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Portable Measurement System Powered By Android

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ABSTRACT

This paper presents the design and implementation of a low cost, portable, light-weight, low power Portable Android Measurement System. This Android based Measurement System consist external Bluetooth Module takes input parameters from the Micro-controller and transmit this input parameter to Bluetooth of Android Smartphone's. Android Smartphone's used to display and measure this input parameter i.e. Square Waveforms and Triangular Waveforms, Sinusoidal Waveforms, Temperature Value and Temperature Graph, Resistance value and Critical value Indication of Voltage. In this paper Android Software Application has been developed for Android Smartphone which display the information in terms of different parameters like Square Wave, Triangular wave, Sine Wave, Temperature Value and Graph, Resistance value and Critical value indication. These parameters are transmitted to Bluetooth of the Android Smartphone through external Bluetooth device from Micro-controller as an input. This developed software application will work for a range of 30 meters between external Bluetooth device and Bluetooth of the Android Smartphone. This measurement System is advantageous over now a day's as a Mini Oscilloscope, Temperature Measurement System, and Resistance Measurement System. For optimal use of the available bandwidth of the external Bluetooth, Mini-Cathode Ray Oscilloscope software application provides single channel mode, Temperature and Resistance Measurement syste.

Keywords

Android Smartphone, External Bluetooth Device, Android Application.

1. INTRODUCTION

Cathode Ray Oscilloscope (CRO) currently in the market is bulky, very expensive, less power efficient and has low resolution displays. This paper presents a portable Measurement System powered by Android implemented using Android software technology, with low power consumption, portable device low cost compared to Cathode Ray Oscilloscope (CRO). This Measurement System provides Mini-Oscilloscope with some Cathode Ray Oscilloscope features that help in measurement of Triangular wave and Square wave, Temperature Value, Resistance Value. The Mini-CRO software application provides and single channel mode. Using this Measurement System, the temperature (e.g. Bottom Panel and Hub Panel of the Wind Turbine- Suzlon Energy Limited, Pune) can be easily measured and graphically available on Android Smartphone. For this purpose temperature sensor is attached to input side. Also Resistance can be measured using this Portable Measurement System. The External Bluetooth module will transmit the input signals to an Android Smartphone's, running the Android operating system. Using Android Smartphone's display and external Bluetooth device system becomes more useful and portable. The selection of Bluetooth to communicate with Android is very important in terms of data rates. The previous researcher used Bluetooth were not achievable with the existing software stacks. The transmitter circuit uses Frequency generator to send Square waveforms, Sinusoidal Waveforms and Triangular waveforms, Temperature sensor to sense the temperature, Resistances to send Resistance value and Android Smartphone to display the input parameter. In this Measurement system we used AVR-ATmega16 Micro-controller and HC-05 Bluetooth module and Android Smartphone for this whole application.

This paper organized in Sections, Section 2 presents System Overview, Section 3 presents Literature Survey on existing system and Section 4 presents developed software application on Android.

2. SYSTEM AND OVERVIEW

All The design and implementation stage of the project, involved the Bluetooth module for sending an input signals (Sinusoidal wave, Square Wave, Triangular wave, Resistance Value, Temperature value and Graph) to Bluetooth of Android Smartphone's. This Measurement System is an AVR-ATMega16 Microcontroller based system. Figure.1 shows a block diagram of the overall system of this project.

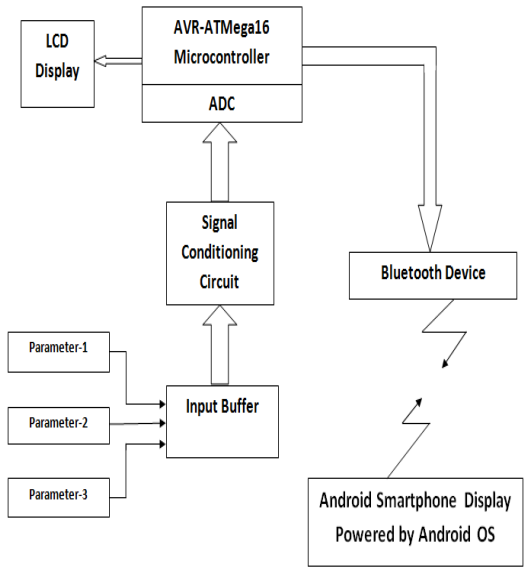

Fig.1 Block Diagram of Portable Measurement System powered by Android.

The input parameters like Square wave, Triangular wave, temperature and Resistance are given to AVR Micro-controller by using Signal Conditioning Circuit. The speed of the sampling of the Micro-controller defines the frequency range of the Measurement System. 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 Bluetooth module. Figure.2 shows the sequence of the samples given to the UART buffer.

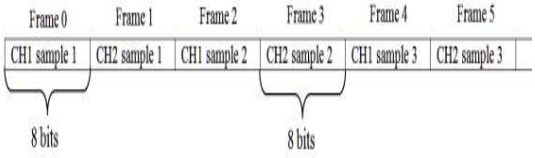

Fig.2 Samples given to Universal Asynchronous Receiver Transmitter(UART).

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 graphical (display) of these parameters.

3. LITERATURE REVIEW ON EXISTING SYSTEM

The implementation of an oscilloscope with Bluetooth was previously reported, by Yus in 2010[1]. It is open prototype project called the "Android Bluetooth Oscilloscope", which consisted of Bluetooth enabled transmitter circuit to send the data to an Android phone which draws the waveforms on its screen. The transmitter circuit uses Microchip's dsPIC33FJ16GS504 And an LMX9838 Bluetooth 2.0 SPP module. However, there is no mention about the bandwidth of the device, no scope for Temperature, Resistance measurement.

From research carried out it was found that data rates of 2 Mbps are not achievable with the existing software on module's controller. There is no scope for measurement of the Temperature, Resistance on single board. Therefore, the approach suggested to fully utilize the Bluetooth bandwidth, was to use the HC-05 Bluetooth module.

4. DEVELOPED ANDROID APPLICATION

The Android application is developed based on the software development kit (SDK) of Android OS. The Android Smartphone's used for testing the application with Android OS, v4.0 (Ice Cream Sandwich), and 1 GHz Cortex-A5 processor and 768 MB of RAM. The Smartphone has a 4.0 inches display with Bluetooth module. It is one of the low cost Android Smartphone available in the market to date.

The screen measures available pixels, the waveform grid area for drawing waveforms and graphs on display and used by various buttons. The waveforms grid area contains horizontal divisions and vertical divisions, similar to a standard oscilloscope. In this Measurement system, software application of the Mini-CRO present dual channel mode.

The External Bluetooth (HC-05) Specifications are:

(a) Bluetooth Version: V2.0+EDR
(b) Frequency Range: 2.40 GHz to 2.48GHz
(c) Power Supply: +3.3 VDC-50mA
(d) Speed: 2.1 Mbps

AVR-ATMega16 Micro-controller Specification is:

(a) 40 pin, 8 bit Micro-controller.
(b) 8 channels,10bit in built ADC
(c) UART
(d) Operating voltage range: 4.5V to 5.5V

5. 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. Figure.3 shows the Screen shot of the Software Application on the Android Smartphone screen with Login Page of Android Application (Figure.3 (a)), Main Dashboard of Android Application (Figure.3 (b)), Resistance

value(Figure.3 (c)), Temperature Value(Figure.3 (d)) and Temperature Graph(Figure.3 (e))

Fig.3(a). Login Page

Fig.3(b). Main Dashboard

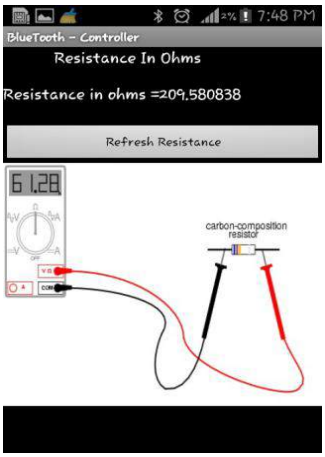

Figure.3(c). Resistance Value

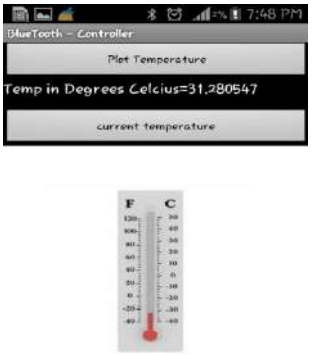

Fig.3(d). Temperature Value

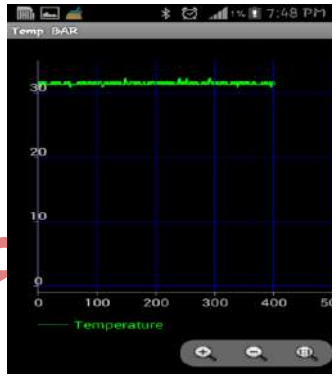

Fig.3(e). Temperature Graph

6. CONCLUSION

Here we conclude that the performance of a Portable Measurement System Powered by Android is done with Resistance and Temperature Values. This system displays the different types of waveforms and their values. This Measurement System used as Mini Cathode Ray Oscilloscope operates on single channel mode that selects optimum sampling rate. 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.

7. REFERENCES

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