PROJECT SYNOPSIS

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Department of Electronics and Telecommunication Engineering

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Proposed Title: Implementation of GSM based smart weather monitoring for agricultural environment.

INDEX

1. Introduction

The modern agriculture is based on knowledge of meteorological parameters, and weather forecasting. Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Using weather monitoring systems, farmers and agricultural experts could collect the information about different weather parameters (temperature, humidity, leaf wetness and moisture etc.), and according to real-time and historical data they could predict precise timing for different farming activities. Some of the key activities dependent on weather conditions are chemical protection and protection against frost. These two conditions can significantly reduce or even completely destroy the quantity of products in one production year. However, listed problems can successfully be avoided with adequate treatments at the right moment. In order to collect weather parameters from arable land and their production fields, farmers need to have well planned system of strategically positioned meteorological stations so as to cover targeted area. Each station has coverage area that is most often conditioned by the configuration of the terrain and the actual purpose of the meteorological station. Along with position of meteorological stations, such systems must satisfy a number of other different requirements.

On the one hand, station needs to be well equipped with different kinds of sensors, and must have the ability to send data to the base station. On the other hand, there are limiting factors such as power supply and natural obstacles that need to be solved. The price of commercial meteorological station equipped with the necessary sensors is one of the limitation factors too. Almost all requirements regarding the creation of a meteorological station can be met with the use of electronic components available on the market. One solution for creation of private weather station is presented in this paper. Proposed solution is based on the use of PIC microcontroller, temperature sensors, humidity sensors and leaf wetness sensors. The proposed station will be equipped with all sensors that can be used in order to improve agricultural production. Along with the solution proposition, the paper gives an overview of the advantages and problems in the realization of the mentioned meteorological station.

2. Literature Review

Weather data logger based on pic microcontrollers for astronomical site survey [1]
International Journal of Knowledge Engineering, Vishnu S.N.K.N., Jeevan B., Rathan K.G.A. and Hegde R.*

This paper is aimed at measuring and acquiring the weather data parameters like temperature, pressure, humidity, wind direction, wind speed and solar radiation at a given site for setting up an astronomical observatory. These weather parameters with other data help to determine the potentially good site for astronomical seeing. The proposed weather data acquisition system should be working as an autonomous instrument generating its own power from solar panels and location information, time tags from the GPS system. Though general data acquisition systems are available in the market, they may be expensive or very general in acquiring the data. The data will be logged onto thumb drive which is a plug and play device.

Embedded weather station with remote wireless control [2], Mircea Popa, Member IEEE, and Catalin Iapa

HEATHER monitoring is of great importance in many domains. It offers information about temperature, pressure, humidity, luminosity, wind speed and direction which are useful in applications from different domains such as: agriculture, military, entertainment etc.
Future development directions are:

1) Adding other sensors, such as sensors for wind direction and speed and sensors for precipitations.
2) Adding a friendlier user interface; the present solution is based on text only.
3) Connecting the weather station to Internet so that the information is present real-time and can be consulted through a PC or a mobile phone with the GPRS service.

Design and implementation of remote terminal unit on mini monitoring weather station based on Microcontroller [3], Purnomo husnul khotimah, dikdik krisnandi,bambang sugiarto,Pusat Penelitian Informatika LIPI Jl. Sangkuriang Komplek LIPI Bandung, Indonesia, dikdik@informatika.lipi.go.id, hkhotimah@informatika.lipi.go.id, bambang@informatika.lipi.go.id

This paper will explain the use of a single master – multi slave communication method in a Remote Terminal Unit (RTU) of Mini Monitoring Weather Station Based on Microcontroller.

Until this research activity reported, it has been obtained a microcontroller-based RTU for mini weather stations model with the ability to perform data acquisition on temperature and wind speed sensors attached. But they also able transmit data to a RMSC (represent by a PC) via RS232/485. There are still improvements needed for future activity, they are adding features to save data on the master and receives commands from a remote master station center. Besides that power supply substitution that originally came from the power line become self-powered using solar cell.

Weather station for educational purposes based on Atmega8L [4], Gustavo Solano, Franco Lama, Jordan Terrazos, Jimmy Tarrillo Department of Electrical Engineering Universidad de Ingenieria y Tecnologia Lima, Peru

This article presents the design and develop of a weather station for educational purposes, which can be monitored continuously under different kinds of climatological changes and works autonomously to the energy network. The proposal of this design is based mainly on the measurement of temperature, humidity, wind, UV radiation and rain parameters using low cost commercial sensors compatible with the Arduino platform.

In this work the design and implementation of a weather station platform for educational purposes was presented. This platform was build using low cost and low precision sensors, and uses open source code. The parameters measured are UV, wind speed, temperature, humidity, and they are sent by RF to remote base station placed around 100 meters. As future work a graphic interface to increase the interaction between the students and the weather station is proposed. Moreover, low power and the calibration of all sensors may be performed in order to be used for longer periods of time with the same batteries, and to obtain the error of measurements.

Low cost weather station for climate smart agriculture [5],Sonam Tenzin1, Satetha Siyang1, Theerapat Pobkrut2, Teerakiat Kerdcharoen2,3,*
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The low-cost reliable microclimate weather station called Cloud-based station was successfully designed, fabricated and installed in an Edamame farm. Upon comparing the data sets statistically, the results have shown that the Cloud-based station is equivalently efficient to measure air temperature, relative humidity and wind direction. Both commercial and lab-made stations yield similar characteristics of climatic conditions at the farm. Therefore, the cloud-based station is more preferable to use in terms of cost affordable to farmers. The Edamame farm is generally dominated by wind from the north and south due to presence of the mountain near the farm. The climatic conditions of the farm as indicated by the obtained data states that the rainy season is the best time to grow soybean. It is obvious that the stability of temperature and humidity would preserve the soil temperature and moisture at a constant level. Hence it is easy for farmers to manage the water supply to the crop like Edamame. The proper management of water supply to the crop will maximize the soybean yield potential. This is because there is boundary function relationship between soybean yield and the seasonal water supply, besides sowing data.

In the future, we hope to compare other parameters like soil moisture and soil temperature to control amount and duration of watering crops in the farm. The use of soil sensor controlled by same microcontroller makes the cost of our weather monitoring system comparatively lower than

Davis Vantage Pro2. Secondly, we hope to use this low cost weather station together with air quality monitoring system. After all, the Cloud-based stations can be used in remote farms of developing countries.

International journal of advanced research in electrical, electronics and instrumentation engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 9, September 2016
Copyright to IJAREEIE DOI:10.15662/IJAREEIE.2016.0509032 7701, PIC microcontroller based greenhouse monitoring and control system [6], Pushkar I Madrap, Amey Deshmukh; B.E Alumnus, Dept. of Electronics and Telecommunication, PVG's College of Engineering and Technology, Pune, Maharashtra, India.

To monitor the Greenhouse parameters like humidity, temperature, soil moisture and light properly, a control system is needed. This control system is comprised of greenhouse data acquisition PIC Microcontroller along with temperature, humidity and light and pH sensor. For monitoring and storing the values of these environmental parameters PIC18F452 based circuit is used. Based on the values stored, the above system will compare the stored values with threshold values set for particular plant and control the actions of cooler, heater, and water pump. Greenhouse monitoring and control software can collect, display and record the collected data i.e., values of various parameters, also can control greenhouse environment. In addition to this the system also consists of solar inverter for backup. For displaying the stored values, we have used GLCD. This system is very useful for proper cultivation and maximum yield of crops.

The present study provides a reliable Greenhouse Monitoring and Control System, having wide application in agriculture. In this system the sensor side acts like a data acquisition unit that is capable of measuring five different parameters like temperature, light, humidity, soil moisture and pH. The main part is the controller which carries out various tasks like collection, data storage, data processing and greenhouse climate adjustment. Also, the database of various plants which is already stored in our system containing the necessary climatic conditions needed for proper growth of those plants will be very useful in increasing yield of crop plants. With graphs provided and E2PROM data, analysis will be very easily done and thus required changes can be implemented in system.

Real time data transmission for weather monitoring system, [7] Prof. Satyashil Nagrale1, Ms. Poonam Khetmalis2,Ms.Sanika Doke3, Ms. Varsha Dherange4

Many organizations, scientific institutions and government agencies are installing monitoring stations to monitor weather data and tides data as raw data for weather forecasts. However these data are still scattered on separate systems. Therefore interested parties are still

difficult to access all the data. This paper propose the design of data center for weather and tides monitoring located in several operational databases. As weather is the statement of the physical conditions at an instant, forecasting is related to all living creatures all over the world. In this 21st

century, weather monitoring and forecasting have great importance and is used in several areas such as keeping track of agricultural field weather conditions to that of industrial conditions monitoring. Weather monitoring would help in keeping record of different climatic behaviors which includes wind speed, wind direction, temperature and humidity. Weather Monitoring System can either be wired or wireless one. Just in case of wireless communication, the connectivity will be more user friendly and weather monitoring would not require physical presence of the person at the remote location. Wireless communication is the transfer of information over a distance without the use of wires. The distances involved may be long. GSM module is the cheapest and the most convenient technology now being used for wireless communication. The wireless weather system fundamentally requires few basic modules such as GSM module, sensors and microcontroller module, display module.

In this project work we have studied existing system and working on this module using a PIC microcontroller and ARM. This work includes the study of sensor (WXT520) and data logger (GEUONICA CM 3000C series) along with their opreating principle,working and features.

This module is not limited for any particular application, it can be used anywhere in a environmental forecasting industries with little modifications in software coding according to the requirements. This concept not only ensures that our work will be usable in the future but also provides the flexibility as needs change.

Utilizing a network of wireless weather stations to forecast weather in developing countries [8] (Turner M. Bumbary, Thomas Jefferson High School for Science and Technology, 2020tbumbary@tjhsst.edu)

The purpose of this research was to construct an inexpensive weather forecasting infrastructure that would allow citizens and government officials to be notified and prepare for extreme weather events. After conducting a one month testing period which consisted of a two week preliminary period and subsequent two week forecasting period, it can be concluded though this system was effective in accurately recording data and forecasting in the short term, it was not able to correctly forecast long term weather condition. After two weeks the forecasting models' accuracy significantly decreased, with the r-squared values falling between 0.14 and 0.13. Therefore, a future goal of this project is to improve the forecasting models to predict accurately up to 4 weeks in advance.

3. Relevance of the Work: -

Traditional weather stations lack self-sustainability, autonomous logging capabilities and the ability to transmit data wirelessly. Furthermore, professional weather stations are too expensive for the average consumer and they have got a limited range of transmission. Although it is not possible to monitor the weather parameters of all the places as some places are not easily accessible, the advancement of science and technology can provide us a way to get information of such places by the use of wireless devices. The weather station monitoring system display the only sensor value. Problem is that night time weather condition is required. Because which weather is night time this information required must for medicing spray. The farmer spray the medicine unwanted so the food production medicine % is increases. My aim is save the farmer's money & improves production with less medicine %. We design the system which give the continuously all weather condition information.

Choice of the topic with reasoning

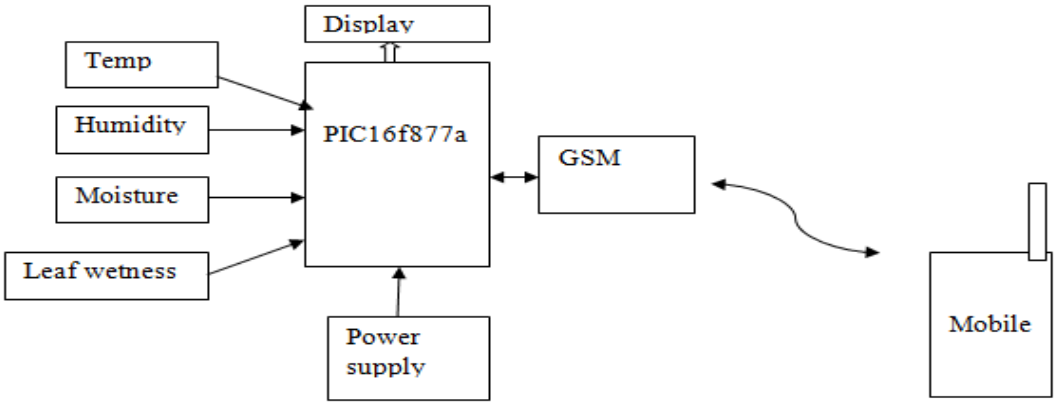
The main aim of this research is to design and implement a wireless remote weather station. The weather station will measure weather conditions using various sensors that measure temperature, light intensity, relative humidity and atmospheric pressure. A central micro-controller will be used to collect all the data from the sensors and send it to a remote user using a GSM network.

The wireless remote weather station will be beneficial to agriculture, industry, and mining and tourism sectors of the economy. The system will help these sectors in weather monitoring and forecasting, thus enabling proper planning on various activities to be carried out. The system will allow monitoring of weather conditions of any desired remote place from

- Anywhere in the world using the widespread GSM network. The design of a cost effective , portable , easy to maintain and affordable weather
- Station will help to give warning of catastrophic weather conditions such as elnino that impact weather patterns causing drought. Zimbabwe is often a victim of such calamities, causing hunger, starvation and untold suffering.

4. Methodology

1) Proposed block diagram



The system is divided into two main parts: transmitter and receiver section. Transmitter section mainly consists of: the sensor circuit, the microcontroller unit, the display unit and GSM module. The sensor circuit contains the temperature sensor, humidity and leaf wetness sensor, moisture sensor. One sensor provides analog output, which is converted to digital form using ADC channel of the controller and another sensor provides digital output and which is further processed to get temperature, humidity. Those measured parameters will be displayed in an LCD display. Block diagram of the overall system is shown in fig 1. Receiver section consists of our mobile. All the coming from weather station to our mobile.

In this system central part is heart of our system. There will be the PIC microcontroller. We will be interface the different types of sensor with PIC microcontroller. We will also interface GSM & LCD with PIC microcontroller.

In this project the sensor will sense the weather condition & sense data send to our mobile. We will interface temperature sensor, humidity sensor, moisture sensor & rainfall sensor. This reading will send to our mobile through GSM. This data will be guide to the farmer & farmer can easily understand which spray required for farm.

2) Tentative components:

Sr. No.	Components
1.	PIC microcontroller
2.	Temperature sensor
3.	Humidity sensor
4.	Leaf wetness sensor
5.	Moisture sensor
6.	GSM
7.	LCD

5. Advantages

1. More accurate results.
2. We get continuous weather station reading.
3. This system send all sensor information on our mobile.
4. High performance combined with durability, low maintenance and low cost

6. Facilities Available & Requirements

Hardware Requirement:

1. PIC Microcontroller
2. LCD Display
3. Temperature sensor
4. Humidity sensor
5. Leaf wetness sensor
6. GSM

Software Requirement:

1. Proteus
2. MicroC

7. References

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