Design & Implementation of Automatic Analyzing and Testing of Soil

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Abstract- In country like India the economy is mainly based on agriculture, still we are not able to make optimal, profitable and sustainable use of our land resources. The main reason is the lack of knowledge regarding the soil testing for the growth of crops. In every state around 9 to 10 lakhs of soil samples have been received in laboratories and it is very difficult to test all the soil samples in time by the laboratories. By the time test reports are generated, harvesting is on the verge of completion. Hence there is a need for soil testing to be made available to the farmer. The main aim of our work is to develop a testing system which can be used for soil testing, which in term helps the farmers to cultivate and produce the proper crop. Presently two-third of the Indian population depends directly on agriculture for its livelihood. Agriculture productivity mainly depends on quality of soil which is dependent mainly on factors like soil texture, soil water holding capacity, soil pH value, soil conductivity and soil mineral contents. Soil pH, Fertilizer and conductivity give a lot of information about the physical and chemical properties of soil. In this work, a microcontroller based system is developed to measure these three properties of soil (soil pH and Fertilizer and Conductivity/Salinity)which in turn effect the plant's growth. The signals from the sensors are conditioned with the help signal conditioning card sand interfaced to microcontroller through inbuilt ADC. Digital readout is used to display the computed results on graphical LCD.

Keywords- ARM 7 Microcontroller, pH of Soil, Fertilizer, Conductivity of Soil, Soil Temperature, TDS

I. INTRODUCTION

Automated Soil Testing Device is an electronic device, which can be used to measure soil temperature, humidity, electrical conductivity of soil and soil moisture values to ensure the fertility of soil in the field of agriculture to select the suitable crop and also the type of fertilizer to be used. The ionic particles present in the soil sample are sensed by the sensor and the output of the sensor is processed by signal conditioning circuit. The Microcontroller is used to compare the pre-stored value with the actual values and the measured values are displayed on the LCD. The data also display in matlab GUI and record store in excel sheet with data and time of samples taken. Automated Soil Testing

Device is a portable device which can be used either in laboratories or on the identified spot selected for farming so that the farmer need not take the pain of visiting the soil testing laboratories which are normally located in district headquarters. Automated Soil Testing Device is a simple & user friendly device so that any person can test the soil without the presence of an operator, it is an economical device & thus a common man can easily afford it. The detection of the fertilizer (Nitrate and Chlorine), soil pH, soil conductivity and soil salinity content in soils is important because it can provide information about Fertilization by Soil testing and pollution by nitrate Fertilizers. It is faced with a crucial challenge of excessive Fertilization in decreasing cultivated lands. An important solution excessive Fertilization is to soil testing for formulated fertilization. Soil nutrient testing is the basis for nutrient commendation and site-specific fertilization. Conventional soil nutrient detection methods are time consuming and expensive. Rapid lower-cost detection methods for soil nutrient are urgently needed. The ion selective e1ectrode is a new and active branch in the potentiometric field in recent thirty years. Because of its special advantages, such as easy, rapid, fitful to analysis on the spot and not ruin the water sample. The technology provides efficient method for resolving some difficult problems in precision agriculture field. It is compared with a reference electrode, is linear to the change of the ionic activity (in logarithmic units) of the target ion [1-2].Discussed that soil has a very important role in the life of plants/crops. Soil provides water and nutrients in the form of soluble salts for the growth of plants. Roots of plants absorb water and nutrients from soil and then they are passed to all the other parts of plants like stem, leaves. Different plants/crops required different types of environmental condition, soil characteristics, and nutrientse.g.Some plants/crops may require the acidic soil while some may have the requirement of alkaline soil. In heavy rainfall region, the conductivity of soil may be less than in the areas of low rainfall due to the leaching of soil which may results in the leaching away of essential plant nutrients.

II. PROPOSED SYSTEM

2.1 Proposed System Table

System Name	Parameters to be measured	Drawbacks to be Overcome
Design & Implementation of automatic analyzing and testing of soil	1) Electrical Conductivity 2) Temperature in C 3) Moisture level of soil. 4) Humidity	1) Data store possible for future need. 2) Cost effective solution. 3) Temp display in both C and F.

2.2 Proposed System Bock Diagram
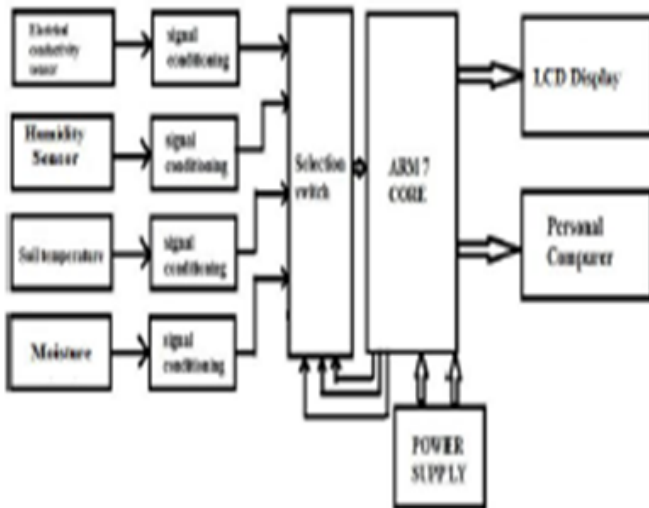

III. PROTEUS SIMULATION
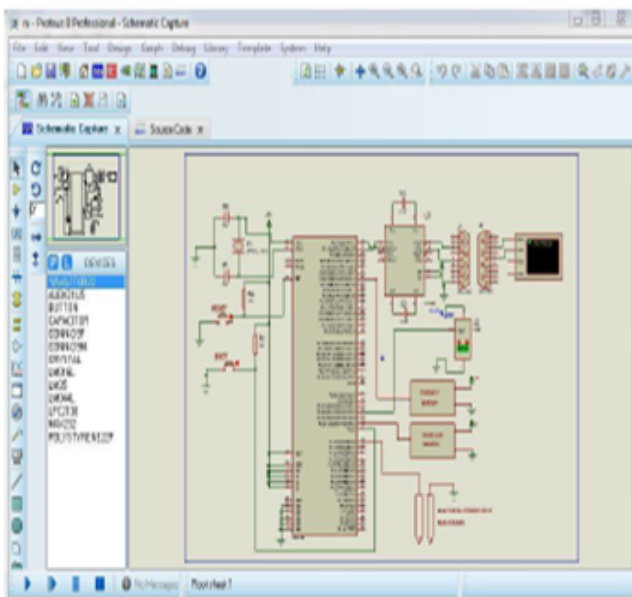
most obvious example of this is wiring in ISIS producing ratsnest connections in ARES but it goes much further than

that. The new Bill of Materials module contains a live viewer and the 3D Viewer and Design Explorer are also linked into the live netlist. This document covers the Proteus 8 application framework and other functionality related to the software suite as a whole. The various application modules (e.g. ISIS, ARES) each have their own reference manuals and tutorial documentation
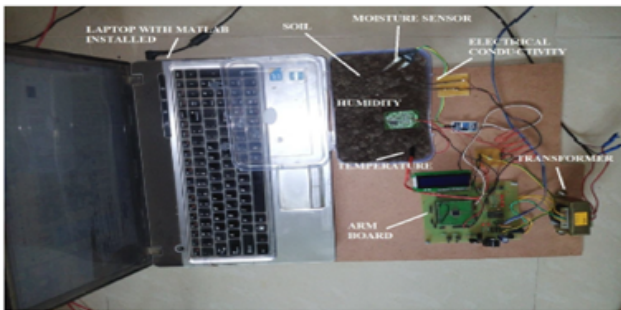
IV. MATLAB

(Matrix Laboratory) is a multi-paradigm mathematical computing environment. It is developed by Math Works. Using MATLAB we can perform matrix manipulation operations, plotting of data and functions, implementation of algorithms, GUI creation i.e. user interfaces, and also the interfacing with programs which are written in other languages, such as C, C++, Python, Java, and FORTRAN. MATLAB is the high-level user friendly language. It is used by millions of engineers and scientists worldwide because of its interactive environment. Using MATLAB we can discover and visualize thoughts. So we can use it in various fields of applications mainly in control systems applications, in signal processing, speech processing and image processing, in communication application, and in computational nance. The MATLAB programming language is part of the marketable MATLAB software. It is frequently used and employed in research field, business and production sector, in engineering and industry. It is an example of a high-level language. The most remarkable difference between C, MATLAB and other compiled languages is that the code is interpreted when the program is executed. An interpreter program reads the source code line by line and translates it into machine instructions. So that the compilation is not required. While this decreases the execution time. It frees the programmer from memory management. Also it allow interactive sessions and dynamic typing. The programs written in scripting languages are typically much shorter than the same program written in compiled languages. To code and debug it takes significantly less amount of time. In short, there must be a trade o_ between the execution time and the development time. Execution time is small for the compiled languages while the development time is small interpreted languages. For plotting of data, for matrix operations, and for general numeric methods, the MATLAB package comes with sophisticated libraries. So I choose MATLAB as my Software Tool for this Project.
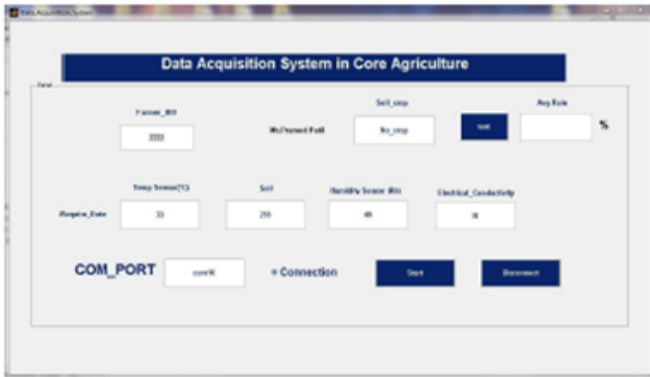
GUI IN MATLAB

IV. EXPERIMENTAL SETUP & RESULT

Experimental setup The proposed approach was implemented and tested as shown in figure.
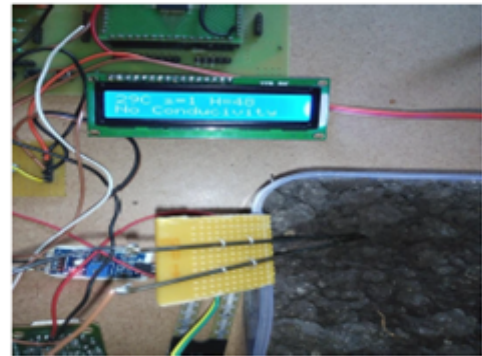

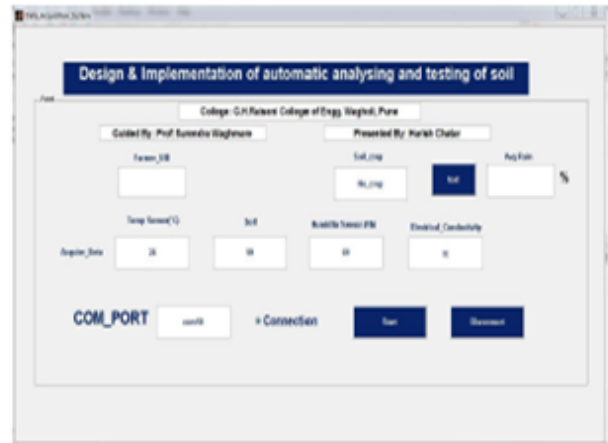A. Moisture Measurement

B. Temperature Measurement

C. Humidity Measurement

D. Electrical Conductivity Measurement

E. MATLAB GUI

F. Reading Data in excel sheet

Result In Excel Sheet

V. CONCLUSION

"Design and implementation of automatic analyzing and testing of soil", has been developed for soil testing of agricultural farm. In this project we measure soil temperature, soil electrical conductivity, soil moisture and humidity. Also parameter values display on MATLAB GUI and store result in excel file for further use. By using this system we can maintain yearly record of soil parameter from this result we can predict the soil parameter changes for next year and take a right decision about which crop is to be successfully taken in such soil. The designed system is cost effective for Indian farmer. It gives accurate reading of all parameter and gets quick result.

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