Intelligent Portable Data Acquisition System with Predictive Features

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ABSTRACT: Day by day advancement of technology, advances the industry and agricultural field. So continuous monitoring is required in industry and agricultural field. Monitoring established in many ways. Data acquisition does monitoring easily. Data acquisition unit mentioned in this paper have sensor circuitry. These sensor circuitry connected to AVR ATMEL microcontroller. AVR ATMEL microcontroller is main processing unit in this project. This microcontroller sends sensors value to android mobile. Android mobile application which is designed in ECLIPSE software. Android mobile transfers the data to the server and to the client module which is designed in NETBEANS software. Client module controls the devices which are connected to microcontroller. Client module can remotely switched ON and OFF devices

KEYWORDS: sensor, microcontroller, eclipse, netbeans, client module , server etc.

I. INTRODUCTION

In the field of industry , agriculture continuous monitoring of farm and industry is important in today's scenario. So that system is require which monitors the farm and industry and transfers the monitored data to remote location. The objective is that to design such data acquisition system. Enhancement of technology, researchers desire to obtain their sensor data faster and to make remotely data available over longer distance Data acquisition is defined as the process of taking a real world signal as input, forward to the computer, for further processing, analysis, storage. Component of data acquisition system includes sensors, that convert physical parameter to electrical signals, signals conditioning circuitry to convert sensor signals into a form that can be converted to digital values, and Analog to digital convertor, which convert conditioned sensor signal to digital values. Data acquisition system are controlled by software programs developed by programming language JAVA in eclipse and NETBEANS software. So the main that to design complete hardware and software section for remotely data acquisition and remotely controlling using software which are mentioned above. "Predictive features" involves in this paper, software takes the further decision by applying ID3 algorithms on the database which are available on server.

II. RELATED WORK

In 1963 IBM produced computers which specialized in data acquisition system. Firstly they produce IBM 7770 DAQ system and than their higher version which is IBM 1800 data acquisition and control system. These are very expensive data acquisition system. Their improved version launched in 1974 by techmar / scientific solution named as S 100 computers and data acquisition card. In 1981 first data acquisition pc introduced by IBM personnel computer and scientific solution.[7] After that various processor are used for the data acquisition and transmission of data to a longer distance. Various microcontroller are used for the data acquisition and transmission. RS 232 cable is used for interfacing between microcontroller and personnel computer. In 1998 Edwards uses a system which has 2 PC 104 which are connected to central monitoring system. These system was designed for analysis and monitoring potential failure of a design in field condition.[6] In 2001 Adcock et al. use a microcontroller ad RF modem to transmit data back to PC. Their system was designed to replace traditional data acquisition system used in wind tunnel.[6]

In 2002 hamels used a PIC controller and RF transmitter to collect data. This system have sensor network which are used in TDMA technique.[6] In 2003 lohachit describes system that uses RF modem to collect water quality data from

a remotely controlled boat. These system collect water from depth.[5] In 2009 paper is published in world academy of science which uses microcontroller and LABVIEW software for totally integrated smart energy system.[2] In 2009 Ali Ziya Alkar and Mehmat aatif karaca explain the embedded DAQ system communicates with GPRS which accessible through web.[1] In 2011 manivannan M and kumaresan explains design of data acquisition system using ARM 9 platform in a published paper to ICETECT.[3]

III. PROPOSED SYSTEM

A. *Hardware Explanation:* Hardware of proposed system have mainly sensor's , microcontroller, bluetooth connector.

- **SENSOR :** This system have totally 6 sensor temperature , light , Gas sensor , humidity sensor , moisture sensor and level.
- ➢ **Temperature sensor :** Thermistor is used in temperature sensor. A thermistor is a type of resistor whose resistance varies significantly with temperature. Thermistor is differ from RTD in that the material used in thermistor is generally a ceramic or polymer while RTD uses pure metal. Thermistor typically achieve higher precision within a limited temperature r ang typically –90 degree Celsius to 130 degree Celsius.[7]
- ➢ **Light sensor :** Light sensor uses LDR. 2 cadmium sulphide photo conductive cells with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity . Application include smoke detection, automatic lightning control.[7]
- ➢ **Gas sensor :** MQ-6 sensor used in place of gas sensor. MQ 6 sensor have high sensitivity to LPG, iso butane and propane and small sensitivity to alcohol and smoke. MQ 6 has fast response , stable and long life and simple drive circuit. MQ 6 composed by micro AL2O3 ceramic tube, Tin dioxide sensitive layer , measuring electrode and heater and fixed into a crust made by plastic and stainless steel.
- ➢ **Humidity sensor :** Humidity is defined as the amount of water vapour in atmosphere of air or other gases. The humidity sensor SY HS 220 as of capacitive type , comprising on chip conditioner. It is mounted on PCB and PCB consists of cmos timer , AC amplifier , Oscillator. This sensor provides DC voltage depending upon humidity of surrounding in RH%. The operating humidity range is 30% RH to 90% RH.[4]
- ➢ **Moisture sensor :** This Moisture Sensor uses Immersion Gold which protects the nickel from oxidation. This Moisture Sensor can read the amount of moisture present in the soil surrounding it. These items have low power consumption, and high sensitivity, which are the biggest characteristics of this module. This sensor has Working voltage: 5V ,Working Current: <20ma, Interface: Analog, Working temperature: 10~60.
- ➢ **Level sensor :** For level measurement POT is used. A potentiometer, informally a POT, is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.
- **MICROCONTROLLER :-** Atmel microcontroller is powerful device for interfacing with any peripherels. The ATmega32 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The ATmega32 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits. Port A of microcontroller serves as the analog inputs to the A/D Converter. Port A also serves as an 8-bit bi-directional I/O port, if the A/D Converter is not used. Port pins can provide internal pull-up resistors (selected for each bit).All the sensor which are mentioned above are connected to port A of microcontroller. A to D convertor at port A convert the analog value to digital value and then microcontroller passes to other android device via Bluetooth controller. Fig. 1 shows the complete circuit diagram using microcontroller and Fig 2 shows general block diagram of proposed system.
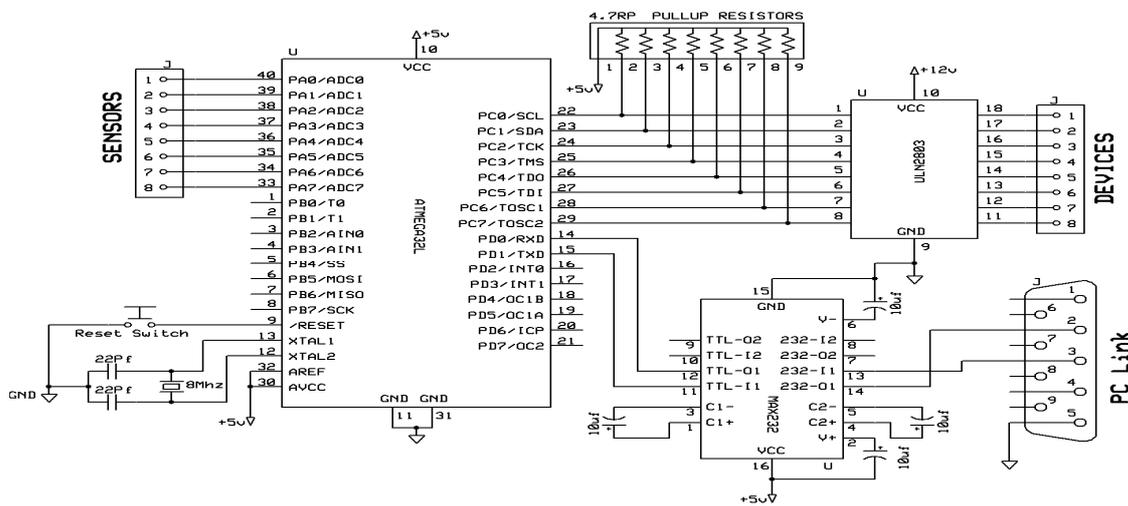
Fig 1. Circuit diagram using microcontroller

B. *General block diagram* – General block diagram consist a simple DAQ unit which have microcontroller unit interface with Bluetooth connector which is connected through Bluetooth device(mobile). Mobile puts the data on server. Fig 2 shows the general block diagram.
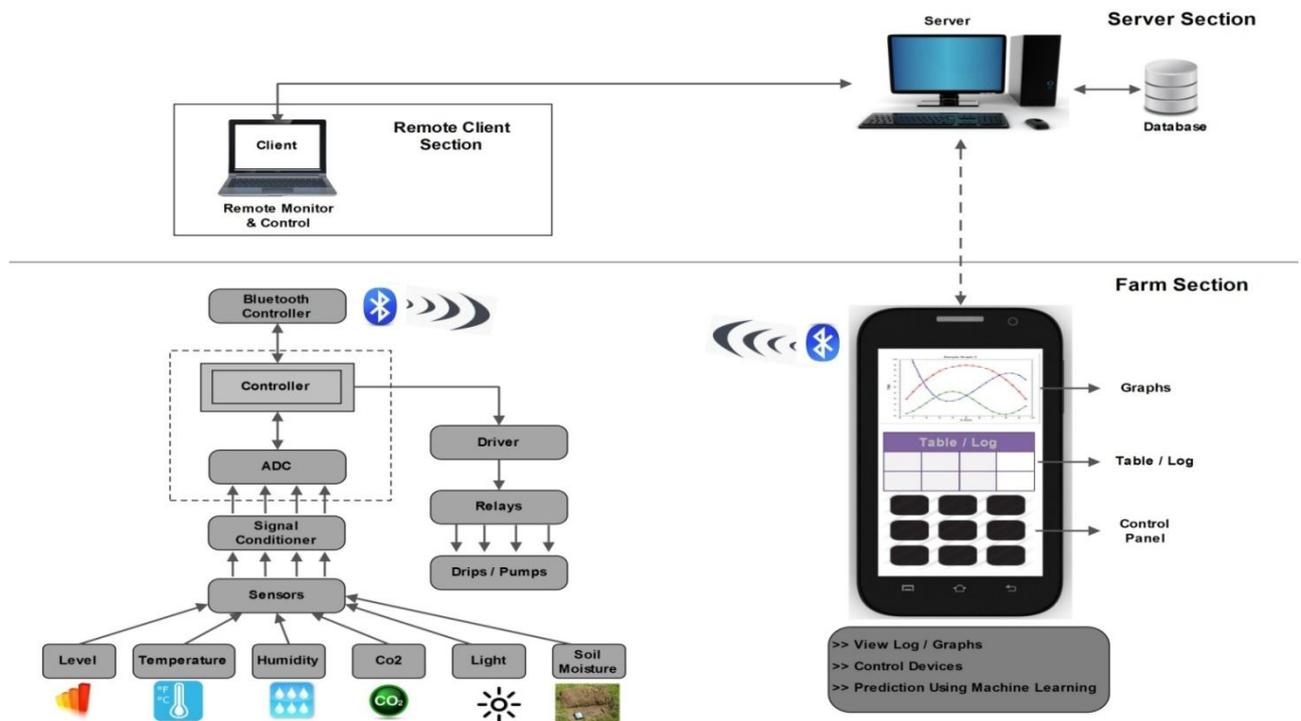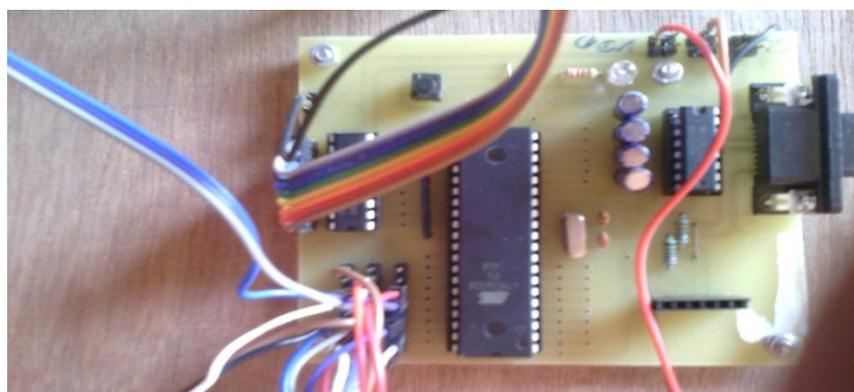

Fig 2. General Block Diagram of proposed system

Fig 3. Photograph of Hardware of system

- **BLUETOOTH CONNECTOR :** Bluetooth device is connected to microcontroller**.** Microcontroller sends the sensor's data to another Bluetooth device (android mobile) as shown in fig 2 via Bluetooth connector. After sending data to android device, android device can monitor the sensor's value with help of android application.

B. *Software Explanation :* Basically 3 software are used in above proposed system.

- **MICRO C AND AVR FLASH :** Micro c pro for AVR is powerful, feature rich development tool for AVR microcontroller. It is design to provide the programmer with easiest possible solution for developing application for embedded system without compromising performance and control. The software used for burning the program in the microcontroller is the WinAVR(AVR Flash). WinAVR is comprised of many open source projects. As the microcontroller AT-MEG32 itself contains ADC at its port A terminal. So there is no need for external ADC circuit. Different pins of port A are allotted to different sensor circuit. There are total 73 cases involved in microcontroller, one case for each pins of its I/O operations, then for each ports along with its I/O operations and lastly one case is for ADC.
- **ECLIPSE :** Android application for controlling devices (which is connected to microcontroller) is designed inn eclipse software. Eclipse is a multi-language software development environment comprising an integrated development environment (IDE) and an extensible plug-in system. It is written mostly in Java. The Eclipse SDK (which includes the Java development tools) is meant for Java developers. The Eclipse SDK includes the Eclipse Java development tools (JDT), offering an IDE with a built-in incremental java compiler and a full model of the Java source files. This allows for advanced refactoring techniques and code analysis.
- **NETBEANS :** The NetBeans IDE is written in Java and can run anywhere a JVM is installed, including Windows, Mac OS, Linux, and Solaris. A JDK is required for Java development functionality, but is not required for development in other programming languages. The Net Beans platform allows applications to be developed from a set of modular software components called modules. Server and client module code is written netbeans software. In the server side servlet is created. A Servlet is part of a Java web application. Applications based on the NetBeans platform (including the NetBeans IDE) can be extended by third party developers. The NetBeans IDE is an open-source integrated development environment. NetBeans IDE supports development of all Java application types (Java SE including JavaFX, (Java ME, web, EJB and mobile applications) out of the box. All the functions of the IDE are provided by modules. Each module provides a well defined function, such as support for the Java language, editing, or support for the CVS versioning system, and SVN. NetBeans contains all the modules needed for Java development in a single download, allowing the user to start working immediately. Modules also allow NetBeans to be extended. New features, such as support for other programming languages, can be added .
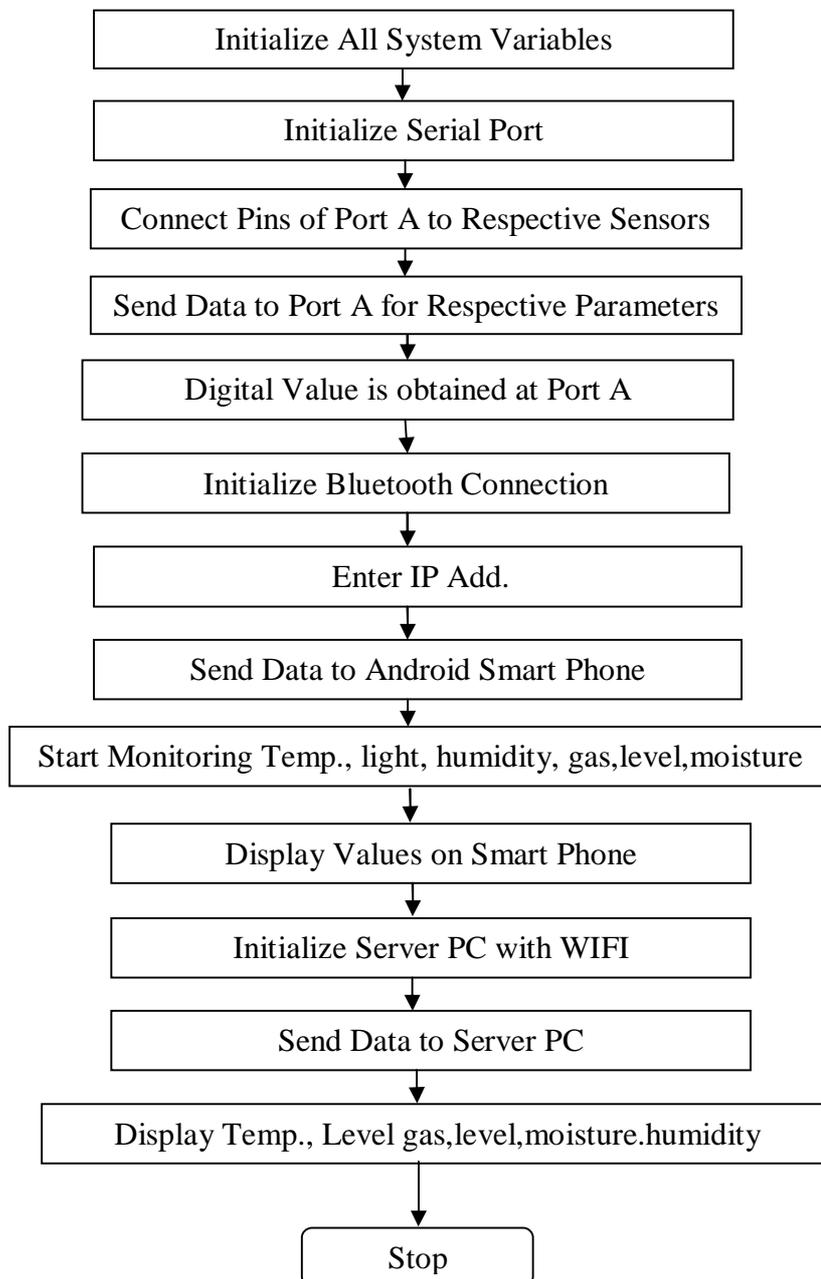
D. *Flow chart :*

Figure 4 Flow Chart Of Whole System Operation

IV. EXPERIMENTAL RESULTS

Experiment results shows the all the sensor value. In which all 6 sensor value shows in fig 5 in android application. Value is increase and decrease as par the value of corresponding environment. Fig. 5 shows the experimental result of above proposed system.
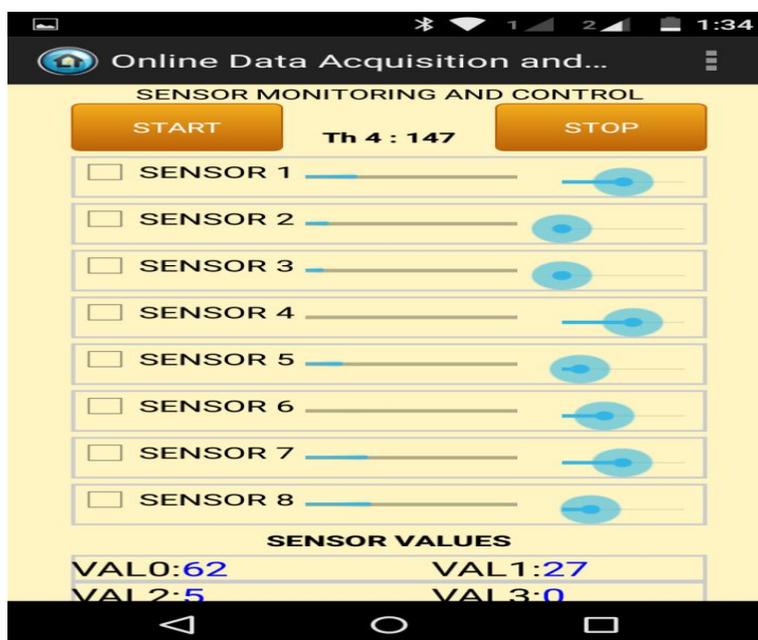
Fig 5 All Sensor value

Fig 6 shows incremented value of humidity sensor(sensor 3) when the humidity is incremented as compare to fig 5 similarly other sensor also shows the changed value
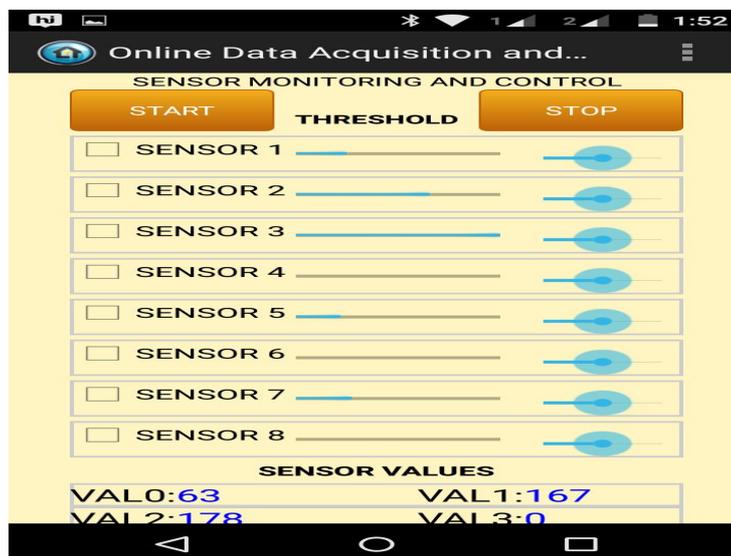

Fig 6. Incremented value of Humidity sensor

Fig 7 shows the result controlling at the client side. Client can easily access the device remotely by just entering the IP address of sever. First we have to enter the IP address of server and than start controlling of devices.
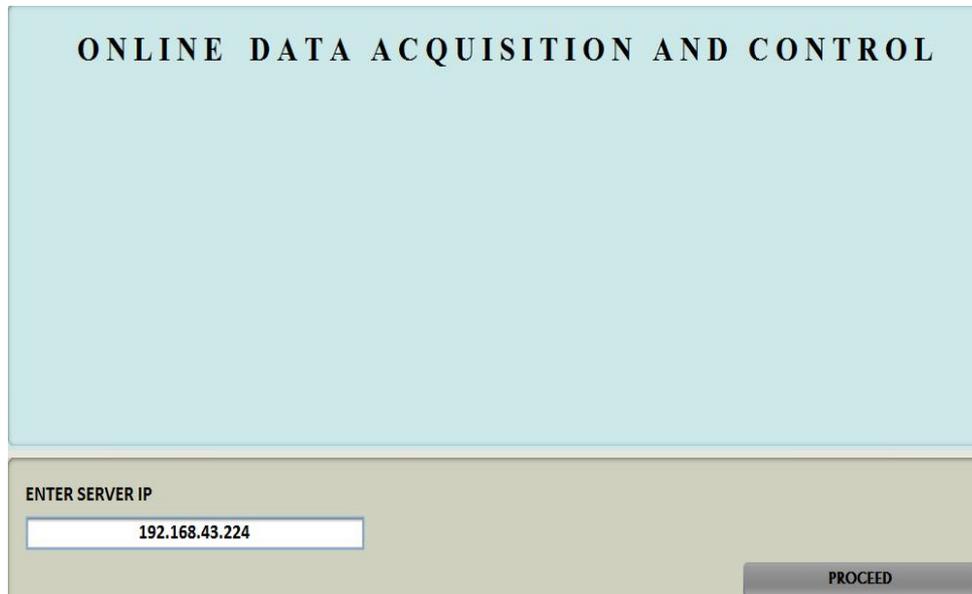
Fig 7 IP Address Entering Pallet

Fig 8 shows the result of server side window and by just clicking on pallet we can control the devices which are connected to the microcontroller ports.
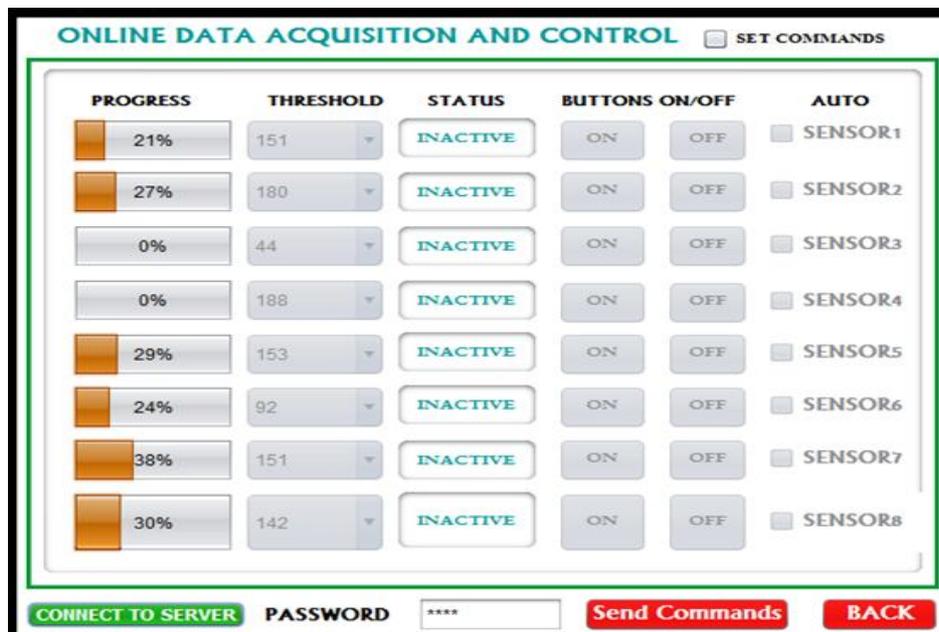

Fig 8. Remote control window at the client side

V. CONCLUSION

Development of technology in industrial field and agricultural field it is necessary to design a system with more sensitivity , reliable , and low cost system. Above proposed data acquisition system fulfil all requirement, mentioned

above. Collected data from data acquisition system transfers via bluetooth which is reliable way of communication. Data put on server via Bluetooth can easily accessible via web or internet. So client module can access of server and easily controls the devices. This system can be applied to agricultural field , industry , petroleum and so on.

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