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Android Based Smart Oscilloscope

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ABSTRACT: : This paper represent the plan and completion of a portable, light weight, low power consumption Android Measurement System. This device is extremely simple to grip, good range, with high speed. Oscilloscopes which are available today are CRO or DSO which is not easy to use, clever, not portable, and it requires more power. The oscilloscope is need for industrialized applications such as testing of signals etc. But the analog oscilloscopes are very bulky in volume and several times we it is impractical to bring it everywhere. The system consisting of a hardware device and a android application. This Measurement System is based on Android device and equipped with Bluetooth Module which can takes input signal since the Micro-controller and forward this input signal to the Bluetooth of An Android Smartphone's. Android Smartphone is used to present and compute this input factor i.e. Square Waveforms and Triangular Waveforms, Sinusoidal Waveforms. In this system a Android Software Application has been developed for Android Smartphone which is use to display the information in the form of different parameters like Square Wave, Triangular wave, Sine Wave etc. This software application will work in the region of 30 meters between the Bluetooth of the Android device and external Bluetooth device. Today this measurement System is very beneficial.

KEYWORDS: Android mobile, Android SDK, AVR-ATmega16 microcontroller, Cathode Ray Oscilloscope (CRO).

I. INTRODUCTION

Today the Cathode-Ray Oscilloscope (CRO) is especially imperative in electronics measurement field . CRO is mostly used to estimate the voltage across the circuit with deviation in time. Cathode Ray Oscilloscope (CRO) presently available in the market is very costly and huge in size, it requires extra power and has small resolution displays. This paper represents a little cost and handy Measurement System based on Android and implement using Android software tools, with low energy expenditure, simple, low cost compare to Cathode Ray Oscilloscope (CRO). This Measurement System is also known as Mini-Oscilloscope which present some Cathode Ray Oscilloscope features that help in the measurement of Triangular wave and Square wave, Temperature Value, Resistance Value. The External Bluetooth module operational with the microcontroller will transport the input signal to an Android Device's, running on the Android operating system. Using external Bluetooth gadget and display of Android Device the system becomes more useable and convenient. The selection of Bluetooth gadget is mainly imperative to edge with Android device in terms of data rates. In this Measurement system we used HC-05 Bluetooth module, AVR-ATmega16 Microcontroller and Android application with Android Smartphone for this whole application.

Now suppose we want to establish a connection between android phone and a Bluetooth based microcontroller. To creating a successful interface between both devices we desires to consider one device as a master device and another one as a slave to pair both devices. Here we consider android device as master device and Bluetooth device as slave to pair both devices After a successful interfacing we can transfer a message between both devices and start working and receiving data for Oscilloscope device. Android device can constantly take delivery of the data from microcontroller via Bluetooth and store received data into the vector form. Vector form is required to draw graph on GUIs..

II. RELATED WORK

Today the currently available Cathode Ray Oscilloscope (CRO) in the market is very costly and massive in size, it requires additional power and has small resolution displays. To rise above from such a problem a new technique is developed i.e. "Android Bluetooth Oscilloscope"

The achievement of an oscilloscope with Bluetooth was earlier reported, by Yus in 2010[1]. It is also known as "Android Bluetooth Oscilloscope" and a open prototype project, which outfitted with a Bluetooth enable transmitter

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circuit which is use to shift the data to the android phone, which draw the waveforms of signal on its display. The transmitter circuit contain a Microchip's dsPIC33FJ16GS504 And an LMX9838 Bluetooth 2.0 SPP module. However in this the device bandwidth is not specified. Also in this it is not suitable for the Temperature, Resistance measurement. From the research it was concluded that the data rates of 2 Mbps are not practicable with the existing software on module's controller. The drawback of such system is that on single board there is no scope for measurement of the Temperature, Resistance

Therefore, in projected system the advanced approach suggested for fully utilize the bandwidth of the Bluetooth, was to use the HC-05 Bluetooth module, which has a higher data rate. It can increase the bandwidth of device.

III. PROPOSED SYSTEM

In a projected system plan, it include a Bluetooth module that is use for move an input signals like Sinusoidal wave, Square Wave, Triangular wave etc to the Android Smartphone's .Bluetooth. This System is base on the AVR-ATMega16 Microcontroller.Figure.1 represent a block diagram of the overall system architecture of this project. The input signals like Square wave, Triangular wave are forward to AVR Micro-controller by using Signal Conditioning Circuit The frequency range of the Measurement system estimate using the sampling speed of the Micro-controller. The Micro-controller contain an ingrained Analog to Digital Convertor (ADC) that can be use to convert the input parameter(analog signal) to the digital signal(into byte). These improved digital signal (byte) send to the Universal Asynchronous Receiver Transmitter (UART) of the ATMega16 microcontroller for the broadcast via Bluetooth module. The External Bluetooth device outfitted with the AVR-ATMega16 Microcontroller which accept input data from UART and send the parameter data to the Bluetooth of a Android Device, where we can easily get the a graphical representation of these parameters on the display of android Smartphone.

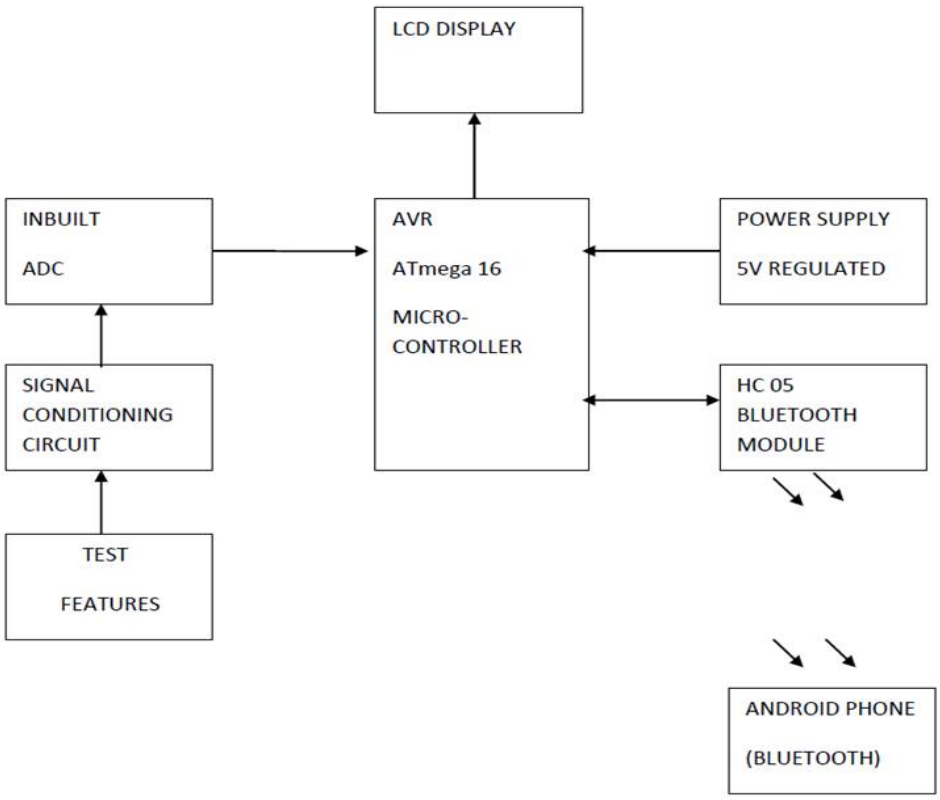

Fig.1.Proposed system architecture.

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Android platform:

Today there are a number of option of platform are available for creating the smart phone application such as android, symbian, windows mobile. ios etc. In a proposed system we use android application i.e arduscope because most of the smartphone support android OS. Android Software Development kit(SDK) to construct an android application, it include a set of development tool such as libraries, debugger and tutorials for building android app.

Atmega 16/32 MICROCONTROLLER :

ATmega16 is an high performance 8-bit microcontroller comes from Atmel's Mega AVR family with small power expenditure . Atmega16 is based on the Reduced Instruction Set Computing (RISC) architecture, with 131 dominant instructions. The instruction execute in one machine cycle. 16MHz is the maximum operating frequency of Atmega16. ATmega 16 contains programmable flash memory of 16kb, 1KB of static RAM and 512 Bytes of EEPROM.

It is a 40 pin microcontroller. There are total 32 input/output(I/O) lines which are partitioned into four ports each port is of 8-bit such as PORTA, PORTB, PORTC and PORTD. There are also many different peripherals along with a microcontroller such as, Analog To Digital Converter(ADC), USART , Analog Comparator, SPI, JTAG etc

Flow chart:

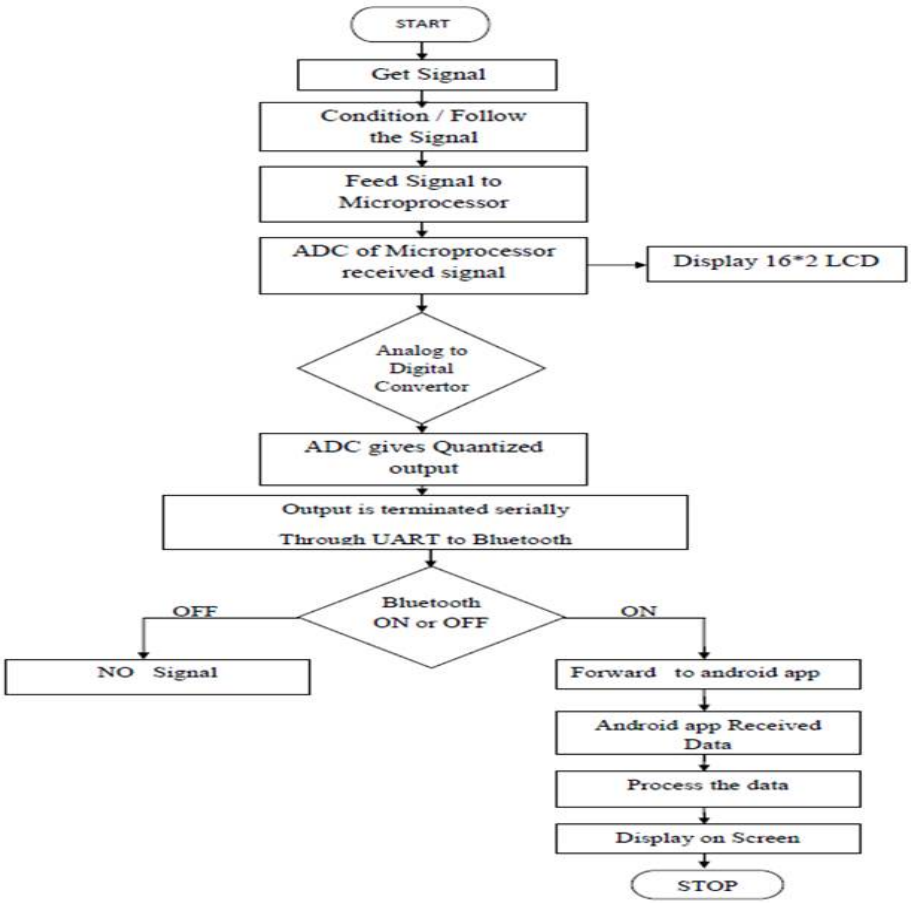

Fig.2. Flowchart for Control and monitor the system.

At first we start the system, The input signal such as Square wave, Triangular wave etc are move to AVR Micro-controller by using Signal Conditioning Circuit. Microcontroller received the signal with the help of the Analog

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to Digital Convertor (ADC). ADC convert the input signal into optimized output and These optimized output send to the Universal Asynchronous Receiver Transmitter(UART) of the ATMega16 microcontroller. Using Bluetooth module these optimized output send to the Bluetooth of android device. The Bluetooth module of microcontroller search the near by Bluetooth of android device and connect to android device. After making a successful connection with android device a data is move to the android application. Android application receive the data and process the data, after processing the output is display onto the screen of android Smartphone.

IV. SIMULATION RESULTS

We have worked on performance of application used on android Smartphone where we successfully achieved the waveforms such as sine wave ,square wave and triangular waveform etc. On the screen of Smartphone it display Mini-CRO and menu screen for menu buttons which display waveforms. Also hardware part is completed. Still we are working on the resistance,temperature measurement with required total performance of different parameters on Android Smartphone Screens.

Fig. 3 show the hardware , it include a Bluetooth module that is use for move an input signals like Sinusoidal wave, Square Wave, Triangular wave etc to the Android Smartphone's .Bluetooth.

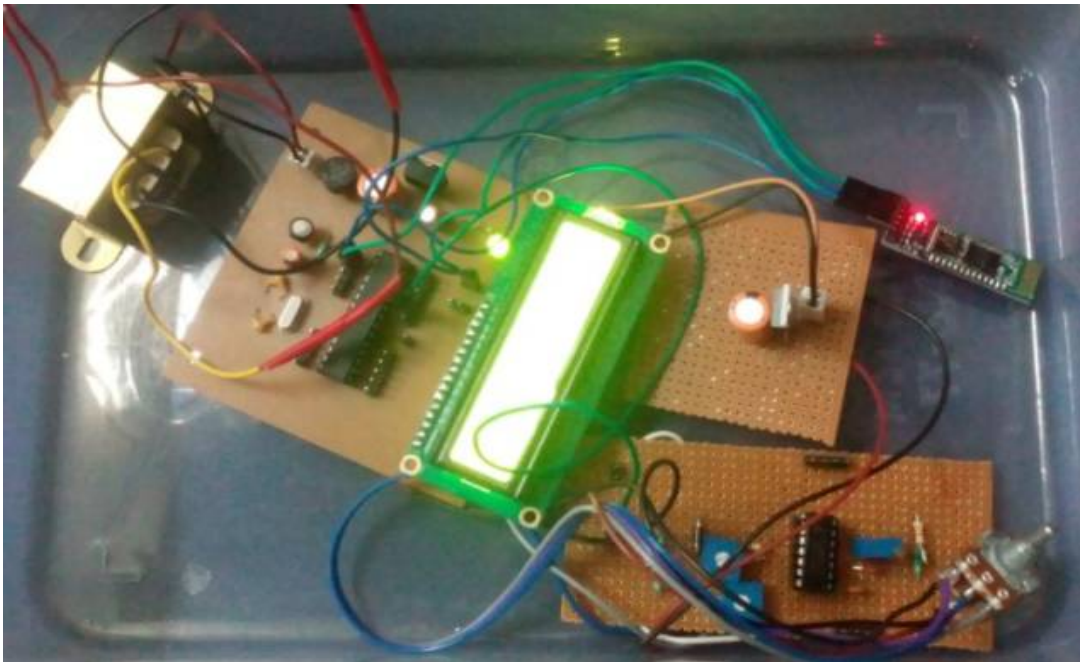

Fig 3.hardware of system

Fig 4 show the main dashboard of android application, which contain four button such as CMD button which can be used to send a character command to the arduino board, Start button Used to stop and resume acquisition by sending a character to arduino, Clean button. This will clear the plot, and "sincronize" samples from different channels, Test button Plots sinusoidal signals as a test.

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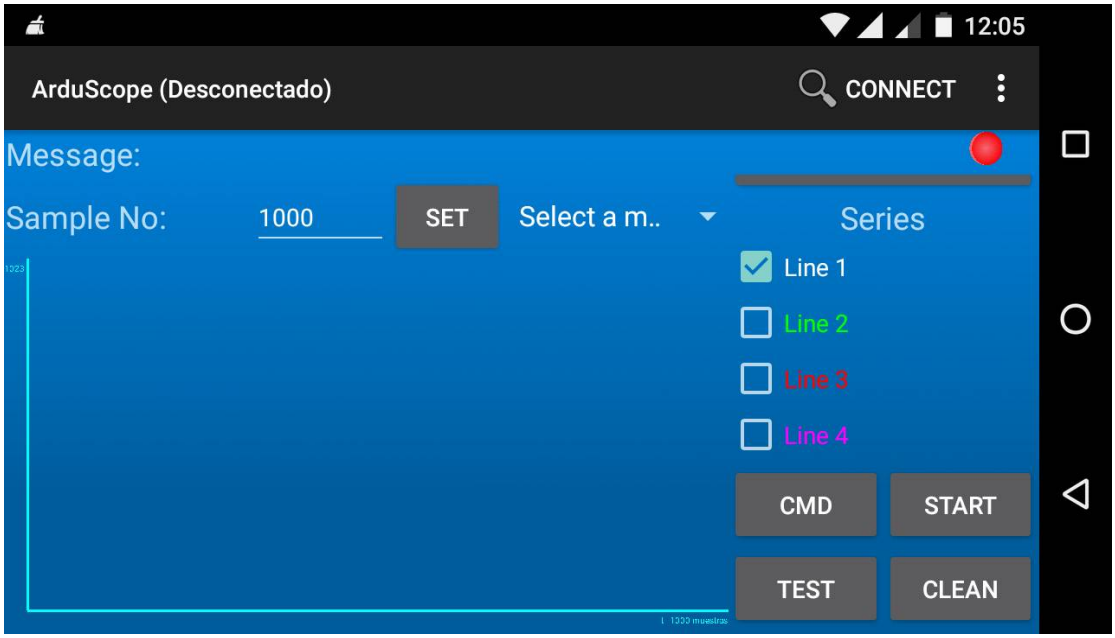

Fig4: main dashboard of application.

Fig 5 show the sinusoidal waveform which can be plot on the display of android Smartphone.

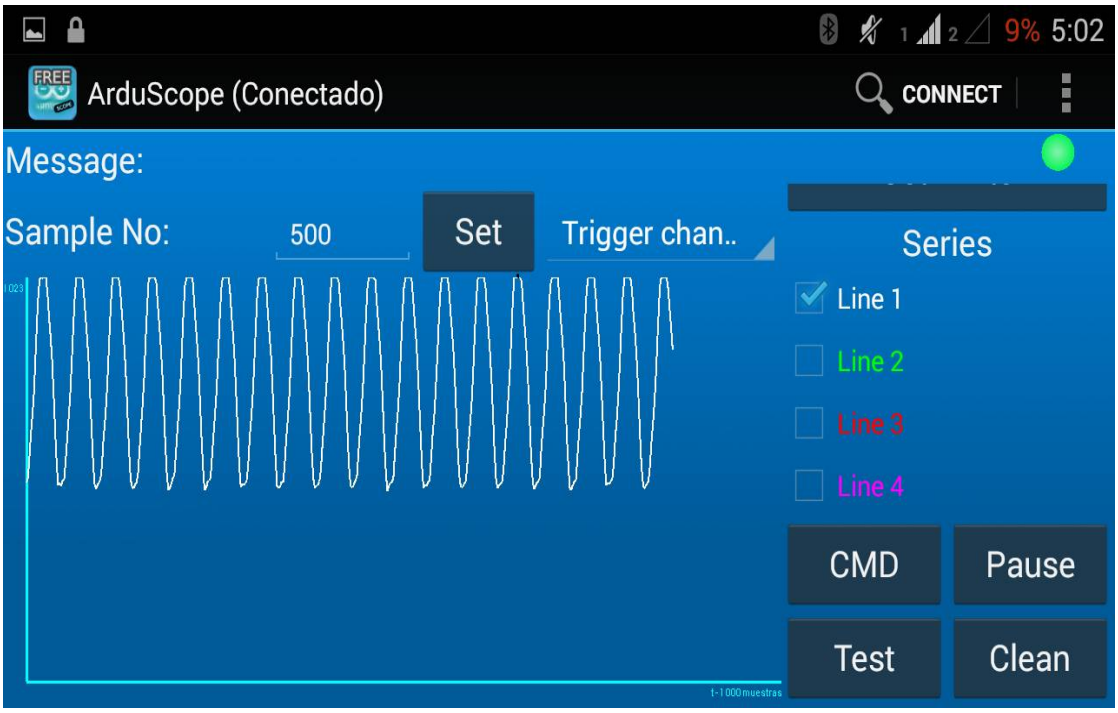

Fig 5: Sinusoidal Waveforms

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V. CONCLUSION AND FUTURE WORK

In this paper we can implement a projected system with the help of android mobile operating system. So we can achieve our aim i.e. Oscilloscope on android phone which is becomes the portable and versatile oscilloscope, with the help of this system we can see the different kind of waveform like Sine wave, square wave etc.

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