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Detection of N, P, Kusing Fiber Optic Sensor and PIC Controller

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Abstracts:
This paper investigates N, P and K contents, humidity, temperature and sunlight control in the agricultural field to help crop growth. Computation of N(Nitrogen), P (Phosphorus), and K (Potassium) accessories of soil is necessary to decide proper percentage of nutrients is to be added in the soil to increase crop fertility. This civilizes the property of the soil which in turn yields a good quality crop. In the present work fiber optic based color sensor has been dilated to decide N, P, & K values in the soil sample. The color sensor is based on the principle of absorption of color by solution. It helps in determining the N, P, K amounts as high, medium, low or none. The sensor probe along with proper signal conditioning circuits is built to detect the deficient component of the soil. It is helpful in dispensing only required amount of fertilizers in the soil.

Keywords: Nitrogen, Phosphorus, Potassium (NPK) sensor; colorimetric measurement; nutrients; fiber optic sensors.

I. INTRODUCTION

To implement increasing claim of growing population over the years there is a requirement of increase in food production. This the most major trouble due to globalization the Indian cultivators faces is property management of their agriculture products which is very docile as paragon to other country Agriculturist due to lack of nutrients of plants. The exceeding cause why they faces this difficulty is due to uncontrolled amount of feeding of the nutrients in excess or in very less amount even without satisfying the needs of plants. So in turn results into poor quality in fruits, vegetable are lagging in color, size, test & even quality. Integrated crop management system have been designed to study spatial & temporal behavior of NPK [1,2] Continuous monitoring of these along with humidity and pH of soil is leading to an automation in agricultural areas to improve crop productivity[3,4].

II. NEED

To grow crop yield fertilizers containing predominantly Nitrate (N), Phosphate (P), & Potassium (K) are imperative. Quality of NPK is dependent on crop type & on plant growth status. How much quality of fertilizer to be used in further dependent on present contents of NPK nutrients in soil Also nutrients required are in macro & major amount so a precise control is must which must be maintained throughout the crop duration, which is only the solution to obtain high yield & quality at par. Researchers in agriculture are looking for ways to optimize plant yield while minimizing the consumption of fertilizer. Since these macro-nutrients vary even on a small scale throughout a cultivated field.[1, 2]

III. METHODOLOGY

A. Proposed Design:

The present study deals with the actual exploration of NPK values of the soil using multimode plastic fiber optic sensor. Aqueous solution of soil under test is illuminated by different light colors. Light gets reflected from solution depending upon its absorbent coefficient of soil. Reflected light is received by another optic fiber which is converted into electrical signal. Further using threshold values stored in database of microcontroller one can determine NPK levels. This helps in detecting the deficient component of the soil. Thus undesired dispensing of the fertilizers can be controlled which in turn reduces deterioration of soil.

B. Hardware and Software Requirement:

1. Fiber Optic Sensor
2. Humidity Sensor
3. Temperature Sensor
4. Sunlight Sensor
5. PIC 16F877A Microcontroller
6. LCD Display
7. Control Device

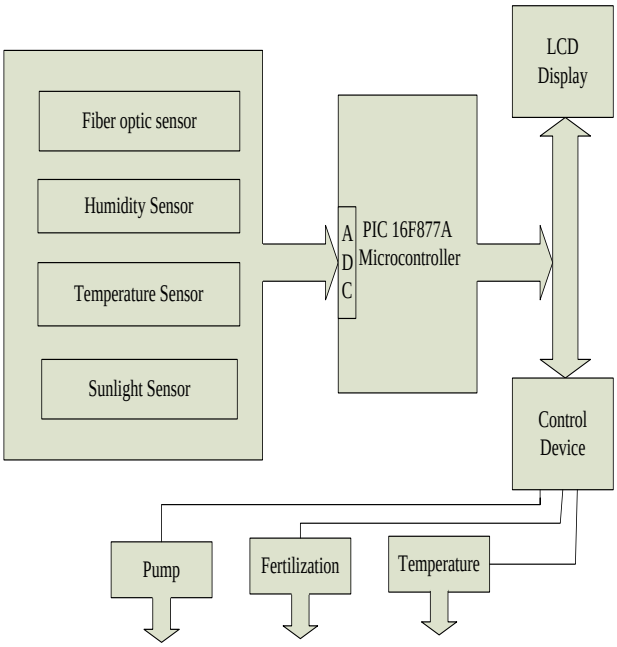

Figure.1. Proposed system diagram

C. Principle of Operation:

The working of the system is illustrated in above fig1.It consist of two modules. The first module consist of a crop parameter sensing unit in which number of sensors will be

used for determination of the N, P, K contents, humidity, temperature& light intensity. For detection of N, P& K contents in the soil we have used the fiber optic sensor. The second module has a control part. The PIC (Programmable Interface Controller) will be used for controlling all the operations or functions of the sensors. The PIC have inbuilt ADC, the data from sensors will be given to the PIC microcontroller. The microcontroller compares the resulted data with required data & displays it on the LCD panel. If the resulted data will not match with the required data then it will be given to the control device, it will control all the functions of the system.

IV. SOFTWARE FLOWCHART

MATLAB software is mainly used for coding Mathematical model is coded in MATAB for image processing which is used to calculate slope of the road. Below flowchart shows actual execution of the code. KEIL software is used to coding related to the ultrasonic distance sensor. Fig 2.shows software flowchart of proposed system It consist of following steps:

1. Initialize Serial Port at baud rate 9600
2. Initialize arrays to store temperature sensor, Light detector, NPK sensor & soil moisture sensor values
3. Read the values of all sensor through serial port
4. Store the sensors value in arrays by parsing
5. Plot all the values of sensor using plot function

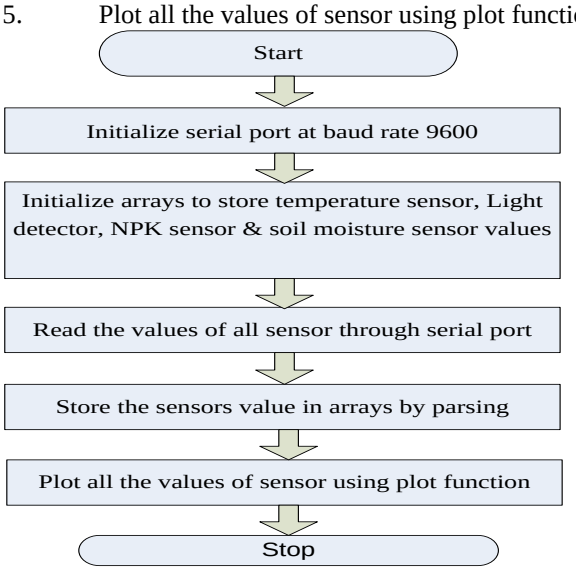

Figure.2. Software flowchart of the System

V. RESULT

In this proposed method we are taking different samples and measured transmission values using fiber optic sensor. So we can detect NPK present in samples. We are also plot the graph of different sensors.

Table.1. Transmission values for LED in different samples.

Sample	Transmission values for LED		
	Red	Green	Blue
Sample 1 500 ml Water+0 gram water	470	630	475
Sample 2 500 ml Water+55 gram water	490	520	440
Sample 3 500 ml Water+110 gram water	500	450	400

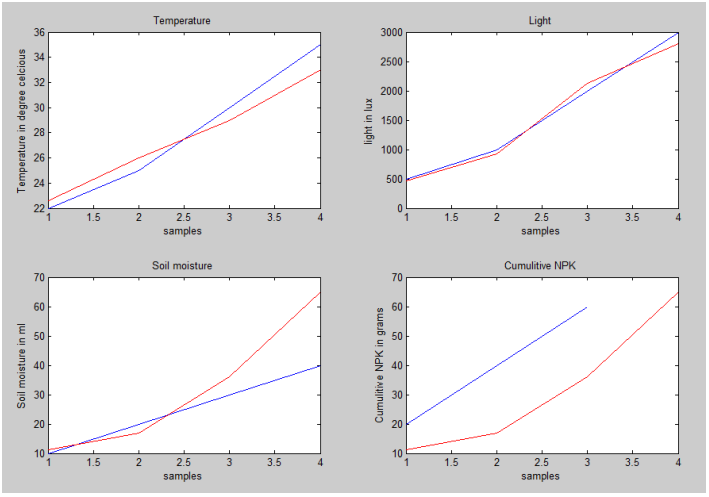

Figure.3. Graphical representation of different sensors

VI. CONCLUSION

The Proposed System results in the designing, progression and optimization of a real time solution for application to the agricultural monitor and controlling. This system utilizes sensor for Nitrate, Phosphate, Potassium, temperature level detection, Humidity, Light intensity of Agricultural environment. It included Real-time valve controlling and pump operation and Agricultural Parameters measurement using Sensor for Agriculture crop. So by using this system productivity of crops increases and efficient use of water through sensor data, the quality of product is also improved through efficient use of fertilizer.

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