

Crop Protection and Monitoring System Applied in Horticulture and Greenhouse Based on ARM processor

Pramod Kumar Mishra, Preet jain

Abstract— crop production in greenhouses & in horticulture is an increasing industry in the fields of agriculture and greenhouse with all measures of environmental controlling and monitoring is some of the important component for crop protection & production. As we know, the most important variable in a greenhouse are temperature, humidity, & moisture of the soil. This paper proposes a new efficient method aims at sensing and monitoring the temperature, humidity & moisture of soil in greenhouse environment for varying distance. The paper is based on the agricultural purpose & protection of crop & vegetables and applicable for greenhouse and in horticulture centers also. Presently greenhouses don't have such type of technology. In rainy seasons when the heavy rain occurs then on that time, sometimes because of heavy rain production of vegetables affected And prices go high so the inflation rate also increases so that's why we have thought that we should make such type system which may be able to protect the crops from unwanted environmental conditions. The system consists various sensors, a microcontroller of ARM family (LPC2129), LCD for displaying the values taken from sensors, two relay circuitry used for controlling the operation of AC motor (submersible) & light source, encoder & decoder integrated circuits. two motor drivers (L293d) for controlling the operation of shade cover, & exhaust fan and also for operation of ac motor & light source here we are using a RF transmitter (RF434) for transmitting the data to receiver section, and in receiver section we are using RF receiver (RF434) to receive the values taken by sensors with another microcontroller unit (ARM lpc2129) and LCD.

Index Terms— agriculture, greenhouse and horticulture, humidity, temperature and soil moisture

I. INTRODUCTION

The paper shows how the crop and vegetables can be protected from heavy rain, especially the work will be very helpful for the greenhouses and in horticulture centers also, and it's because that they have a requirement of small field so the proposed system can be easily implemented in greenhouses. We know that India is an agricultural based country and our economy is agricultural based economy, presently in our agricultural system there is no advanced

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technology which may be able to protect the crops from environmental harmful factors, for ex. From heavy rain, excessive humidity and temperature, etc. These factors are very harmful for the

Crops and because of these factors the production of crops affected and every year a Lakhs of tons of grains and vegetables are going to be wasted. If we are able to protect the crop from these environmental harmful factors then we can save a lot of tons of grains and vegetables every year. In India the most important reason of the inflation is the increased rate of vegetables.

Recently a report has been come, that the prices of vegetables have been increased twice in this year more as compared to the last year.

The inflation rate is going to increase day per day and the reason behind this is, the vegetables are not available in a required amount in market. So the idea comes in mind to implement such type of system.

The literature review will be shown in the second part, and the proposed work and the principle of whole system will be illustrated in the third section, the systems block diagram will also be shown and introduced in this part. In the fourth section, system's every section has been discussed and described. Specific introduction for each section of the whole system has been given out; at last in the fifth section the conclusion will be introduced.

II. LITERATURE WORK

We have found the idea of wireless sensing of environmental parameters (humidity & moisture conditions) and from using these parameters such type of alarm system is developed in which when the moisture or humidity level will deviate from its standard value then the alarm system will operate and send SMS through mobile to workers of that particular field [1].

The idea about the wireless sensing of the environmental parameters shows that the developed monitoring system has the simple structure, high reliability, good extensibility and flexible configuration [2]. It can protect and adjust automatically the environmental parameters in every greenhouse, and has project practically.

This Paper shows [3] the idea about creating the favorable conditions and suitable environment for vegetables crops in greenhouses and in horticulture centers. "Good agricultural practices for greenhouse vegetable crops, Food and agriculture organization of United Nations".

Next paper [4] gives the idea about irrigation and moisture level in the greenhouse and horticulture centers for the vegetables, so by this paper illustrates the idea about setting the moisture level in the greenhouses for different crops. "Vegetable crop irrigation by dc sanders extension horticultural specialist" (department of horticultural science, North Carolina state university).

John A. stankovic, &cuishanghu, zhangmau uses the wireless sensor network in greenhouses to send the environmental parameters like (humidity & moisture)[5,6,7].

III. DESIGN FLOW OF SYSTEM

In our proposed work, we want to design such type of system which can protect the crops from harmful environmental parameters & able to create favorable conditions for the crop, so for this system we have a requirement of some output devices which will control the systems operation & performance and give the desired output. The system includes sensors like (soil moisture sensor, humidity sensor, temperature sensor), microcontroller units (ARM LPC 2129), a RF Transmitter and receiver(RF434), relay circuitry, display device(LCD16x2), motor drivers(L293D), encoder and decoder circuits (HT12E& HT12D) a power supply(7805). The whole system is divided in two parts, a transmitter section & a receiver section. The transmitter section will consist, sensors and a microcontroller unit followed by a RF transmitter with encoder circuit and a LCD to see the values obtained from sensors.

Then for obtaining outputs, we are using two motor driver circuits and two relay circuitries. first motor driver circuit will use for operating exhaust fan and shade's DC motor, and another motor driver will be connected to two relay circuitries, which will be used to operate AC submersible water motor and light source. So In this section the sensors will sense the condition of the field/greenhouse like its moisture level, humidity & atmospheric temperature & all data will go to the receiver section.

Further in receiver section, a RF receiver with decoder circuit and a LCD will be connected to microcontroller. RF Receiver will receive the atmospheric data transmitted by RF transmitter and display the values in LCD. In greenhouse the most important parameters are temperature of atmosphere, relative humidity, and moisture of soil and to control these parameters, it becomes more and more critical in the greenhouse cultivation & every crop has its own comfortable environment so for creating this favorable environment inside the greenhouse we are going to use some output devices (shade, exhaust fan, water motor, light source) which will help us to create such type of environment. If we want to know the whole field's information and also about the moisture level, humidity level, and the temperature then we will place many transmitter sections on different-different locations in the field and they will give the atmospheric information to the receiver section.

A. TRANSMITTER SECTION WORKING:-

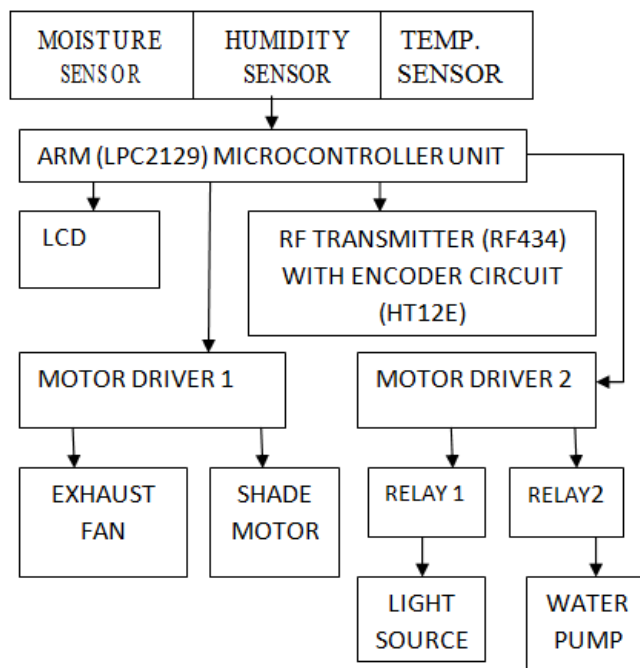


Fig1. Transmitter section block diagram.

B. RECEIVER SECTION WORKING:-

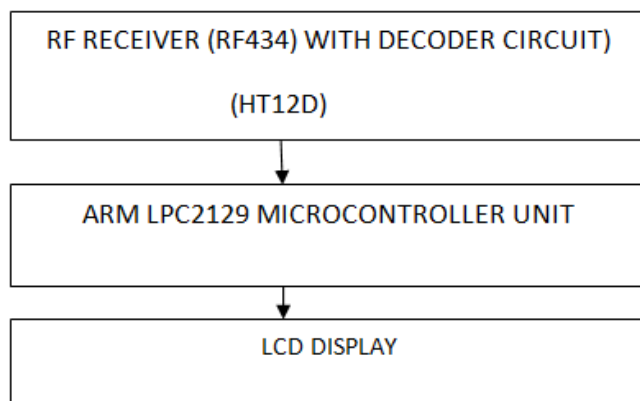


Fig2. Receiver section block diagram.

IV. WORKING OF EVERY SECTION & CONDITIONS

In earlier we have discussed about the transmitter section and its Main work is to give information about the field's environmental conditions to the receiver section. Transmitter section will work as a control panel in the system. In transmitter part a type of sensing section will work which will sense the condition of field and give the information to the receiver section. The working of this system is in this way, firstly all three sensors will sense the conditions of the field and give the data to microcontroller unit, ADC (analog to digital converter) is inbuilt in ARM microcontroller so it will convert the analog data into digital form and then converted data will be given to LCD. After that the converted data will be transmitted to RF receiver through RF transmitter, RF transmitter will be connected with encoder circuit which will encode the data in the encrypted form of RF transmitter and then it will be able to transmit the data. Further in the system

two motor drivers and two relays will be connected and the main reason of connecting the motor drivers and relays is that they can obtain the desired outputs and control the operation of outputs, so the first motor driver will operate the exhaust fan and shade motor and these two output devices are DC type and they requires 12volt for performing operation and motor driver also takes +5volt as an input and gives 12 volt output. Now second motor driver will be connected to two relays and they will operate the light source and water pump (AC submersible motor). This two output device are AC type and requires input in AC form & operated by relay circuitry because relay gives output in the AC form, so the relay will give AC input to these output devices. When the data comes in receiver section then the RF receiver receives the information and gives it to microcontroller, and after that data will be given to LCD display, so we will be able to see the data of the field (environmental parameters) in digital form.

V. CONDITIONS & WORKING:-

Every crop has its own standard & favorable conditions and on the basis of these conditions the production of crop depends, suppose if atmospheric temperature and humidity is increasing from its standard value then on that condition the shade's DC motor will start and open the shade and the exhaust fan will start. If temperature or humidity any of them is high then this condition will be performed. Similarly if the humidity is decreasing from its standard value then shade will be closed & exhaust will be off, when humidity & temperature is in normal condition then shade will be closed, exhaust will be off, and water pump will be off. If atmospheric temperature is going below to its standard level then lights will be start and shade will be covered and exhaust fan will be off. If soil moisture level is going below to its standard level then the water pump will be on and if moisture level is going high to its standard value then water pump will be off. Sometimes if heavy rain is occurring from last 3 to 4 days and the atmospheric conditions are so bad and temperature is very low so on that condition plants have a requirement of photosynthesis without photosynthesis they can't be grown, on this condition we will give an artificial light source to the plants.



Fig 3.model of crop protection and monitoring system

Here in the fig.3 model of crop protection and monitoring system has been shown, the three sensors (humidity, moisture and temperature) will present inside the system and they will sense the condition of greenhouse so according to the condition & requirement, systems output will perform the operation. This system has some specialty that it has an automatic shade which opens and closes according to condition & requirement of greenhouse, it will open the shade when temperature or humidity of greenhouse will increase from its standard value and it has also an exhaust fan which will start when the temperature and humidity will increase from its standard value, because too much temperature or humidity is harmful for the crops. Further in this system the presented soil moisture sensor will check the moisture level of soil and if it is below to the standard value then the water motor will start.

If the temperature level is below to its standard value then The light source will start.



Fig.4 the microcontroller unit and other circuitry (transmitter section)

In fig. 4 the microcontroller unit and other circuitry has been presented, in this whole unit the ARM microcontroller (LPC2129) is used and we have motor driver & relay circuitry, RF transmitter section with encoder circuit (HT12E) for transmitting data, & the sensors for analyzing the actual condition of greenhouse and they will be connected with microcontroller unit and a LCD screen for seeing the data. Motor drivers and relay circuitries will operate the whole output devices.



Fig. 5 receiver section

Receiver section consists the ARM (LPC2129) microcontroller and RF receiver (RF434) with decoder circuit (HT12D) and LCD screen. RF receiver receives the data from RF transmitter and the received data will be seen in the display device.

VI. RESULTS

- Maintained the greenhouse conditions like its temperature, humidity level, moisture level with the help of four outputs, like shade and exhaust fan used for maintaining the temperature and humidity level of greenhouse and water pump for maintaining the soil moisture level of the plants in the greenhouse.
- Light source is used for bad weather conditions.
- Wireless transmission & reception of environmental data through RF transmitter and receiver.
- Displayed environmental data on LCD through RF transmission.

VII. CONCLUSION

The project completes the design and implementation for wireless sensing the temperature & relative humidity and soil moisture in green house. This concept is new in agriculture & will be very helpful in agricultural purpose. The system will be able to protect the crops from unwanted environmental features & will also be helpful to increase the production of crop. We should try to make this system more advanced & in a low cost so the farmers can easily accept and use this technology on field. We should also try to bring some new technology and advancements in agriculture. In The future, some other features can be added in this system. If our agriculture will improve then our economy will also become healthy and India will become a developed country very soon.

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