C code to hex file format

5.2 Flash Magic Software: The converted hex file is dumped into microcontroller by Flash Magic Software.

5.3 Thingspeak Server: We use thingspeak server as user interface for IoT communication. We can see the sensor values and other modules values on thingspeak website. It is a user friendly service which can be accessed free.

6. Advantages and Applications:

6.1 Advantages:

- Easy to use and implement this system.
- High speed communication.
- Automatic Irrigation.
- Evacuated Bore-well accident alerting and prevention system.
- Local alerting system for unauthorized bore-well removal.
- Low water level indicator.
- Cost effective.

6.2 Applications:

Automatic Irrigation System: This can be used where there is an application of automatic watering.

- Agricultural farms
- Fruit orchards
- Small planation areas
- Green houses

Evacuated Bore-well Accident Alerting and Prevention System: This is can be used anywhere where there is chance of happening of unauthorized bore-well removal.

- Agricultural lands
- Houses/Apartments

7. Results:

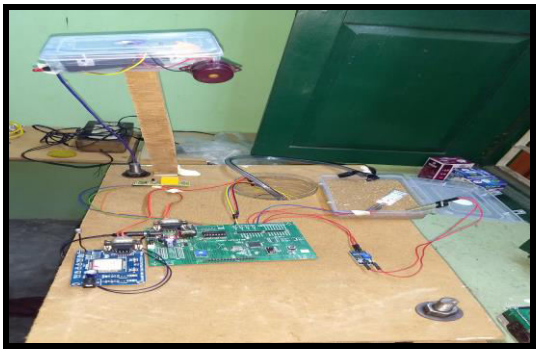

Fig 7.1 Hardware kit of the project

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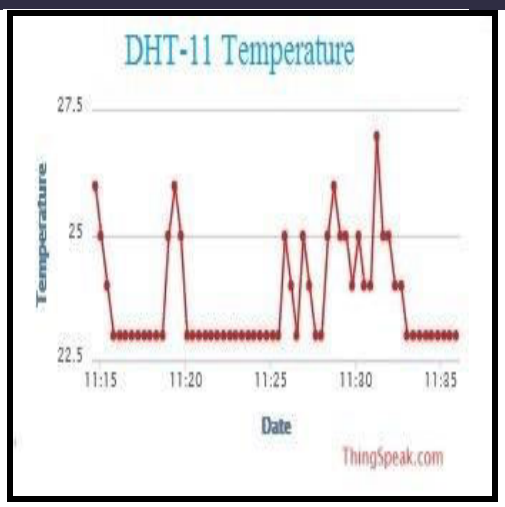

Fig 7.2 Temperature Graph

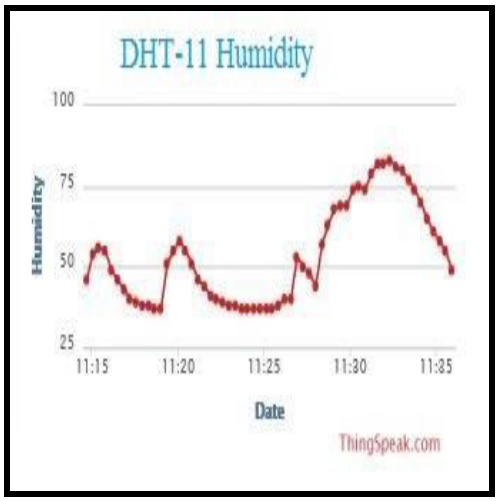

Fig 7.3 Humidity Graph

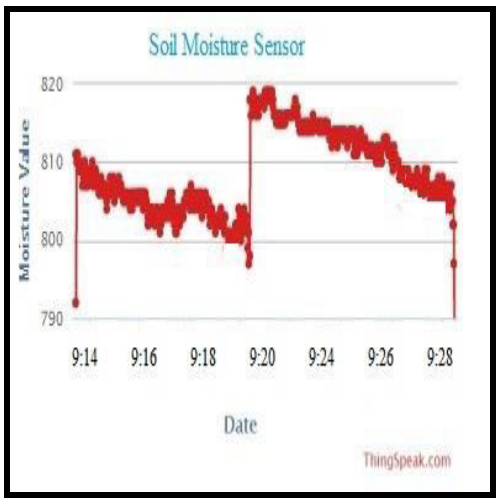

Fig 7.4 Soil Moisture Sensor Graph

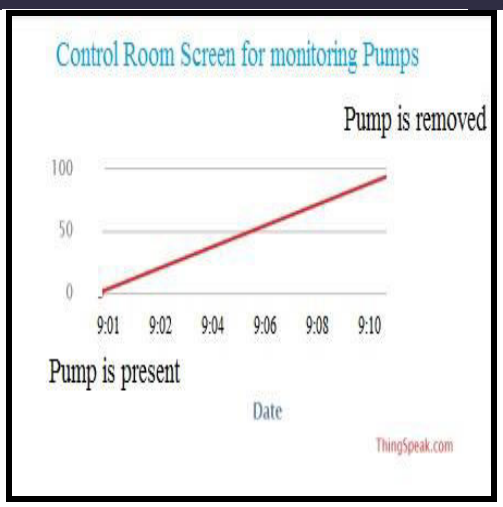

Fig 7.5 Control Room Screen

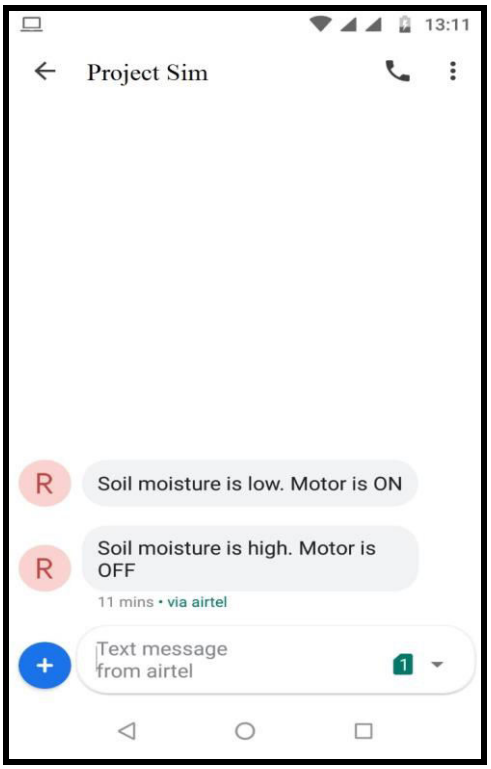

Fig 7.6 SMS Alerts

8 Future Scope:

This project can be extended by adding more sensors based on the application. We can develop separate server and IoT user interface for much better GUI of the project.

9. Conclusion:

So we can conclude that **"Automatic Irrigation and Evacuated Bore-Well Accident Alerting and Prevention System",** has lot of advantages and

applications and can be implemented easily with low cost.

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