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WSN Based Realization of Agriculture Monitoring System

Mrs. S.Uma Maheswari[1], Mrs. M.Jeyachitra[2]
[1]Associate Professor, [2]Assistant Professor
[1,2]ECE, Panimalar Engineering College, India
[1] umasg76@yahoo.co.in, [2] mjeyachitra87@gmail.com

Abstract— This project is a novel approach to analyze and monitor with remote sensing the evolution of crop fields. In this project, the Temperature sensor, Moisture sensor and Humidity sensor are used to analyze the parameters of agricultural crops. The PIR sensors are used to find out the human/animals in the land. The measured parameters values are displayed in LCD display and the GSM technology used to send the measured values to the particular person. Also, the motor automatically on/off based on the Agriculture parameters condition.

Keywords- wireless sensor network (WSN), LCD,GSM

I. INTRODUCTION

In the agricultural information developments, the information collection technology is indispensable to agricultural scientific research administration. The low cost and high intelligent equipment are used in the fields to improve the traditional agricultural of continued assessment of the spatial availability within the field. It identifies the critical factors where the yield is limited by controllable factors. It is essentially more precise farm management made possible by modern technology. The variations occurring in crop or soil properties within a field are noted, mapped and the management actions are taken as a consequences. Conventional agricultural is a practised for uniform application of fertilizers, herbicides, insecticides, fungicides and irrigation, without considerations spatial variability. To alleviate the ill-effects of over and under usage of inputs, the new concepts of precision agricultural has emerged [2]. It leads to sustainable development, spatially variable crop production and to a large extent is technology driven .The new tools applicable to precision agriculture are the advances in electronics and computers such as RS, GPS, and GIS. The technology covers three aspects such as data collection, analysis or processing of recorded information and recommendations based on available information. In the coming year, it is expected that the wireless sensor network (WSN) will be used commonly in application in consumer electronics, personal healthcare, toys and games, industrial control and monitoring, agriculture, etc. Considering the site of the sensor node with fairly high precision, the researchers use a planned network rather than a network with ah-hoc routing. WSN provides route diversity and multiple transmissions .The total cost of a ownership of a wireless network is lower than the wired network. Another described a precision agriculture architecture based on WSN. They deployed a large scale sensor network and acquired valuable experiences. The paper is very useful reference for WSN application in the intelligent agricultural field. However they have a little bit weak point. They can gather the environmental information, but they are weak to control the environment of the field. The contributions of his papers are summarized as follows. The system architecture of

the agricultural system is presented from the sensor node hardware in the bottom to management sub-system in the top and is evaluated in the real-deployment. The way to control the environment using the feedback from the gathered information is described in the paper. The paper gives the experiences of the real development in fields and ideas to improve the system.

II. DESCRIPTION

The architecture of the precision agriculture system based on wireless sensor networks consists of environmental monitoring nodes, hardware and software system. According to different functions, a large number of different sensors can be placed in the field and constructed a self organized network to monitor the value change including temperature, humidity and moisture. The collection data is send to the sink by wireless mode. The control center can send the control information to any node in the network. Likewise the remote data could be transmitted to the control center with the sink the system adopts the cluster topology and hierarchical routing protocols. All sensor nodes are divided into some cluster. Each cluster is equivalent to a relatively fixed self organizing network. The nodes are divided into the common node and the cluster head node the common nodes will collect the data which transmitted to the cluster head node. The data is stored to the data base .expert decision support system processes and analysis the data at the same time and send the values to the mobile phone through the message by using the GSM.

III. BLOCK DIAGRAM

The Temperature sensors are used to monitor the temperature of the agricultural field to avoid dryness of the crops. The Moisture and Humidity sensors are used to monitor the moisture of the agricultural field. GSM is used for abnormal intimations of sensors to the user by mobile SMS. LCD is used for displaying the sensor values.

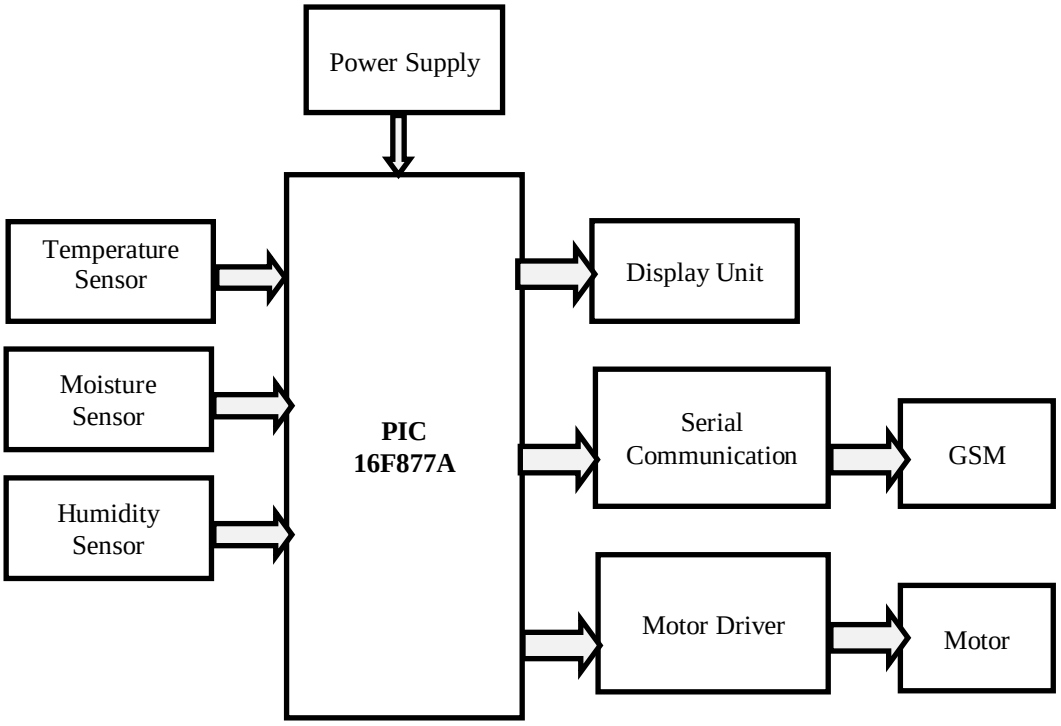

Fig.1 Block diagram using PIC16F877A

IV. HARDWARE DESIGN

A. Temperature Sensor:

The LM35 series are precision integrated circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full 55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output

impedance, linear output and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60microAmps from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a- 55°C to 150°C temperature range, while the LM35C device is rated for a -40°C to 110°C range (-10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package..

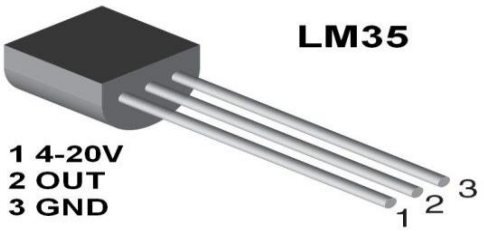

Fig.2 Temperature sensor

B. Humidity Sensor:

A Humidity sensor (or hygrometer) senses, measures and report the relative humidity in air. It therefore measures both moisture and air temperature. Relative humidity is the ratio of actual moisture in the air to the highest amount of moisture that can be held at that air temperature. The warmer the air temperature is the more moisture it can hold. Humidity sensor use capacitive measurement, which relies on electrical capacitance. Electrical capacitance is the ability of two nearby electrical conductors to create an electrical field between them. The sensor is composed of two metal plates and contains a non-conductive polymer film between them. This film collects the moisture from the air, which causes the voltage between the two plates to change. These voltage changes are converted into digital readings showing the level of moisture in the air.

The most common types of humidity sensor are categorized as accuracy, operating temperature range, humidity range, supply voltage and supply current. The temperature range of this sensor is 20 deg Celsius, the most common size for supply voltage are 3 to 5.5V and 4.5 to 5.25V. we also carry humidity sensor with supply as high as 15V. Supply current can be between 100microamps and 15milliamps.

Fig.3Humidity Sensor

C. Moisture Sensor:

Soil moisture sensors measure the volumetric water content indirectly by using some other property of soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on the environmental factors such as soil type, temperature, or electrical conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

- Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensor measure another property of moisture in soils is called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.
- Soil moisture sensor specifications. Range 0 to 45% volumetric water content in soil (capable of 0 to 100% VWC).
- Measuring soil moisture is important for agricultural applications to help farmers manage their irrigation system more efficiently. Knowing the exact soil moisture conditions on their fields, not only

are farmers are able to generally use less water to grow a crop, they are also able to increase yields and the quality of the crop by improved management of soil moisture during critical plant growth stages.

Fig.4 Moisture Sensor

D. GSM:

Global System For Mobile Communication (GSM) is a digital mobile telephony system GSM uses the variation of Time Division Multiple Access (TDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the "900MHZ or 1500MHZ" frequency band.

- GSM supports voice calls and data transfer speeds upto 9.6Kbps, together with the transmission of Short Message Services (SMS).
- The use of harmonized spectrum across most of the globe, combined with GSM's international capability, allows travelers to access the same mobile service at home and abroad.
- GSM enables users to reach via the same mobile number in up to 219 countries.
- Terrestrial GSM network now cover more than 90% of the world's population. GSM satellite roaming has also extended service to where terrestrial coverage is not available.

E. LCD:

Liquid Crystal Display (LCD) is a technology that displays the images. It is a flat panel display or other electronic visual display that uses the light modulating properties of liquid crystal. Liquid crystal does not emit light directly.

- The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables to be used in battery powered electronic equipment more efficiently than a CRT.
- It is an electronically modulated optical device made up of any number of segments controlling a layer of liquid crystals and arrayed in front of a light source or reflector to produce images in color or monochrome.
- LCD's are available to display an arbitrary images(as in a general purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits and 7-segment display as in a digital clock. They use the same technology except the arbitrary images are made up of small pixels, while other displays have larger elements.

Fig 5 LCD display

F. PIC16F877A:

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

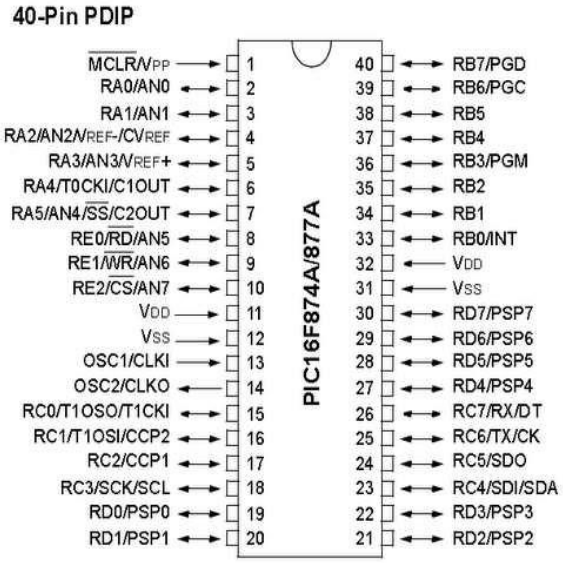

Fig. 6 Pin diagram of PIC16F874A/877A

G. POWER ADAPTER:

A power supply for electronic devices are also called as "AC adapter" or "Charger", power adapters plug into a wall outlet and convert AC to single DC voltage. Computer use multiple dc voltage, and the power adapter is the external part of the power supply. The additional DC voltages are created by internal circuits.

H. CONNECTING WIRES:

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads and electricity and telecommunication signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate.

- Wire comes in solid core, stranded or braided forms. Although usually circular in cross section , wire can be made in square, hexagonal, flattened, rectangular or other cross sections, either for decorative purposes, or for technical purposes. The term wire refer to a bundle as strands , which is "wire rope" in mechanics and "cable" in electricity
- A relay is electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

I. DC MOTOR SPECIFICATIONS:

12VDCMotor-100 RPM
Rotations per minute : 100
Output Torque Range : 7kg-cm to 10kg-cm

TABLE I
SPECIFICATION DETAILS OF MOTOR

S.No	Parameter	Specifications
1	Shaft	6mm
2	Gearbox diameter	37 mm
3	Motor Diameter	28.5 mm
4	Length	63 mm without shaft
5	Shaft length	15mm
6	Weight	300 gm
7	No-load current	No-load current : 800 mA(Max),
8	Load current	up to 9.5 A(Max)
9	RPM	100 at 12V
10	Voltage	4V to 12V
11	Stall torque	42.51 Kg-cm at stall current of 6.9 Amp.
12	Shaft diameter	8mm

13	Shaft length	25 to 30mm
14	Gear assembly	Spur
15	Brush type	Carbon
16	Motor weight	370gms

J. POWER SUPPLY UNIT:

- The purpose of a power supply is to take electrical energy in one form and convert it into another. There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices such as computers, fax machines and telecommunication equipment.
- In Supply from 230V, 50Hz AC mains is converted into smooth DC using AC-DC power supply. A power supply can by broken down into a series of blocks, each of which performs a particular function. A transformer first steps down high voltage AC to low voltage AC.
- A rectifier circuit is then used to convert AC to DC. This DC, however, contains ripples, which can be smoothened by a filter circuit. Power supplies can be 'regulated' or 'unregulated'. A regulated power supply maintains a constant DC output voltage through 'feedback action'.
- The output voltage of an unregulated supply, on the other hand, will not remain constant. It will vary depending on varying operating conditions, for example when the magnitude of input AC voltage changes.

V. SOFTWARE DESIGN

A. Proteus:

Proteus is a Virtual System Modeling and circuit simulation application. The suite combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs.

Project Notes is an application module in Proteus for adding documentation or written content to the project. It is a free-form editor so you can add whatever you like in whatever style you want. This may be as simple as scribbling a TBD list at the end of the working day or as formal as an approved revision history for the project. Project Notes are stored inside the main Proteus file (*.PDSPRJ) but can be printed separately or exported to PDF. They can also be appended to the end of the BOM PDF report or included inside the CADCAM ZIP file.

The template system in Project Notes allows you to create save and re-use formatted content and we have included some example templates for things like Engineering Change Orders, PCB Specifications and Lab Exercises that might prove useful.

In keeping with the other modules in Proteus, you can use Project Notes to interact with the rest of the system. For example, you can link text to real parts on the schematic or layout so that clicking on the link will navigate to the part in your design or PCB. You can also use field codes to bring in design information such as Author or Revision Number and the internal clipboard makes it easy to copy and paste pictures from other Proteus modules into Project Notes. Project Notes is the generic documentation center for your projects and we expect it will find many useful roles for different users.

B. PIC C Compiler:

This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The compiler includes built in functions to access the PIC hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PRAGMA. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure in C. The microcontroller clock speed may be specified in a PRAGMA to permit built in functions to delay for a given number of microseconds or milliseconds. Serial I/O functions allow standard functions such as GETC and PRINTF to be used for RS-232 like I/O.

The hardware serial transceiver is used for applicable parts when possible. For all other cases a software serial transceiver is generated by the compiler. The standard C operators and the special built in functions are optimised to produce very efficient code for the bit and I/O functions. Functions may be implemented inline or separate. Function parameters are passed in reusable registers. Inline

functions with reference parameters are implemented efficiently with no memory overhead. During the linking process the program structure including the call tree is analysed. Functions that call one another frequently are grouped together in the same page. Calls across pages are handled automatically by the tool transparent to the user. Functions may be implemented inline or separate. RAM is allocated efficiently by using the call tree to determine how locations can be re-used. Constant strings and tables are saved in the device ROM. The output hex and debug files are selectable and compatible with popular emulators & programmers including MPLAB for source level debugging. The Professional Package (PCW) provides both compilers in a powerful Windows environment.

VI. APPLICATION

This project mainly used in Agricultural for crops parameters monitoring and also used in industrial for machines automatic on/off purpose.

VII. SIMULATION OUTPUT

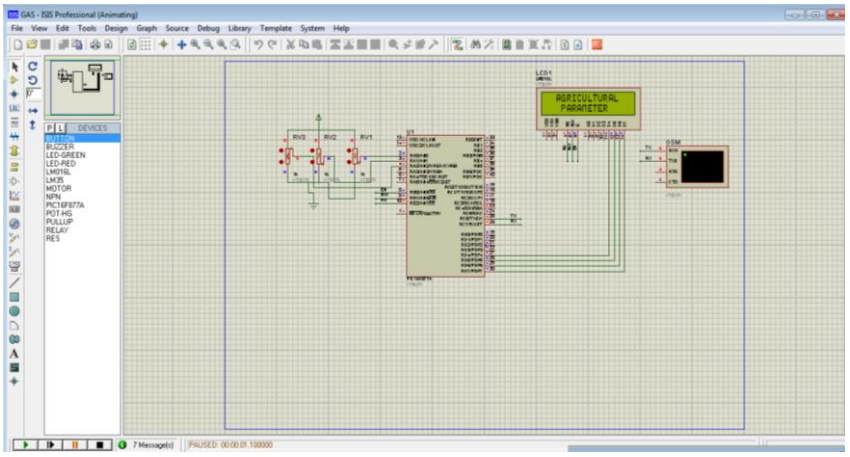

Fig.7 Agricultural parameter

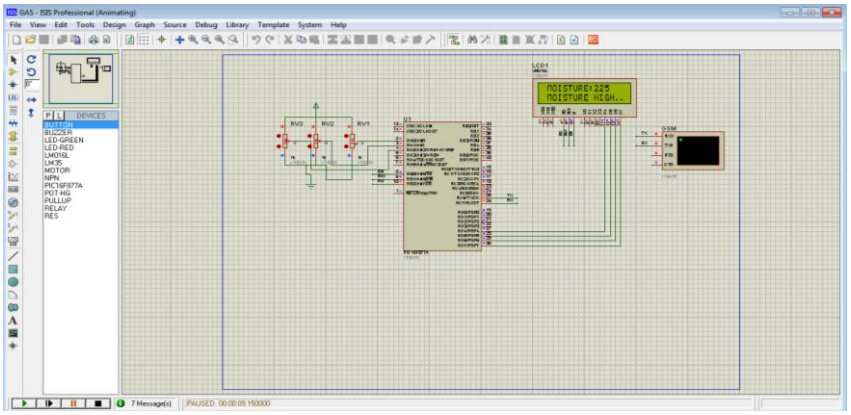

Fig 8 Moisture parameter

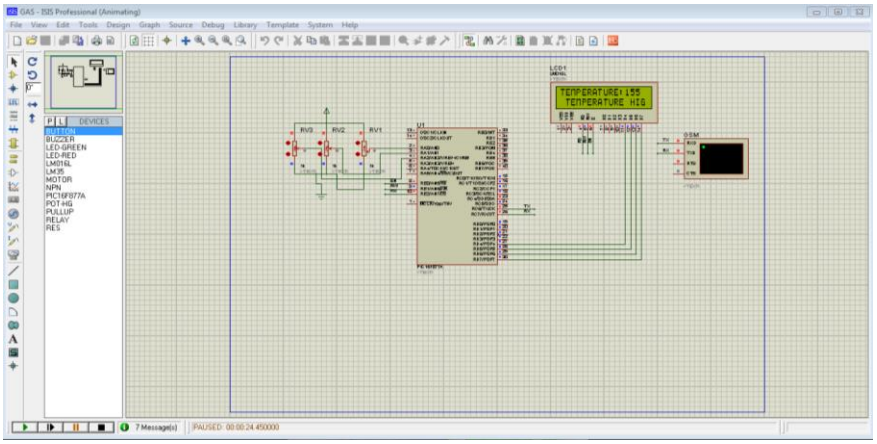

Fig 9 Temperature parameter

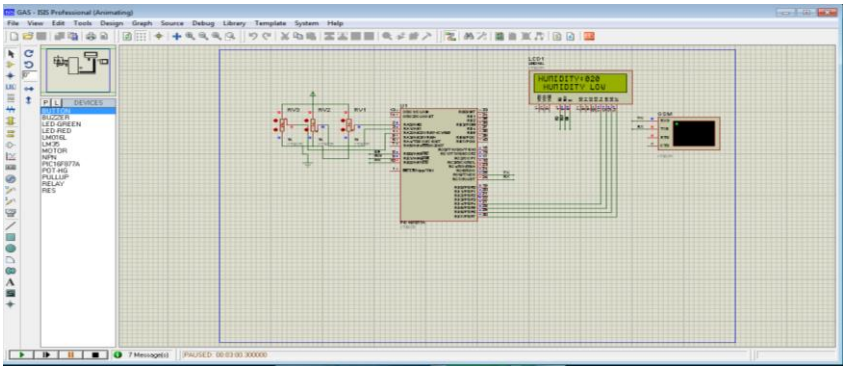

Fig 10 Humidity parameter

Fig.11 GSM display

VIII. EXPERIMENTAL RESULT

Fig.13 shows the temperature, soil moisture, humidity and sensors will send the input data to the PIC16F877A microcontroller according to the environment and values are displaying on LCD. The temperature sensor which senses the water content of the plant whether water level is high or low and also displaying on LCD when water reaches at particular level of the plant automatically the motor stops running. The GSM sends the data to PIC which is also continuously receives the data from sensors in some form of codes. After processing, the data is displayed on the LCD. When the microcontroller will get any signal may be it will on or off it says the respective action. If it is on relay then it should get activated because the relay fault is connected to the microcontroller. The microcontroller controls the operation through some activation command. Those commands were

written in the program and are used easily by the end user (farmer) through the mobile phone services. Through those commands the microcontroller gives the desired output.

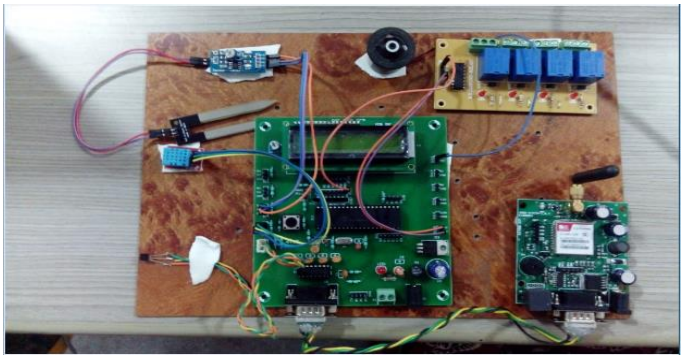

Fig.12 Hardware description

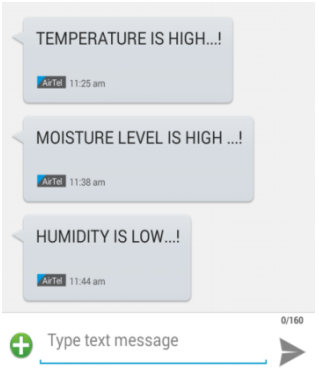

Fig.13 Snapshot of android mobile receives the Atmospheric conditions through GSM

Fig.13 shows that the user communicates with the centralized unit through SMS which will be received by the GSM with the help of the SIM card. The GSM sends this data to PIC microcontroller which is continuously receives the data through sensors. If power is available sensor which detects the current and intimates farmer through SMS. Switch ON the motor through message by the farmer.

IX. CONCLUSIONS

In this project, a novel approach to analyze and monitor with remote sensing the evolution of crop fields has been proposed and tested. The methodology is based on considering the crop evolution as a dynamic system, hence providing real-time monitoring based on remote sensing input data. It has been shown that multitemporal data are suitable to define an approach in that context. Although the methodology has been tested using polarimetry SAR data, the approach is fully capable of defining the same strategy by employing any other remotely sensed data with sensitivity to different biological crop variables.

REFERENCES

[1] T. Sakamoto, B. D. Wardlow, and A. A. Gitelson, "Detecting spatiotemporal changes of corn developmental stages in the U.S. corn belt using MODIS WDRVI data," *IEEE Trans. Geosci. Remote Sens., vol. 49, no. 6,* pp. 1926–1936, Jun. 2011.

[2] H. McNairn and B. Brisco, "The application of C-band polarimetric SAR for agriculture: A review," *Can. J. Remote Sens., vol. 30, no. 3,* pp. 525–542, Jan. 2004.

[3] A. Bouvet, T. Le Toan, and N. Lam-Dao, "Monitoring of the rice cropping system in the Mekong delta using ENVISAT/ASAR dual polarization data," *IEEE Trans. Geosci. Remote Sens., vol. 47, pp. 517–526,* Feb. 2009.

[4] J. M. Lopez-Sanchez and J. D. Ballester-Berman, "Potentials of polarimetric SAR interferometry for agriculture monitoring," *Radio Sci.*, vol. 44, no. 2, Apr. 2009, Art. ID. RS2010.

[5] N. Poole, "Disease management and crop canopies," Grains Res. Develop. Corp., Barton, ACT, Australia, Tech. Rep., 2009.

[6] R. Zurita-Milla, J. A. E. van Gijsel, N. A. S. Hamm, P. W. M. Augustijn, and A. Vrieling, "Exploring spatiotemporal phenological patterns and trajectories using self-organizing maps," *IEEE Trans. Geosci. Remote Sens., vol. 51, no. 4, pp. 1914–1921, Apr. 2013.*

