OSCILLOPHONE

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Abstract - *Today we live in 21st century and it is century where there is lot of advancement in the industrialization and electronic devices. As the time has passed there have been mass development in devices.*

Oscilloscopes and Signal Generators are two essential electronics devices to create and test electronic circuits. Unfortunately, these devices are very expensive for students starting electronics, or makers who want use electronic circuits in their creations just once.

So we have come up with an idea by which we can have a portable oscilloscope and signal generator with us. The idea of our project is to rethink your smartphone as a portable, powerful and secured platform, able to simulate an oscilloscope and a signal generator for your electronic circuits.

***Key Words*: Oscilloscope, smartphones, electronic circuits, signal generator, electronic devices**

1. INTRODUCTION

1.1 Theory behind the project concept

A oscillophone is a portable oscilloscope and function generator through which we can obtain output of particular circuit. Oscillophone is used to observe the change of an electrical signal over time, such that voltage and time describe a shape which is continuously graphed against a calibrated scale. The observed waveform can be analysed for such properties as amplitude, frequency, rise time, time interval, distortion and others.

1.2 Problem Definition

Today with advancement in electronic devices it is also mandatory to keep a check on the nature of output of a particular circuit. Continuous monitoring is required for this without breaking the circuit. One disadvantage is that oscilloscopes cost many times more than other types of electronic measuring instruments, such as multimeters. They are also very sophisticated, and tend to be costly to repair if damaged.

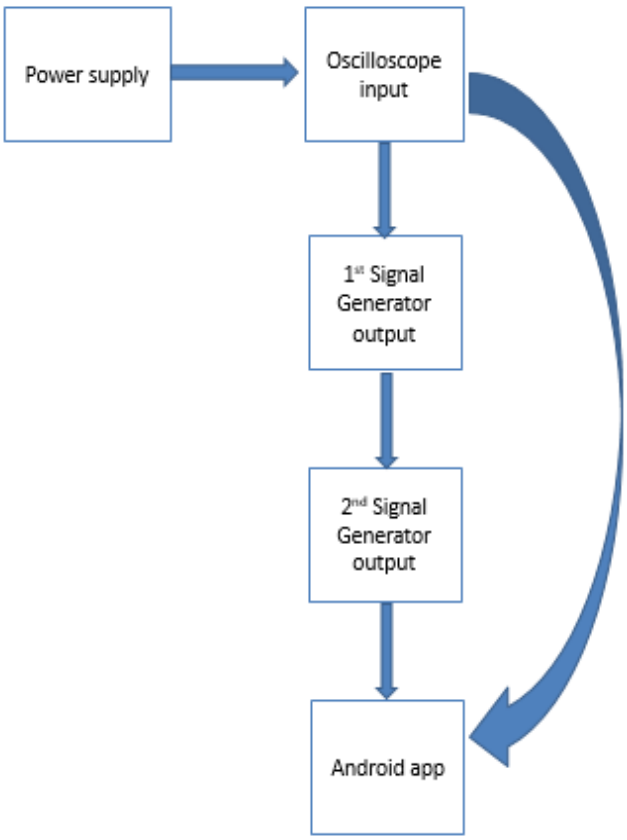
1.3 Need for Project

The idea of our project is to rethink your smartphone as a portable, powerful and secured platform, able to simulate an oscilloscope and a signal generator for your electronic circuits. Here, your phone isn't just an accessorize or an ordinary remote control it becomes the canter of the project, and a tool to help you create better things in the future.

The Oscillophone project includes:

- An oscilloscope input for visualize electronic signals ranging from 150 Hz to 15 kHz. Beyond this bandwidth, the displayed signals have a lower quality. Signals up to ±50V up can be injected on the input of the circuit. A warning LED alerts the user when a too high signal is measured.
- A signal generator output, able to generate sinusoidal, square and triangular signals up to 15 kHz. A potentiometer is used to adjust the signal amplitude.
- A signal generator power output, able to generate sinusoidal, square and triangular signals up to 15 kHz and 2A. A potentiometer is used to adjust the signal amplitude.

2. BLOCK DIAGRAM



2.1 Block Diagram Description

Signal Generators:

"Signal generators, also known variously as function generators or waveform generators, are electronic devices that generate repeating or non-repeating electronic signals. They are generally used in designing, testing, troubleshooting and repairing electronic or electroacoustic devices."

The signal generators are used in designing, repairing of electronic devices, and in troubleshooting. Every versatile signal generator can create an unlimited number of signals to meet the debug challenges. You can vary the output of the signal generator by setting the amplitude and frequency of the output signal while a simulation is in the process.

On the Signal Generator, you can choose the kind of signal you want (sine wave is the most common waveform but saw tooth, square and triangular waves are commonly available), his amplitude in volts or percent, and his frequency.

Types of Signal Generators

- **Functional Signal Generators**

A function generator contains an electronic device called electronic oscillator which generates simple repetitive wave forms such as sine waves, square waves, triangular wave forms, and sawtooth wave forms. In modern devices, these wave forms are created by digital signal processing technique followed by analogous signals of lower frequencies so they are often required.

A variety of function generators are black boxes with USB interfaces, used in instrumentation bus, and some are in the form of software. Their common uses are in the field of education, repairing electrical and electronic equipment and stimulus testing.

- **Arbitrary Waveform Generators**

Arbitrary generators are a device that generates arbitrary streams of digital information. These waveforms do not have any fixed shape, and can be entered in a variety of waveforms. This is a generator with two independent output channels, which can stimulate two systems simultaneously. A common use of an arbitrary waveform generator is to stimulate a system with a complex waveform. It has a display screen that shows an exact picture of the arbitrary waveforms that helps in avoiding the chance of mistake while selecting waveform from memory.

- **RF Signal Generators**

The radio frequency signal generators uses the variety of method to produce the signal like phase locked loop and direct digital synthesis etc. But most of the generators use frequency locked loop techniques to provide the stability and accuracy required by the system. It produces continuous wave tones of output frequency within their frequency range. The features of RF and microwave generators are almost same except they have different frequency range.

- **Analog Signal Generators**

It is based on sine wave oscillator with a sharp distinction in design of radio frequency and audio frequency signal generators. But now it is outdated and digital electronics are in use.

- **Vector Signal Generators**

Vector signal generators also called digital signal generators are capable of generating digitally modulated radio signals with complex modulation formats such as QPSK< QAM, etc.

- **Logical Signal Generators**

Logical signal generators produce logic pulses in the form of conventional voltage levels. These generators are often called digital pattern generators. Pulse generators able to generate pulses with variable delays and some even offer variable rise and fall times. It is used for functional validation and testing.

The Oscilloscope:

"An oscilloscope, previously called an oscillograph, is a type of electronic test instrument that allows observation of constantly varying signal voltages. Oscilloscopes are used to observe the change of an electrical signalled time." - Definition of oscilloscope by Wikipedia

More famous than the signal generator, the oscilloscope can in effect allows observation of electrical signals over time. It's a kind of voltmeter for varying and non-varying signals with a screen for the visualization. On the oscilloscope screen, you can observe the form, the amplitude and the frequency of the signal studied.

A typical oscilloscope can display alternating current (AC) or pulsating direct current (DC) waveforms having a frequency as low as approximately 1 hertz (Hz) or as high as several megahertz (MHz). High-end oscilloscopes can display signals having frequencies up to several hundred gigahertz (GHz). The display is broken up into so-called horizontal divisions (hor div) and vertical divisions (vert div). Time is displayed from left to right on the horizontal scale. Instantaneous voltage appears on the vertical scale, with positive values going upward and negative values going downward.

The oldest form of oscilloscope, still used in some labs today, is known as the cathode-ray oscilloscope. It produces an image by causing a focused electron beam to travel, or sweep, in patterns across the face of a cathode ray tube (CRT). More modern oscilloscopes electronically replicate the action of the CRT using a liquid crystal display (liquid crystal display) similar to those found on notebook

computers. The most sophisticated oscilloscopes employ computers to process and display waveforms. These computers can use any type of display, including CRT, LCD, and gas plasma.

In any oscilloscope, the horizontal sweep is measured in seconds per division (s/div), milliseconds per division (ms/div), microseconds per division (s/div), or nanoseconds per division (ns/div). The vertical deflection is measured in volts per division (V/div), millivolts per division (mV/div), or microvolts per division (V/div). Virtually all oscilloscopes have adjustable horizontal sweep and vertical deflection settings.

CONCLUSION

For testing an electronic circuit, an electronic signal is generated on the circuit input by the signal generator. The output signal of the circuit is measured by the oscilloscope and if it meets the requirements, then the circuit operates correctly.

By this manipulation, we visualize the impact that the electronic circuit has on the input signals.

ACKNOWLEDGEMENT

We whole heartedly thank our project guide Prof. Akshatha Bhatt and Mini Project co-ordinator Prof.Ameya Pethe, Department of Electronics Engineering for their valuable advice, guidance and support.

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