Smart Gardening System

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Abstract: The main aim of the project is to develop techniques in agriculture automation to flourish and deliver its full potential. This system designed by using arduino microcontroller to overcome limitations of agriculture farming about supplying of water to plants by drip system with the available water tables. In our system we use Arduino microcontroller, motor pump, soil moisture sensor. The motor pump works according to the soil condition that is soil wet or dry; if soil is wet motor stops otherwise motor run to give water to plants. The status of smotor is displayed on LCD. Different sensors are connected to the controller to verify the temperature and CO gas. SMS will be sent to the owner in case of any critical situation. To keep the strangers away from the field an electric fence is included with slight shock. The electric fence will be deactivated when a authorized persons presence is identified near the field through the RFID.

Keywords: Arduino, soilmoisture, temperature, Cosensors, RFID module, electricalfence, GSM, motor pump.

I. INTRODUCTION

Irrigation is the main problem in agriculture in the countries which are in developing stage.The main cause is low rainfall due to this more land is not irrigated. Another very important reason is unplanned usage of water resources by this way more water gets wasted. By the drip system, water is supplied to the plant zone only thus saving a large amount of water. Automatic irrigation system can supply water to plants whenever they are in need of water at regular power supply intervals. Here no need of turning ON/OFF of valves.

By this automatic irrigation system, watering plants at exact time based on soil condition which will improve crop growth by taking water and minerals from soil when needed. The aim of the project is to create a sensor network based on low cost soil moisture, temperature monitoring system which helps to track the moisture of the soil and temperature in real time and allow water to the plants based on the detecting values and the type of crop.

The sensors detects the values and provide it to the Arduino microcontroller. It converts these values into its appropriate form that is executing in it and gives the output in the form water flow according to the input values.

In case, critical situation is detected through these sensors then an SMS is sent to the owner. An electrical fence is included to keep the strangers away from the field by its slight shock. Presence of a person is detected through PIR sensor and a led indication with buzzer alert will be given in case of unauthorized person's appearance. Authorized person's presence is identified using RFID module interfaced to the controller since the RFID card is being carried by that candidate, in such case electric fence will be deactivated hence it doesn't produce any shock.

II. EXISTING SYSTEM

This system is designedusing LPC2148 microcontroller, soil moisture sensor, motor pump, opto isolator which drives motor, temperature sensor, LDR sensor. A motor will turn the switch ON /OFF based on soil condition and the temperature increase in the field. The status of motor can be showed on 16X2 liquid crystal display. To find the day and night mode LDR sensor, Triac with bulb is used. The status of LDR can be showed on LCD.

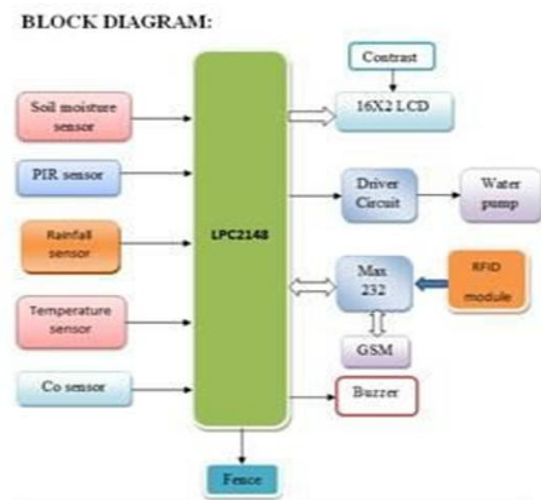**Fig. 2.1 Existing block diagram**

III. PROPOSED SYSTEM

In this system we use Arduino microcontroller, soil moisture sensors and motor pump. The motor will get switched ON/OFF depending upon the soil moisture condition and the condition of motor can be displayed on LCD. The temperature and dangerous CO gas is also identified using different sensors which are connected to the microcontroller.

In such case, unwanted situation detected through these sensors then a SMS is sent to the owner. An electrical fence is also included to keep the strangers away from the field by giving a slight shock. Presence of a person is detected through PIR sensor and then indication with buzzer alert will be given in case of unauthorized person's appearance. Owner's presence is detected using RFID module which is connected to the microcontroller when the RFID card is taken by owner in this case electrical fence is deactivated and he is free from shock by fence.
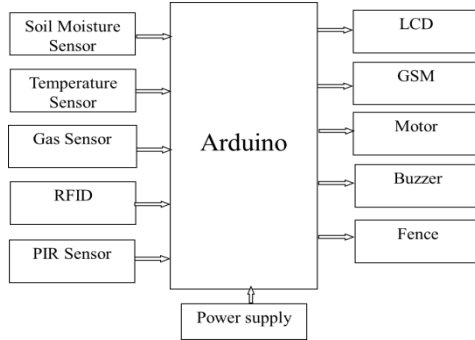

Fig. 3.1 Block diagram

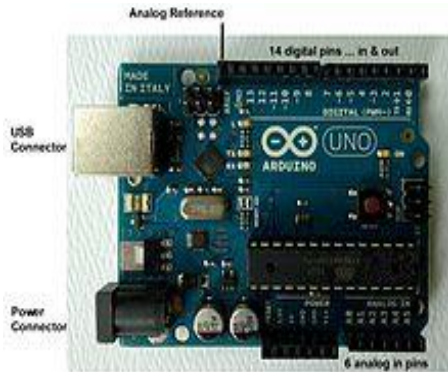## IV. HARDWARE COMPONENTS

A. Arduino

Fig. 4.1 Arduino UNO

Arduino is an open source environment that is used to manufacture microcontroller kits. It is a circuit board that has a chip on it which is programmed to do many different things. It reads information from the sensors, for instance we can use arduino to sense the moisture content of the soil using soil moisture sensor. Some of the features are as follows:

• It is with RS-232 serial interface
• It is an Atmel AT mega 8 microcontroller chip
• 14 digital I/O pins at the top, 6 analog input pins and power connector at the bottom.
• Addressable via an I²C serial bus

B. Sensor Module

A sensor is a device which is used to detect any changes in the environment and send information to the processor. The sensors in this project are as follows:

• Soil moisture sensor
• Temperature sensor

• Gas sensor
• PIR sensor

Soil moisture sensor

Working

The soil moisture sensor senses the moisture content of the soil. It has two conductors which are separated by small distance commonly called as electrodes. It has Vcc,ground and signal pins along with the digital pins which provides the output as high or low. The signal pin gives the analog value which is proportional to the amount of moisture in the soil. The two electrodes are inserted into the soil to get the moisture level of the soil. There will be high resistance when the flow of electricity is high and the resistance will be low when the flow of electricity is low. When the resistance is high the moisture content wil be high and the moisture content will be low when the resistance is low. It has two modes as follows:

• Analog mode
• Digital modes
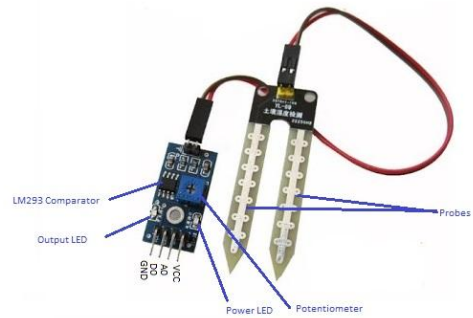
Fig. 4.2 Soil moisture sensor

The output semiconductor diode will illuminate up and down by the threshold value.

Temperature sensor

The LM35 is a analog temperature sensor used to measure the temperature. The LM35 looks like a transistor with three pins. The three pins are Vcc (power pin), Vout (output pin) and gnd (ground). The power supply can be between 2.7V to 5.5V.It is directly calibrated in centigrade and the output accuracy is + 2°C.It doesn't require any external calibration. There is linear relationship between the input voltage and the output voltage

Fig. 4.3 LM-35

Gas sensor

A gas detector is a device that is used to detect the presence of gases in an area. This type of kit is employed to observe a gas leak or different emissions and might interface with a bearing system that the method will be mechanically finish off. It has four pins namely Vcc,gnd,A0 and D0. The Vcc powers up the sensor and normally 5V is used. The gnd pin is connected to the ground or 0V.The D0 pin is a digital pin which sets to high when the gas is detected. The A0 is analog out which sets the output to 0V to 5V according to the intensity of the gas. It can detect the gas concentration anywhere from 200 to 1000 ppm(parts per million).

Fig. 4.4 CO gas sensor

These sensors employ an alarm to alert people when a dangerous gas has been sensed.

PIR Sensor

The PIR sensor stands for Passive Infra-Red. It is called passive because they don't generate or radiate any energy for the detection purpose. They work entirely by detecting the energy that is radiated by detecting objects including humans and animals.

Working

The basic principle of PIR sensor is that any objects whose inner temperature is above the absolute zero. It emits heat in the form of IR radiation. It has a white cap covered which is made up of Fresnel lens and these lens ensures to cover wider range. The sensor doesn't measure the presence of IR radiation, it actually measure the changes in the level of IR radiation. Depending on the change in the IR radiation the output will be generated. There are two slots in the sensor, when a heat body like human or animal passes by it first intercepts the one slot of the sensor and therefore the IR radiation in this slot1 will be high compared to the slot2.

When the heat body leaves the slot1 the IR radiation in the slot2 will be increased therefore the differential change will be in negative The change in pulses are given as the input to the PIR sensor and the output is detected. When the heat body passes the sensor the output of the sensor will be high and the output will be low viceversa.

C. Buzzer

A buzzer is an audio producing device that may be mechanical, electromechanical or piezoelectric. The uses of buzzer include alarm devices, timers and confirmation of user input such as a mouse click.

Fig. 4.5 Buzzer

D. Relay

A relay is an electrically operated switch. Many relays use an electromagnet energy to mechanically operate a switch. Relays are used to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. At early stage,relays were used as amplifiers in long distance circiuts, they repeated the signal coming from one circuit and re-transmitted it to another circuit. They were used extensively in telephone exchanges and old version computers to perform logical operations.

E. Rfid

The electromagnetic waves are used to detect and track the tags attached to the objects in the radio frequency identification. Information are stored in the form of electronic using the tags. Passive tags collect energy from a nearby RFID reader's by using the radio waves.Passive tags collect energy from a nearby RFID reader's by using the radio waves. Active tags have a power source and operates hundreds of meters away from the RFID reader. The tag need not to be in the line of sight, unlike the barcode. RFID is one of the method for Automatic Identification and Data Capture (AIDC).RFID microchips are implanted in livestock and pets for positive identification of animals.

F. Lcd Display

A liquid crystal display(LCD) is a flat panel display and it doesn't emit light signal directly. It uses reflectors to produce color images as well as the black and white images. It is non-emissive type of display. It has two conductors, one in the horizontal position nd the other in the vertical position.

V. WORKING PROCEDURE

Many advanced techniques has been introduced in agriculture automation to flourish and produce its full potential. This system designed by using Arduino microcontroller to overcome limitations of agriculture farming about supplying of water to plants by drip system with the available water tables. In our system we use Arduino microcontroller, motor pump, soil moisture sensor, LDR. The dielectric permittivity of the surrounding medium is measured using the capacitance of the soil moisture sensor. The dielectric permittivity is the purpose of the water content in the soil. It is proportional to the voltage created by the sensor and also to the water content of the soil. The sensor averages the water content.

The Soil Moisture detector is employed to live the loss of moisture over time because of evaporation and plant uptake, observe optimal amount of soil moisture contents for various species of plants, examine soil moisture content to limit irrigation in this experiment.

The working of the temperature sensor is about the environment climatic changes. The sensors works by the voltage read across the diode. There will be a voltage drop across the transistor terminals of base and emitter, if the voltage is high and temperature rises, then it is recorded by the sensor. An analog signal is generated by the device when there is difference in the voltage is amplified and it is proportional to the temperature. It is measured by Arduino microcontroller in real time. The working principle of an LDR is photo conductivity. The conductivity of the material is reduced when the light is absorbed. When the light falls on the LDR, the electrons in valence band gets excited to the conduction band. Hence, when light having superior energy, more electrons are excited to the conduction band which results in accumulation of large number of charge carriers. The resistance of the device reduces, when the effect of this process makes the flow of current more. Light fall of the sun is recorded by microcontroller to compare the crops in the field which one needs more sun light.

Gas sensors works on the principle of diffusion of gas in the sensor, which results in the proportionality of gas concentration to the electrical signal. Gas coming in contact with the sensor passes through a small capillary-tube and diffuses into a hydrophobic barrier to reach the electrode surface. When this reaction takes place, the required amount of gas is allowed to react with the sensing electrode to produce a sufficient electrical signal. The diffused gas in turn gets reduced at the sensing electrode. The current flowing between the cathode and anode can be measured to determine the gas concentration, with the resistor connected between the electrodes. By measuring gas concentration in the fields to detect any harmful gases generated around the fields to protect the farmer's health.

The motor pump operates based on soil moisture content measurement. If soil have more water content moisture measurement of soil is high, in that wet condition crop doesn't need water so the motor no need to run. If the water content in the soil is low that is dry condition motor run to give water to plants. The status of motor displayed on Liquid crystal display by the microcontroller. The dangerous CO gas also verified by using gas sensors connected to controller. In that case the controller circuit send SMS alert to the farmer saying dangerous gas formed in the fields. Any critical situation occurs in the field the smart sensors of this project send SMS to the owner. To avoid trespassers on fields an electrical fence also included to keep strangers away from field by its slight shock. Authorized persons presence identified by using RFID cards interfaced to controller. A RFID card consists of an element chip hooked up to a precise antenna and fixed on a substrate and compressed into numerous materials like plastic or glass fibre and attached to the objects with a fixative on the back side.

Our RFID reader consists of a scanner with antennas to transmit and receive signals and is responsible for transmitting and receiving information from the tag. This reader circuit attached to Arduino micro controller, when RFID card is carried by that person near field electrical fence deactivated hence no shock by fence. To detect the motion of any human beings near the field PIR sensor is used.There are two slots in the sensor, when a heat body like human or animal passes by it first intercepts the one slot of the sensor and therefore the IR radiation in this slot1 will be high compared to the slot2. When the heat body leaves the slot1 the IR radiation in the slot2 will be increased therefore the differential change will be in negative The change in pulses are given as the input to the PIR sensor and the output is detected. When the heat body passes the sensor the output of the sensor will be high and the output will be low viceversa.These change in pulses are detected by the arduino control circuit and send SMS through GSM module to the owner of the field
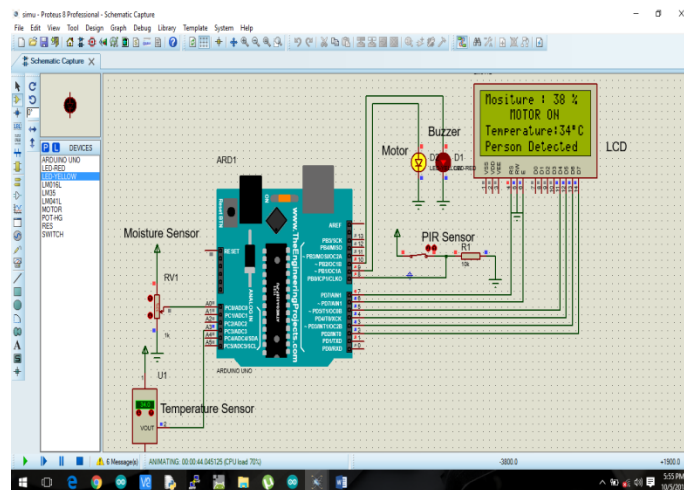
VI. SIMULATION RESULT

Fig. 6.1 Schematic design

VII.CONCLUSION

The back bone of human civilization has been irrigation since man has started agriculture. As the years passed by many methods of irrigation to the land has been introduced by the humans.

Now a days there is scarcity of water everywhere so thesaving of water plays an important role. The water flow can be controlled by sensing the moisture content in the soil and sending messages to the mobile through the GSM.

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