Open access Journal International Journal of Emerging Trends in Science and Technology

Greenhouse Microclimatic Real-Time Monitoring with the Help of NPK Sensor

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Abstract
In this system for increasing the production of food in farming the low cost greenhouse technique is used. Now a days the population goes on increasing but the productivity goes on decreasing due to environmental changes.. In order to solve this food problems we can use the greenhouses for increasing the food production in agriculture field. In old days farming requires the more man power so this disadvantage is overcome using greenhouses. For increasing the food production we have to measure the various parameters like NPK humidity,temp.co_2 of a soil and air.In his paper we can measure these parameters and can be controlled and monitored using WSN. .

Keywords—*pH,himidity,LPC2148,co2*

INTRODUCTION

The aim of this system is to produce a low-cost greenhouse monitoring to increase the food production and reduces the man power in agriculture field. Now a days the food problem is the most important problem in our country due to large population. In order to solve this food problems we can use the greenhouse for increasing the food production**.** In this paper we have measure various parameters of soil like NPK,PH,humidity, CO_2. In this research, with the help of this technology we can increase the production of food and reduces the man power in agriculture field Our population is increasing but Agriculture field goes on decreasing so we have to improve the food production.

The environment is changing due to change in environment we have feed the fertilizer But our aim is to scenes these parameters and then provide the fertilizer as per requirement. Here we use different sensors like humidity, temperature, CO_2 ,NPK etc. for detection purpose.

The NPK are the main nutrients in soil and the efficiency of soil is mostly depend on these nutrients. So to increase the production of food we have to measure the content of NPK present in the soil. So for this purpose we use the PH-EC sensor to measure the content of NPK. These sensors send real time values to microcontroller and microcontroller send these values to PC via serial communication. According to sensor values graph will be display on PC.

THE GOALS OF THE SYSTEM DESIGN

Modular Design:- In this module design we have composed of various sensors like pH, NPK, humidity. temp.co_2 based on various applications.

Low-cost and Stable network:-The system uses low-cost and wireless communication network to achieve intelligent management without the construction of large communication devices

Data Analysis System:-According to different environment conditions, we have to analysis the data.

4. Operating Humidity Range: 30-90% RH
5. Temparature Range: -30°C ˜ 85°C
6. Storable humidity range: within 95%RH
7. Standard output voltage: DC 1.980 mV (at 25°C, 60%RH)
8. Accuracy: ± 5% RH (at 25°C, 60%RH)

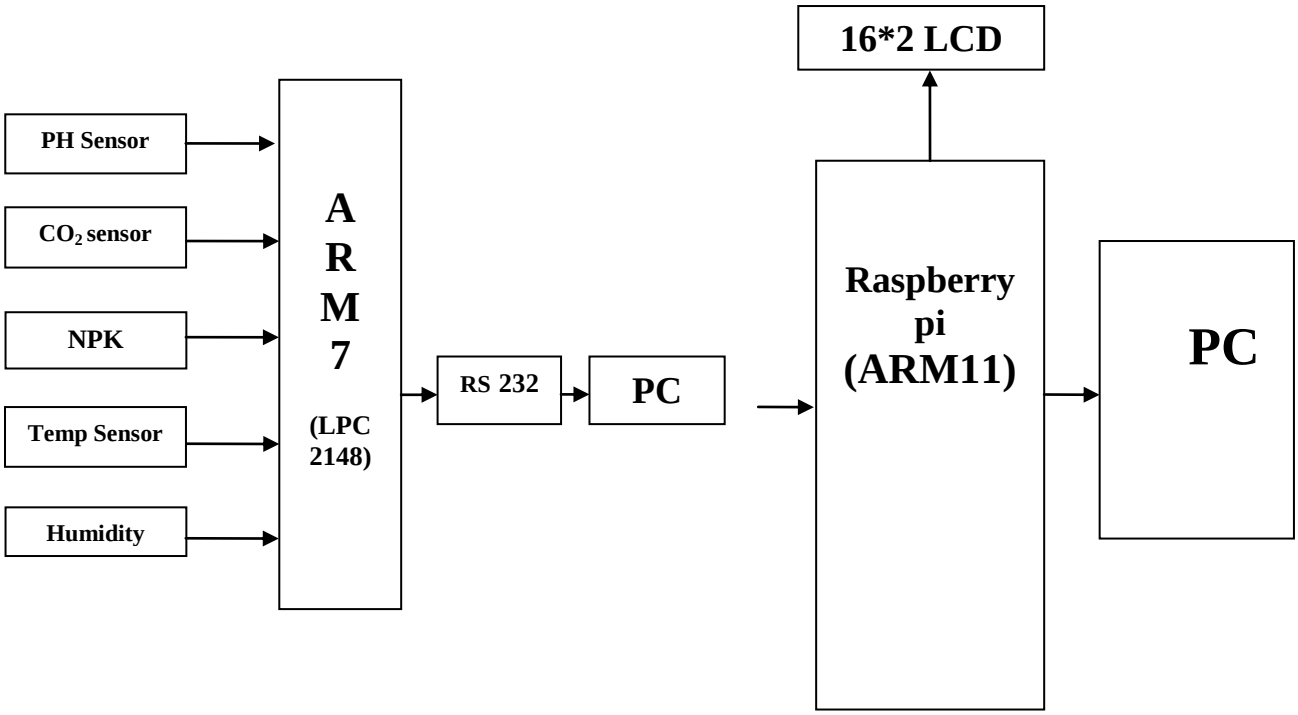


FIG.BLOCK DIAGRAM

This system required following sensors to measure the various parameter

1) **Humidity Measurement**:-

To measure the humidity, amount of water molecules dissolved in the air of environment, a smart humidity sensor is used. This capacitive humidity sensor changes its capacitance based on the relative humidity (RH) of the surrounding air. Relative humidity (RH) is the percentage of actual vapor pressure (P) compared to saturated vapor pressure(Ps). As the relative humidity increases the capacitance also increases. The variable capacitance is converted into usable voltage.SY-HS-220 is used as a humidity sensor. These module convert relative humidity to the output voltage. SY-HS-220 has 3 pins and the pins are Vcc, Vout and GND.

Specifications:

1. Rated Voltage: DC 5V
2. Current Consumption: <-3mA
3. Operating Temparature Range: 0^0-60°C

2) **CO_2 Measurement**

A portable, field deployable sensor for continuous data monitoring of Carbon Dioxide and Oxygen in environment has been developed within this handheld data monitoring system. Subsequent to autonomous field trials and sensor validations, this sensor will be integrated with PSoC from Cypress .The Oxygen sensor, SK-25 from Figaro had been used because it has a linear dynamic output range between 0-30% Oxygen and excellent chemical durability. This sensor is based on unique galvanic type of oxygen sensor makes stable output signal and virtually no influence from CO2. Carbon dioxide (CO2) is the gaseous component of the earth‘s atmosphere. The concentration of CO2 in natural ambient air is about 0.04% or 400ppm. With each breath, humans convert oxygen(O2) into carbon dioxide. The CO2 sensor, EE-89 series had been used (Fig. 3) because it can measure0-2000ppm (part per million) CO2 in air. Auto

calibration functions and digital output make this sensor easy to integrate to different type of systems

3) **LM35 Temperature sensor:-**

The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies.

As it draws only 60 µA fromits supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to+110°C range (−10° with improved accuracy). The LM35 series is available packaged inhermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Specifications:

1. Calibrated directly in ° Celsius
2. Linear + 10.0 mV/°C scale factor.
3. 0.5°C accuracy guarantee-sable (at +25 °C).
4. Rated for full −55° to +150 °C range.
5. Suitable for remote applications.
6. Low cost due to wafer-level trimming.
7. Operates from 4 to 30 volts.
8. Less than 60 µA current drain.
9. Low self-heating, 0.08 °C in still air.
10. Nonlinearity only ±1⁄4 °C typical.

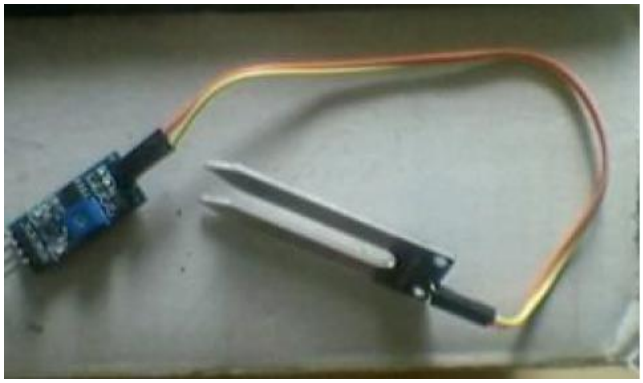
4) **NPK Micro sensors :-**

A pH meter measures essentially the electro-chemical potential between a known liquid inside the glass electrode (membrane) and an unknown liquid outside. Because the thin glass bulb allows mainly the agile and small hydrogen ions to interact with the glass, the glass electrode measures the electro-chemical potential of hydrogen ions or the *potential of hydrogen*. To complete the electrical circuit, also a reference electrode is needed. Note that the instrument does not measure a current but only an electrical voltage, yet a small leakage of ions from the reference electrode is needed, forming a conducting bridge to the glass electrode. A pH meter must thus not be used in moving liquids of low conductivity (thus measuring inside small containers ispreferable).

The pH meter measures the electrical potential (follow the drawing clock-wise from the meter) between the mercuric chloride of the reference electrode and its potassium chloride liquid, the unknown liquid, the solution inside the glass electrode, and the potential between that solution and the silver electrode. But only the potential between the unknown liquid and the solution inside the glass electrode change from sample to sample. So all other potentials can be calibrated out of the equation. The calomel reference electrode consists of a glass tube with a potassium chloride (KCl) electrolyte which is in intimate contact with a mercuric chloride element at the end of a KCL element..

5) **pH sensor:-**

Soil pH is a measure of soil acidity or alkalinity. The pH scale extends from 0 (a very strong acid) to 14 (a very strong alkaline or base), but most soils will have a pH range of 4 to 8.5. Pure water is neither an acid nor a base and is considered neutral, right in the middle of the scale at 7. pH values less than 7 are called acidic and values greater than 7 are called alkaline. If a soil has a pH of 6, it is mildly acidic. If it has a pH of 8, it is moderately alkaline. Soil pH is considered a master variable in soils as it controls many chemical processes that take place. It specifically affects plant nutrient availability by controlling the chemical forms of the nutrient. The optimum pH range for most plants isbetween 5.5 and 7.0.



DATA SHARING SYSTEM

In Data Sharing System we are going to used for transferring the data from one node to another node in this data sharing system we are going to sence the various parameter and with the help this parameter the wireless communication. In this system we use different parameters such as soil temperature, Humidity ,Pressure,NPK Sensor etc.

At NPK micro-sensors for agriculture the cost of each sensor needs to be low and the stability of the sensor membrane needs to be high, especially when such sensor deployed harsh environments; furthermore the sensitivity needs to be high, and they also need to be supported by robust data management systems to be able to collect the data, manipulate it for decision support analysis in fertilizer management.

We have taken this problem for my M.E. project and decided to develop a system "Greenhouses Microclimatic real time monitoring with the help of NPK sensor" because our aim of the project is to reduce the man power and increases the food production .For increasing the production we will required the main nutrients such has NPK. We have use that NPK and other type of sensors to improve the food production.

RESULTS

At NPK micro-sensors for precision agriculture the cost of each sensor needs to be low and the stability of the sensor membrane needs to be high, especially when such sensor deployed harsh environments; furthermore the sensitivity needs to be high, and they also need to be supported by robust data management systems to be able to collect the data, manipulate it for decision support analysis in fertilizer management.This measured data can be transferred through the ethernet using raspbery pi.

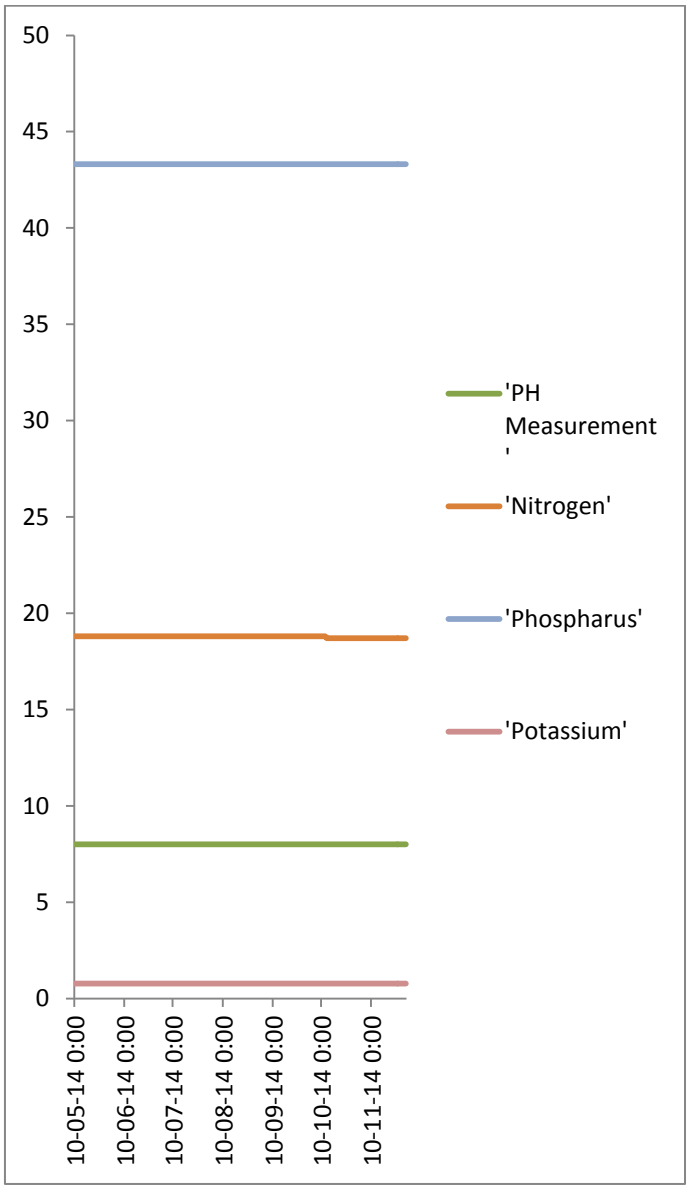


fig. Time Vs various sensor parameters

CONCLUSION

In this system we have to monitor the nutrients present an the soil.In soil NPK is major nutrient to increase the food production capability of soil,so we have to controlled and monitored thease nutrients present in the soil. The system thus designed is advantageous as it reduces the undesired use of fertilizers to be added in the soil. One can properly select the fertilizer quantity to be used for reducing the deficiency in the soil at a particular field.for the measuremrent of soil nutrients the PH-EC sensor is used ,this sensor measures the NPK of soil so we can add the fertilizers in the soil as per requirement for increasing the food production capability of soil.

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