Portable Measurement System Powered by Android

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Abstract— Now days, the importance of real time condition monitoring and measurement for machines or electronic devices is increasing because machines are installed on remote site where human being cannot easily survive and having complex task for error troubleshooting. Consistent monitoring and measurement of vital different parameters is an important issue in the Electronic Industry. In this paper, we implement Portable Measurement System Powered by Android to measure and monitor the different parameters of remotely installed machines. For example: Wind Turbines (WT). This allows communication between a machine and operation engineer using a Android Smartphone, which will connect to input circuitry by using external Bluetooth device, get parameter values serially and display on the Android Smartphone display which is view by a operation engineer. The measurement system display parameters from various sensors and test points: temperature, voltages and resistance at different test point. It is also used to show the critical parameters of the machine or electronic devices. An External Bluetooth Device (HC-05) is used to communicate between an android Smartphone and different connected parameters of machine.

Keywords— External Bluetooth Device, Android Smartphone, Android Application (.apk).

I. INTRODUCTION

Now a day, the importance of real time condition monitoring and control for machines and electronic devices is increasing because machines and electronic devices are installed on remote site such as mountains and offshore. The human being cannot survive that remote sites and offshore easily. It is very difficult to measure the different type of parameters of Electronic Devices and machine which are installed in remote areas and offshore. With the rapid development of portable monitor and measurement technology, embedded system technology, wireless technology, which plays a key role in measurement devices, extends the requirement into highly intelligent-measurement and monitor the machines. However, the latest achievements in different fields of technologies may allow us to minimize the problem and successfully integrate these technologies into the modern portable measurement system.

The real time monitoring and control is an essential part of the remotely installed machine. Each of us requires a periodic monitoring of vital parameters and right measurement of the parameters for error troubleshooting to reduce the maintenance cost and repair cost. These processes become even more crucial when machine and electronic device having critical problem at that time sophisticated equipment to perform the monitoring. The machine or devices gets, the critical error and unexpected emergency situations might occur. In order to avoid this, to error troubleshooting, observed by operation engineer provided with immediate help if some of the parameters are abnormal. In many cases, even a short delay might lead to the dangerous consequences including blast in machine.

Now a day, there is a wide spectrum of modern monitoring measurement devices which possess a various number of capabilities. However, normally, Critical parameters of machine are being monitored and measured by operation engineer only at discrete intervals. This common approach can sometimes lead to the loss of crucial data (e.g. during the night).

II. OBJECTIVE OF PROPOSED PROJECT

In Now days, it's very difficult to measure, test and monitor parameters of remotely placed Electronic Devices or machines where human being can't easily survive. Also very difficult to measure and test the parameters of machine at high height on ruler sites.

For e.g. Wind Turbine-650kW (Suzlon Energy Ltd.), Operation Engineer climbs the wind turbine to measure or test the parameters at 25 meter to 30 meter in Top Panel at the time of Error troubleshooting. Handheld Devices are used to measure the parameters or test the parameters having fixed functionality. To overcome this disadvantage, we are using Portable Measurement System Powered by Android to measure, monitor, sense and test parameters of wind turbine. Operation Engineers can carry a Android Smartphone in their pockets used to monitor the parameters of Top Panel (Height-25meter) at Bottom Panel.

The main objective of the paper work is to implement and design of Portable Measurement System using Android Smartphone's with:

- Measure parameters at high height from bottom on site.
- Evaluate the performance of machine before Visual Inspection increase   performance of the Machine.
- Achieve communication between hub and nacelle at the time of error troubleshooting in the Top Panel (Hub and Nacelle) in wind turbine.

- Low Cost due to Android Smartphone.
- Portable due to Wireless technology (Bluetooth).
- Due to light weight easy to carry when climb Wind Turbine.

This Portable measurement System used to measure following parameter in Wind Turbine.
- Temperature Value with Graphical Representation.
- Resistance Value.
- Voltage Measurement with Sinusoidal and Square Wave representation.
- Critical Indication of Voltage Value.

III. SYSTEM DESIGN

The design and implementation stage of the project involved the Temperature Sensor (LM-35), Resistance of different value, AVR microcontroller, External Bluetooth module, Android Smartphone.
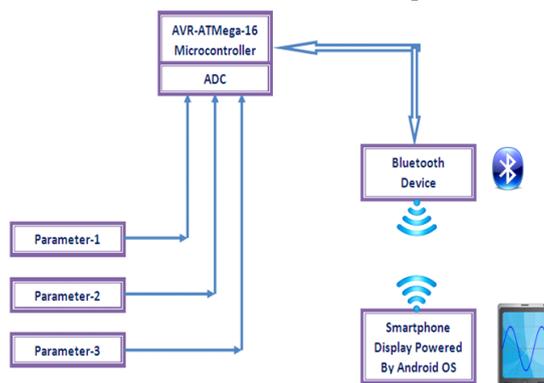

Fig. 1: Block Diagram of the Proposed Project.

Input Parameter:
The input parameter i.e. Sinusoidal and Square wave, Temperature Sensor (LM-35), Different value Resistance are given to analog to Digital Converter in AVR Micro-controller (ATMega-16). These input parameters are physical quantities which give the analog output which is converted into digital output for the processing and send serially to another Bluetooth device.

AVR Microcontroller (AVR-Atmega16):
These input parameters (analog signals) converted to digital signals (into byte) by using inbuilt Analog to Digital Convertor (ADC) of the Micro-controller. These converted byte given to the Universal Asynchronous Receiver Transmitter (UART) of the ATMega16 microcontroller for transmission via external Bluetooth module. Figure.1.2 shows the sequence of the samples given to the UART buffer.
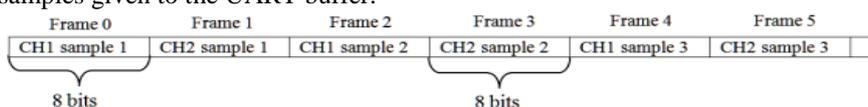

Fig. 2: Samples of Universal Asynchronous Receiver Transmitter (UART).

The External Bluetooth device taken input data from UART and transmit the parameter data to Bluetooth of Android Smartphone, where we can easily obtain a measurement and graphical (display) of these parameters.

Bluetooth Module (HC-05):
Wait for connection request from the Android Smartphone. After connection, the Bluetooth Module (HC-05) takes data serially from external HC-05 Bluetooth module and buffers it for displaying on Screen by using different activities.

Android Smartphone's:-
Buffer the incoming data using in built Bluetooth of Smartphone. Buffered incoming data is used to plot Sine/Square waveforms and Temperature Values/Graph and Resistance values by using Android activities.

IV. RESULT

We have worked on performance of software used on Android Smartphone where we achieved to obtain the values of Resistance, Temperature and Temperature Graph. Screen of the measurement system consist Display of the Mini-CRO and Menu screen for menu buttons which displays waveforms. Also Hardware part is completed. Still we are working on Square Wave, Sinusoidal Wave and Triangular Wave with required total performance of different parameters on Android Smartphone Screens. To make secure this application, Create Password Application create password for Portable Measurement System Powered by Android.

Following figures shows the Screen shot of the Software Application on the Android Smartphone display.
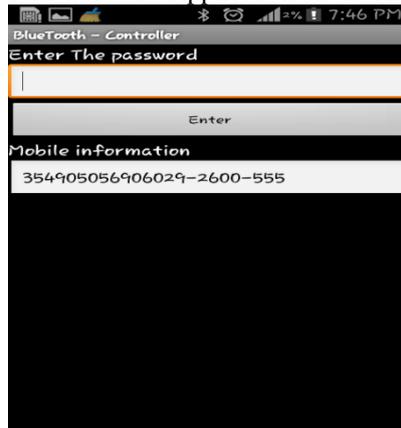

Fig. 3: Login Screen of Application
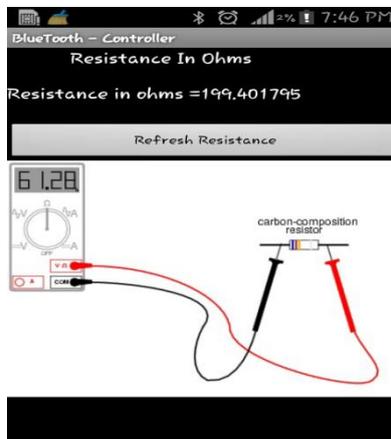

Fig. 4: Dashboard of Application
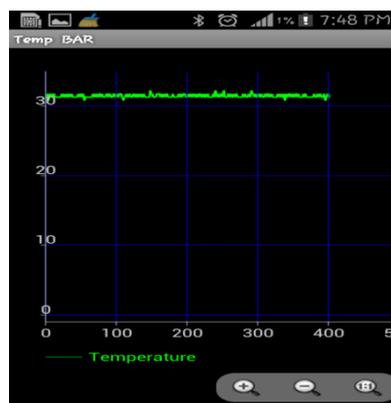

Fig. 5: Resistance Measurement

Fig. 6: Graphical Measurement of Temperature Measurement
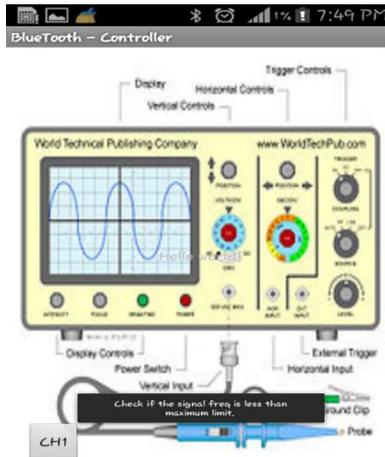
Fig. 7: Temperature Measurement

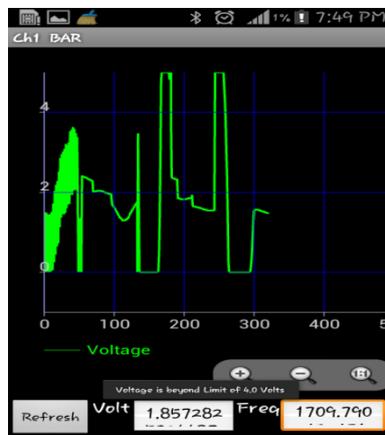Fig. 8: Channel Selection of Waveform Measurement

Fig. 9: Voltage and Frequency Measurement of Square Wave

Fig. 10: Voltage and Frequency Measurement of Sin Wave

Fig. 11: Create Password Application

V. CONCLUSIONS

Here we conclude that the performance of a Portable Measurement System Powered by Android is done with Resistance, Temperature Values with Graphical representation, Sinusoidal and Square Wave with Voltage and Frequency values. This system monitors and measures the different types of waveforms and their values. This Measurement System used as measure and monitor the parameters at remotely installed machines and Electronic devices. For example Wind Turbine in Suzlon Energy Limited company. The advantages of this device, without change in hardware we can be upgraded to provide more features, which is helpful to increase the device standards.

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