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E - Farming

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Abstract *—Agriculture plays an important role in the development of agricultural country. In India, farming employs over 70% of the population and accounts for one-third of the country's GDP. Agriculture has always been a stumbling block to the country's progress. Smart agriculture, which involves upgrading present agricultural processes, is the only solution to this challenge.. Hence the project aims at making agriculture smart using automation and GSM technology.*

Keywords —*GSM Modem, Moisture Sensor, PIC Microcontroller, LCD, Relay, Relay driver.*

1. INTRODUCTION

The aim of this project is to illustrate the IOT based automatic irrigation for the agricultural field. This project was initiated to develop a complete automation system for the production cycle of field plants in a greenhouse environment. The project is equipped with number of sensors like temperature, humidity, soil moisture level, and a wireless GSM modem for the complete control and monitoring of the field. All the power supply will be provide through Solar Pannel and Battery.

Agriculture plays vital role in the development of agricultural country. Farming is still based on techniques developed hundreds of years ago and does not include resource conservation. We now have the technology to close the gap between water conservation and the waste. Some developed-country technology is too pricey and sophisticated for a typical farmer to comprehend. which would help in conservation of resources such as water and also in automatizing farm. Using GSM technology, such as sensors, to allow farmers to make quick decisions. They can make well-informed crop decisions depending on meteorological conditions, moisture and humidity, and soil chemical compositions. Technology-assisted agriculture development will be extremely beneficial to farming. Without knowing or monitoring the critical soil properties for a new agricultural region.

The measurements of temperature, soil moisture measurement by using the sensors important in agricultural control. A device for control and monitoring is presented in this project. To monitor the temperature, soil moisture in field is detected and transmitted via GSM module, using analog and digital components.

2. OBJECTIVE

This project aims to develop basic technologies needed for constructing multiple, agriculture, automatic demonstration models with different application. Designing, constructing and developing this demonstration models will provide insight into the sensor technologies required to achieve the desired functionality. The project can be monitor all the parameters like temp, humidity, and water level in the soil and all the parameters can displayed on LCD simultaneously the whole capture data will be conveyed in the form of text message to the field owner.

In agriculture, measuring soil moisture is critical for farmers to better manage their irrigation systems. Farmers can not only use less water to raise a crop in general, but they can also boost yields and crop quality by better managing soil moisture throughout important plant growth stages. A potential option to assist site-specific irrigation management that helps farmers to maximize their productivity while conserving water is an embedded system for autonomous irrigation of an agriculture area.

The proposed technique has many advantages like

Reducing the risk of electric shocks, deaths due to poisonous creatures in the fields.
Visual display using LCD display unit.
Watering depends on the moisture level present in the field.
All the farm parameters can view through online in graphical notation.

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3. PROBLEM STATEMENT

This concept was sparked by the desire of farmers working in farmlands who are exclusively reliant on rain and bore wells to irrigate their land. Farmers have started employing irrigation techniques with manual control in recent years, in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. Furthermore, they are lighting a single bulb between phase and neutral for power indication, meanwhile when there is any phase deduction occurs in other phases, the farmer cannot know their supply is low. If they turn on any of the motors, the motor circuit will suddenly defuse. They may have to ho a long distance to turn the motor on or off. They may be suffering from hot Sun, rain and night time too. When they arrived at their farm, they discovered that there was no power, so they were silently disappointed!! Is there a way to fix it??? Let's take a look at our solution.

PHASE-1
Monitoring and evaluation of soil, climate, water availability & farming related information , use as a starting point of the project.
Study of various methods to test soil moisture, water level, voltage, temperature level.
Study of sensors and its availability & prices.

PHASE-2
Designing of circuit diagrams and simulation according to various blocks in block diagram.
Designing of circuit for proper mounting of various electrical and electronic components.
Fabrication of project, wirings and power testing

4. BLOCK DIAGRAM

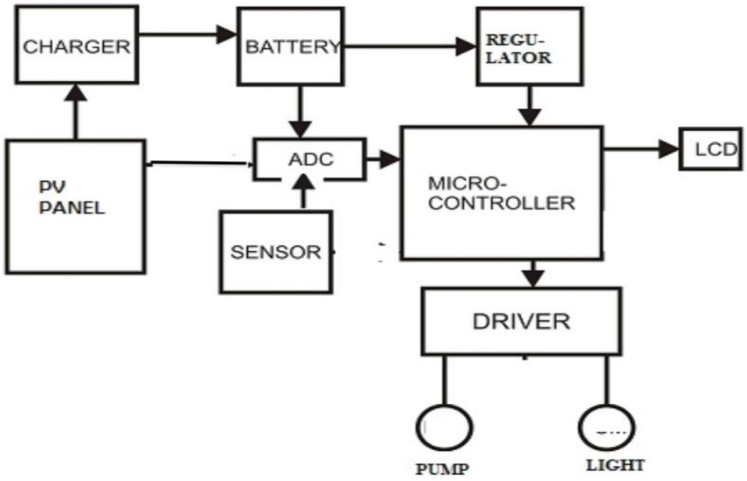

Fig 1: Block diagram of E-Farming

Block diagram consist of different types of sensors like temperature sensor, light sensor, humidity sensor, soil moisture sensor, GSM, LCD display and water motor etc. All sensors are connected to the pic microcontroller; LCD is also connected to the pic microcontroller. The input voltage is 230volt AC is applied to the transformer. Transformer is 12volt so we get 12volt output at the output of transformer. Then for filteration purpose we have used bridge rectifier. Regulator IC 7805 is used to regulate the output coming from bridge rectifier so we get 5volt DC output at the output of regulator IC 7805. LM35 is a temperature sensor, operating at 4volt to 30volt which is used to sensing the temperature from surrounding environment. DHT11 is a humidity sensor, operating at 3.3volt to 6volt which is used to sensing the relative humidity in the air. We have used Soil moisture sensor operating at 3.3volt to 5volt to measure the moisture in the soil.

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All this data coming from the sensors which is given to the pic microcontroller. Data from sensor is displayed on the LCD. The pic microcontroller transmits all data collected by the sensors to the GSM and GSM is used to send the message on mobile phone. So on mobile phone we get all data of soil moisture, temperature, Voltage level. When soil moisture sensor take reading below 50% then water motor is turned on automatically. When soil moisture sensor take reading above 50% then water motor is turned off automatically.

5. METHODOLOGY

1) PROTEUS : It is used to design circuit diagram of our project.

2) DIPTRACE: It is use to design PCB layout. In this, we design layout in manual routing.

3)MPLAB IDE(integrated device environment) : This is compiler software in which a programme of microcontroller can be write and compile using Assembly & Embedded-'C' language. This compiler generates .Hex file, further which will be dump inside the microcontroller.

6. COMPONENTS

1. REGULATOR IC 7805

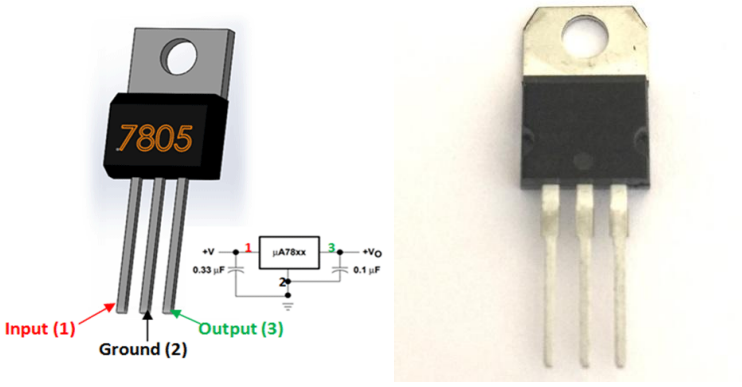

Fig 2: Regulator IC 7805

Features:
5V Positive Voltage Regulator
Minimum Input Voltage is 7V
Maximum Input Voltage is 25V
Operating current is 5mA

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. The name 7805 signifies two meaning, "78" means that it is a positive voltage regulator and "05" means that it provides 5V as output. So our 7805 will provide a +5V output voltage.

2. DRIVER IC ULN2003

It contains 7 high-voltage and high current Darlington pairs and Each pair is rated for 50V and 500mA. ULN2003 IC is one of the most commonly used Motor driver IC. This IC comes in handy when we need to drive high current loads using digital logic circuits like Op-maps, Timers, Gates, DRIVERS, PIC, ARM etc. For example a RELAY that requires 12V and 300mA to run cannot be powered by an PIC I/O hence we use this IC to source enough current and voltage for the load. Relay modules, motors, high-current LEDs, and even stepper motors are all driven by this IC. So, if you need to work with anything that requires more than 5V 80mA, this IC is the one for you.

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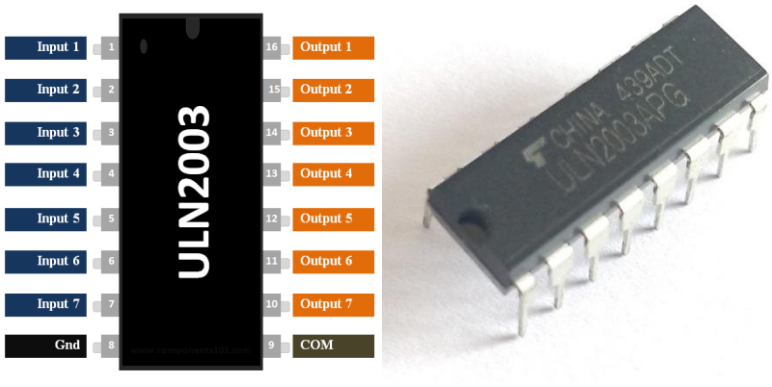

Fig 3: Driver IC ULN2003

3. PIC16F886 – 8 Bit Microcontroller

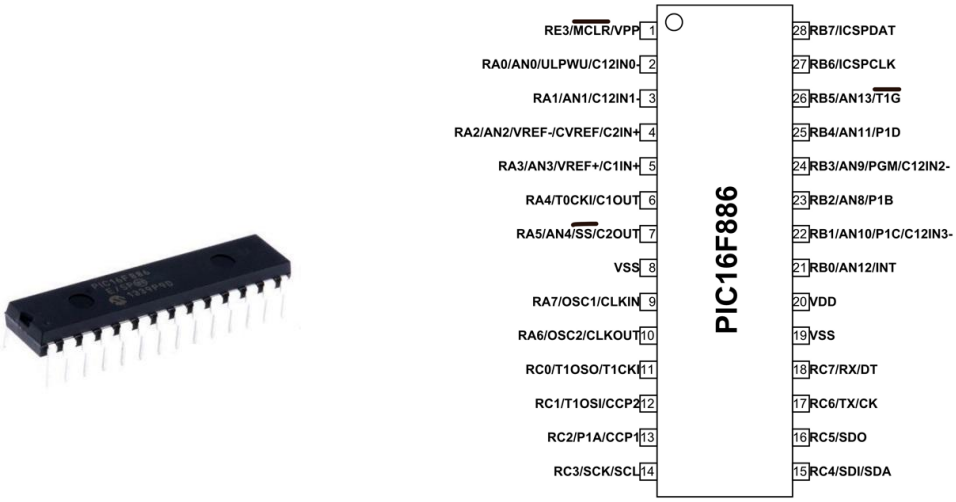

Fig 4: PIC16F886 – 8 Bit Microcontroller

PIC16F886 is a microchip technology microcontroller from the 'PIC16F' series. It is an 8-Bit CMOS Microcontroller with nano-Watt Technology. This microcontroller is popular among hobbyists and engineers due its features and cost.

4. LIQUID CRYSTAL DISPLAY (LCD)

Features of 16×2 LCD module
The operating voltage ranges from 4.7 to 5.3 volts.
Without the illumination, the current consumption is 1mA.
The term "alphanumeric LCD display module" refers to a display that can show both letters and numbers.
There are two rows, each of which can print 16 characters.
A 588 pixel box is used to create each character.
Both 8-bit and 4-bit modes are supported.
It can also show any characters created by the user.
Backlights are available in green and blue.

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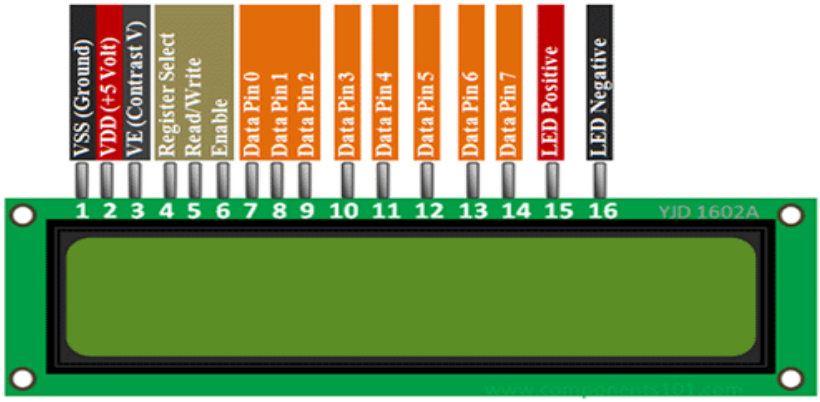

Fig 5: Liquid Crystal Display(LCD)

Brief Description on LCD modules

LCD modules are widely utilised in embedded projects due to their low cost, wide availability, and programmer friendliness. The majority of us have seen these displays in our daily lives, whether at PCOs or calculators. Let's get technical now. The appearance and pin outs have already been visualised above. The 162 LCD gets its name from the fact that it contains 16 columns and 2 rows.

There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots.

Now, we know that each character has (5×8=40) 40 Pixels and for 32 Characters we will have (32×40) 1280 Pixels. Further, the LCD should also be instructed about the Position of the Pixels. Hence it will be a hectic task to handle everything with the help of MCU, hence an **Interface IC like HD44780**is used, which is mounted on the backside of the LCD Module itself. The IC get the **Commands and Data** from the MCU and process them to display meaningful information onto our LCD Screen. If you are an advanced programmer and would like to create your own library for interfacing your Microcontroller with this LCD module then you have to understand the HD44780 IC is working and commands which can be found its datasheet.

5. RELAY

Relays are most commonly used switching device in electronics. There are two important parameters of relay, first is the Trigger Voltage, this is the voltage required to turn on the relay that is to change the contact from Common → NC to Common → NO. The other parameter is your Load Voltage & Current, which is the highest voltage and current that the NC, NO, or Common terminal of the relay can withstand, which in our instance is 30V and 10A for DC. Check to see if the load you're utilising is within this range.

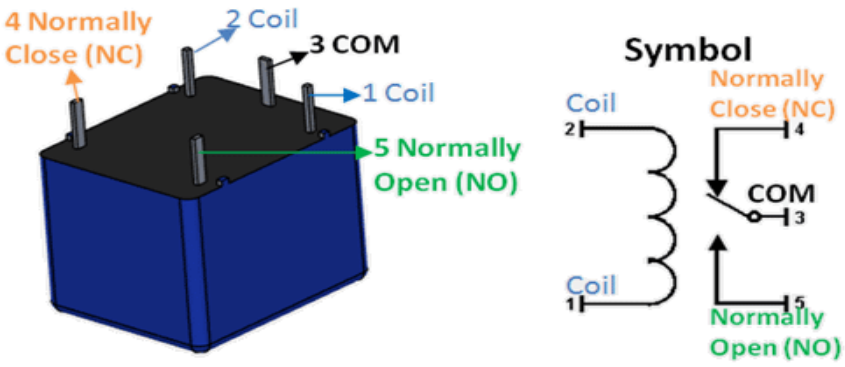

Fig 6: Relay

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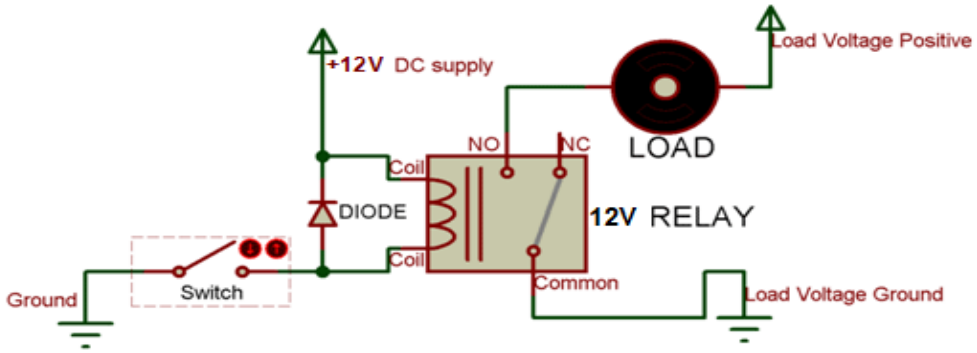
Since the relay has 12V trigger voltage we have used a +12V DC supply to one end of the coil and the other end to ground through a switch. For switching, transistor is used as a switching device. The purpose of the diode is to protect the switch from high voltage spike that can produced by the relay coil. If connected to NO the load remains disconnected before trigger and if connected to NC the load remains connected before trigger.



6. GSM MODEM

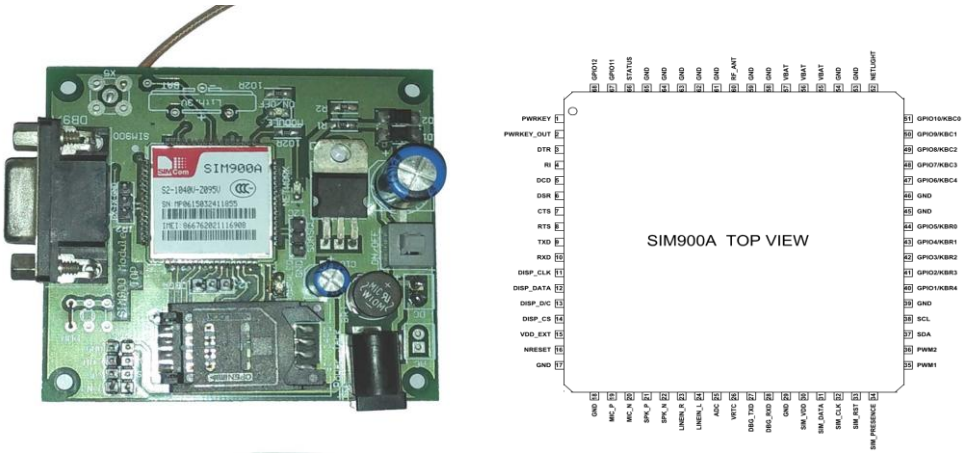


Fig 7: GSM Modem

The SIM900A is a common GSM/GPRS module found in various cell phones and PDAs. The module can also be used to create Internet of Things (IoT) and Embedded Apps. The SIM900A is a dual-band GSM/GPRS engine that operates on the EGSM 900MHz and DCS 1800MHz frequencies. SIM900A supports the GPRS coding schemes CS-1, CS-2, CS-3, and CS-4, as well as GPRS multi-slot class 10/class 8 (optional).

7. LM35 Temperature Sensor
Regulator Features:
This sensor typically operates at 5V. And can measure temperature ranging from -55°C to 150°C
Output voltage is directly proportional (Linear) to temperature (i.e.) there will be a rise of 10mV (0.01V) for every 1°C rise in temperature ±0.5°C Accuracy
Drain current of this sensor is not more than 60uA.

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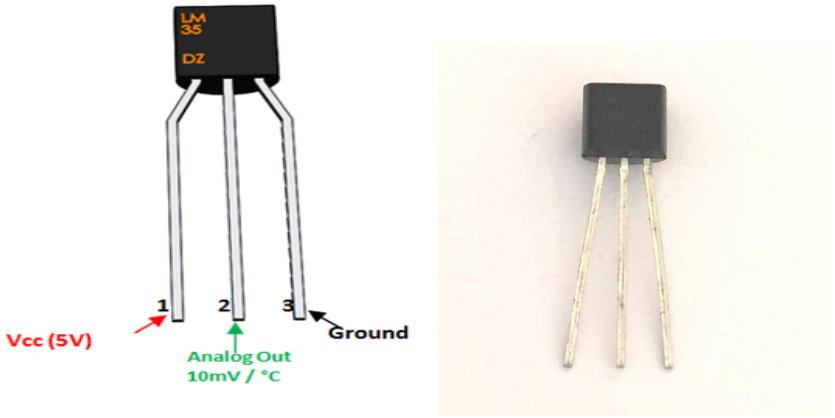

Fig 8: LM35 Temperature Sensor

7. RESULT AND DISCUSSION

(a) Pump turn on condition:
When the moisture of the agriculture field is less than 50% then the pump turns on automatically. In the period of turn on the pump, an sms containing temperature and humidity, date, time information is provided to the user.
(b) Pump turn off condition:
The flow of water can be measured. After a certain period, this pump need to be off. For turning off the pump, the condition of moisture sensor and water level should be medium. Also the notification of turning off of the pump shown to the notification bar of the user. With it, the additional information of temperature and humidity will be provided to the user.
(c) Light ON/OFF function:
The light will automatically ON if day light falls below certain value sensed by LDR and OFF in day conditions.
(d) A SMS send to the mobile number stored in micro controllers memory regarding Soil Moisture level, Pump ON/OFF, Solar Panel voltage, Battery voltage.

8. ADVANTAGES

1. The model eliminates human intervention in some of the most labor-intensive parts of an agriculture procedure.
2. The simplicity of model enables even an untutored user to use it with ease.
3. Reduce the wastage of water and can save electricity.
4. They are small in size.
5. Reducing the risks of electric shocks ,deaths due to poisonous creatures in the field.

9. Scope for Future Improvement

1. The model can be modified to fit in extra features, namely a mechanism for weeding and planting the saplings.
2. Hydraulics could be used so that the level of the digger could be adjusted automatically.
3. Solar cells can replace the DC battery to reduce the recharging cost and improve the overall efficiency.
4. Ultrasonic detectors can replace sensors for better performance.

10. CONCLUSION

This type of working model will reduce the human efforts and maintain the environment stability as well as power provisions from non conventional sources The system includes both the hardware and software interfaces and provides an easily accessible and user friendly mobile device. Messages on mobile devices

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provide advice and notifications for practically all of the challenges that farmers confront. As a result, the farmer can respond quickly to any situation. The measurement findings revealed that the system's performance is extremely dependable and precise. This approach in the field can surely aid to boost crop yields and overall productions because the implementation is made easier. Each parameter is monitored by a different sensor. Wi-Fi is a cutting-edge technology that will be important in the future.

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