DESIGN AND IMPLMENTATION OF INTELLIGENT MOBILE PHONE DETECTOR

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ABSTRACT

The ubiquity of the cell phone has made communication easier and faster, integrating the world into a global village as people who are in different geographic location are connected in seconds, it's great to be able to call anyone at any time. There is great need to limit the use of cell phone at particular places and at particular times. Hence, the use of intelligent mobile phone detector is guaranteed. This work concentrates in designing a system that will dictate the presence of GSM signals from an unauthorized user in restricted areas which will in turn trigger another device to restrict the user from service. The system will be able to jam GSM frequency signal upon detection to prevent the transmitted signal from getting to the users cell phone.

Keywords: intelligent detector, GSM signal, Cell phone, restricted areas, communication, jamming

INTRODUCTION

The rapid proliferation of cell phones at the beginning of the 21st century to near ubiquitous status eventually raised problems such as their potential use to invade privacy or contribute to rampant and egregious academic cheating. In addition public backlash was growing against the intrusive disruption cell phones introduced in daily life. While older analog cell phones often suffered from chronically poor reception and could even be disconnected by simple interference such as high frequency noise, increasingly sophisticated digital phones have led to more elaborate counters [MOHAN , 2008]. Intelligent Mobile Phone devices are alternative to more expensive measures against denial of services by service providers. This work concentrates in designing a system that will dictate the presence of GSM signals from an unauthorized user in restricted areas which will in turn trigger another device to restrict the user from service. The system will be able to jam GSM frequency signal upon detection to prevent the transmitted signal from getting to the users cell phone [Abdul, 2008] and [electronics.howstuffsworks.com].

The Intelligent Mobile phone detection project is an advanced device which finds various applications in the modern fields of communication and surveillances. This work is very useful for the private meetings, examination hall, defense establishments, military camp, Hospitals; Petrol pumps etc., where the uses of an active Mobile Communication (GSM) device are prohibited.

DESIGN OBJECTIVES

The objective includes building a mobile detector to locate a phone within one and a half radius and to jam GSM signal within 5 to 10 meters radius.

Design Consideration

Most components were assembled before takeoff and all except few available in Nigeria market. Robust components were carefully chosen.

Design Specification

Detecting Frequency is between 1820MHz to 1865MHz and Jamming Frequency is within 900MHz to 1800MHz.The distance of detection falls within 1.5 meters and the distance to be jammed is within 5-10meters. Table 1 shows the operating frequency band used by mobile service operators in Nigeria.

Table1: Operating frequency bands

GSM900-1800 USED IN OWERRI	UPLINK (Handset transmit)	DOWNLINK (Handset receive)
GLO	1725-1740 MHz	1820-1835 MHz
MTN	1740-1755 MHz	1805-1850 MHz
AIRTEL	1756-1770MHz	1850-1865MHz

BLOCK DIAGRAM OF THE SYSTEM

The main purpose of the overall system is to disable or block mobile phones in the restricted area. As shown in Figure 1 the system is designed to work as a Mobile phone detector. It detects the RF signals from mobile phones and relay a signal to the trigger of the jamming circuit and this in turn blocks the desired frequency (GSM 900, GSM1800) [Ahmed S, 2006] and [Ahmed J, 2006].
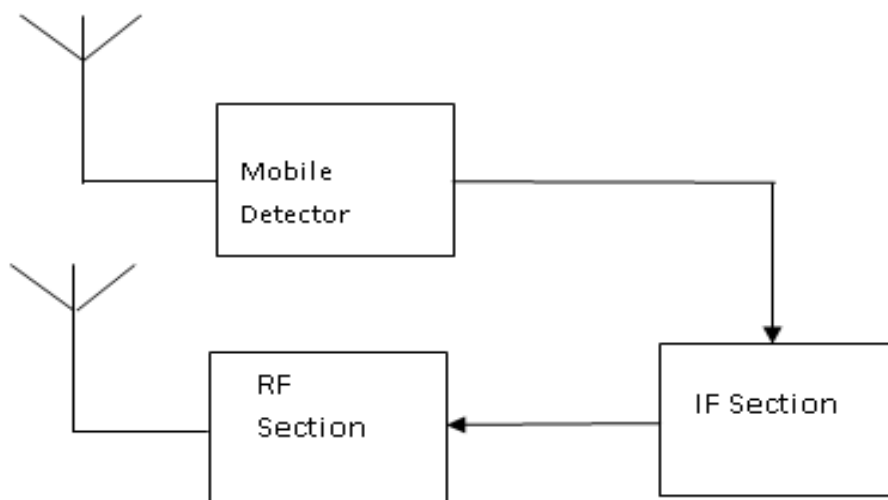

Figure 1: General Block Diagram of an intelligent mobile phone

Mobile Detector

The circuit shown in Figure 2 can sense the presence of an activated mobile phone from a distance of one and half (1.5) meter. It can detect the incoming and outgoing calls, SMS and video transmission even if the mobile phone is kept in the silent mode. At the moment the module detects RF transmission signal from an activated mobile phone, it sounds a beep alarm and the LED blinks. The alarm continues until the signal transmission ceases.
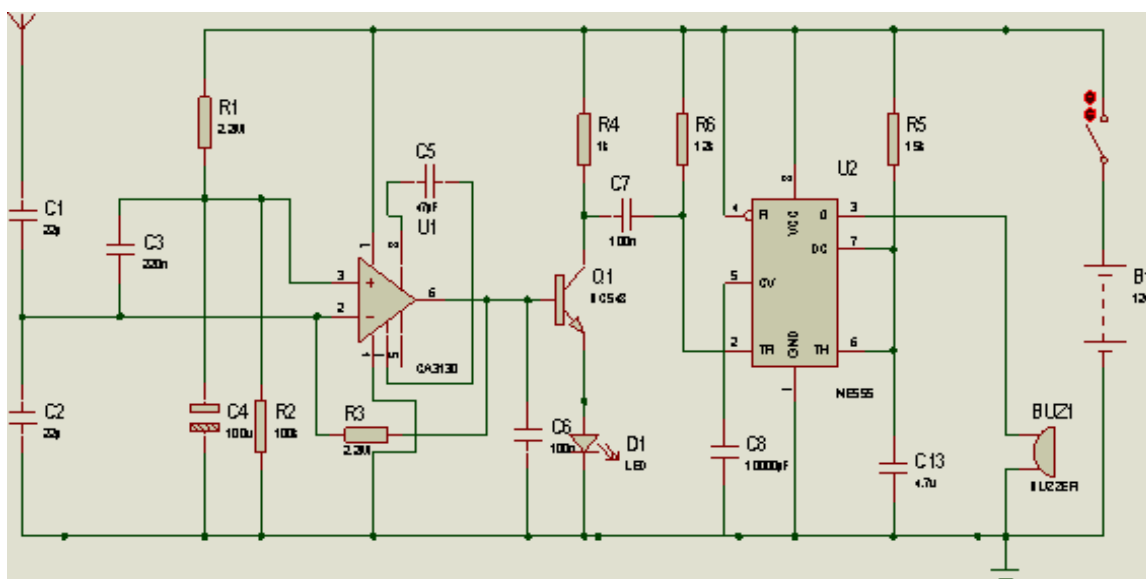

Figure 2: Circuit Diagram

This subsystem comprises the capturing RF transmission stage, the current to voltage converter, the trigger stage, Timer stage. The capture stage can capture all frequencies in the mobile communication spectrum from 0.9 to 3 GHz with a wavelength of 3.3 to 10 cm. This stage uses a 0.22μF disk capacitor (C3), this capacitor stores energy and transfers the stored energy in the form of minute current to the inputs of the current to voltage converting stage. The current to voltage converting stage converts the minute current from the previous stage into the corresponding output voltage by using a current to voltage convertor operational amplifier (CA3130). This stage helps trigger the timer stage and provide an Invisible alert about the transmission mobile data occurrence. The trigger used here is a mono-stable timer (NE555) [www.phonejammer.com].

IF Section

The IF section comprises the Triangular wave generator, the Noise generator, the Amplifier Stage, Mixer circuit, and the Clamper circuit.

The triangular wave generator circuit [6], is made up of two stages-the Schmitt trigger that generates square wave and the integrator circuit that produce the triangle wave. The frequency generated depends on the ratio of the resistors R2 and R3. The period of Triangle wave required to block GSM signal is given as T=0.577x2 m sec where 0.577m sec is the time for one slot. Without noise, the output of the VCO is just an un-modulated sweeping RF carrier. So, triangular signal must be mixed with noise (FM modulating the RF carrier with noise). This noise signal is generated by using Zener Diode operated in reverse mode. This noise is then amplified in two stages-first using the NPN transistor in common emitter configuration, and in the second stage, using the LM386 Audio amplifier IC. The capacitor C4 is just for blocking DC. The value of the resistor forms the none-inverting Amplifier and its gain is given by (1+ R/R2). The LM741 IC was used to mix the triangular wave or sweeping signal and the noise signal in the ration of 2:1. The ratio is achieved by selecting the resistor values as R1=2KΩ and R2=1KΩ. The out of this OP-AMP can now be applied to the VCO. The input of the VCO must be bounded between 0V to 3.5 V and this is realized using a clamper circuit. The clamper consists of a capacitor connected in series with a resistor and diode [Mazda, 1993].
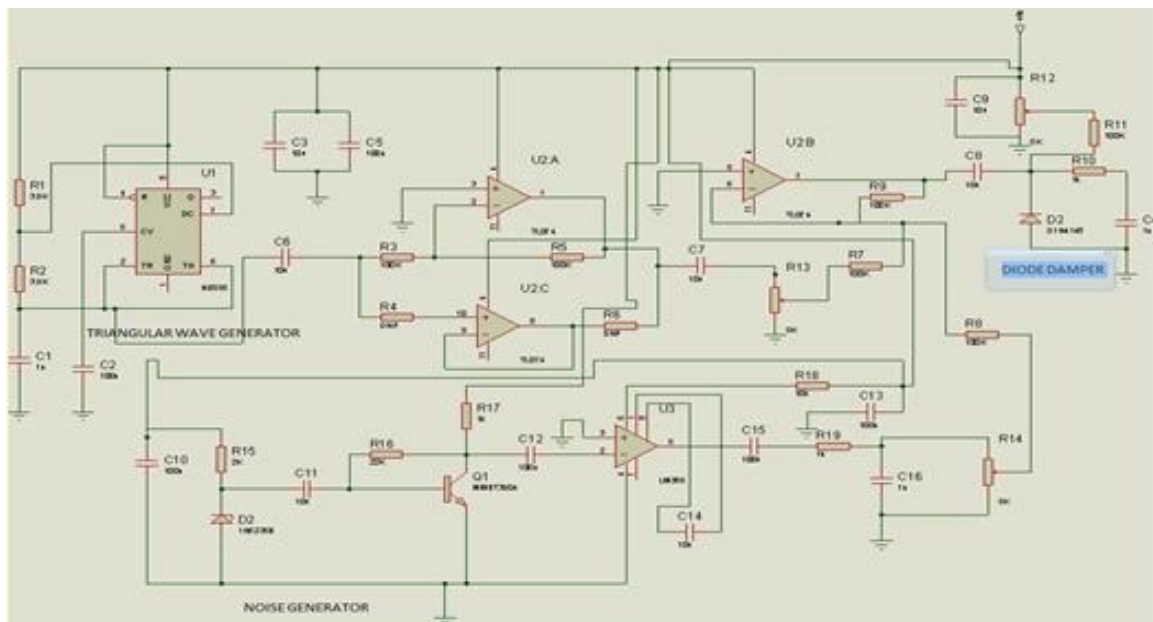

Figure 3: The IF Circuit of the Jammer System

The RF-Section

The voltage controlled oscillator (VCO) is the heart of the RF-section. It is the device that generates the RF signal which will interfere with the cell phone. The work requires a VCO for GSM 900 and GSM 1800. The CVCO55BE is the VCO for GSM 1800 and the output frequency is 1785-1900 MHz and the output power is up to 5 dBm. CVCO55CL is VCO for GSM 900. The output frequency is 925-970 MHz and the output power is up to 8 dBm.

SIMULATION OF THE DESIGNED SYSTEM

The software used for the simulation of this work is PROTUS. What was done was to use a Signal Generator to generate a frequency of 100Hz since the CPU of the system would be completely utilized for higher RF signal for mobile phone. The signal was sent into the input terminal (antenna) as shown in figure 5. The figure 6 shows the tested reading values of Detector RF Input Signal. The LED was immediately energized indicating that the input signal triggered the 555 Timer IC and this in turn shows that a mobile phone has received signal [www.espow.com/].
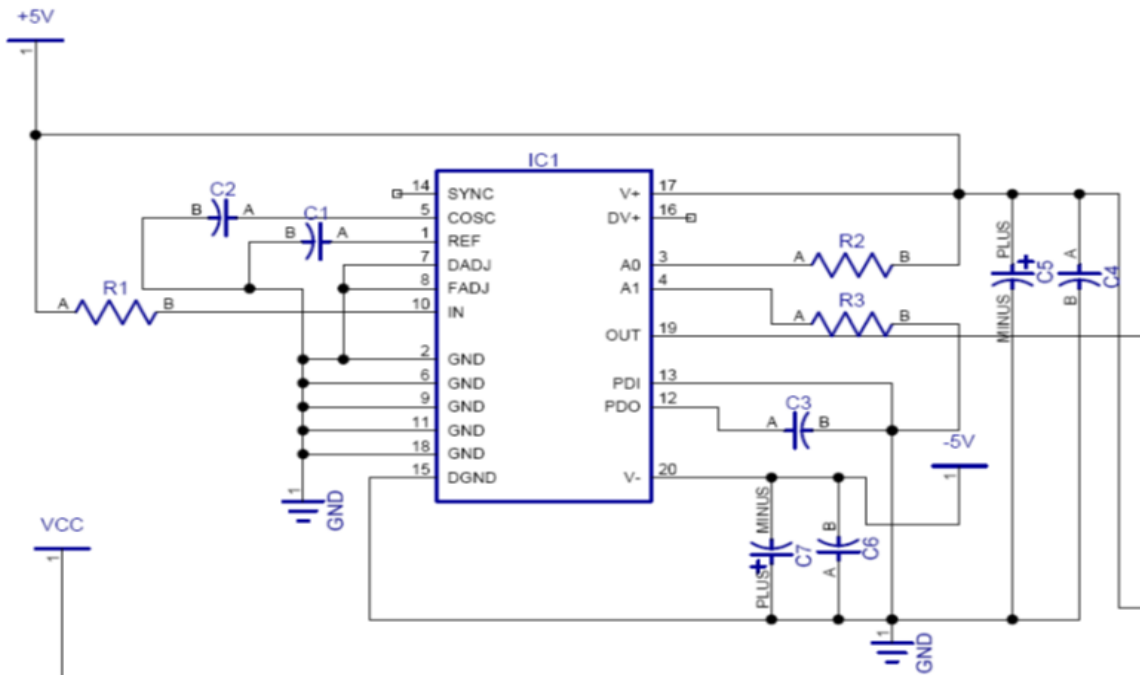

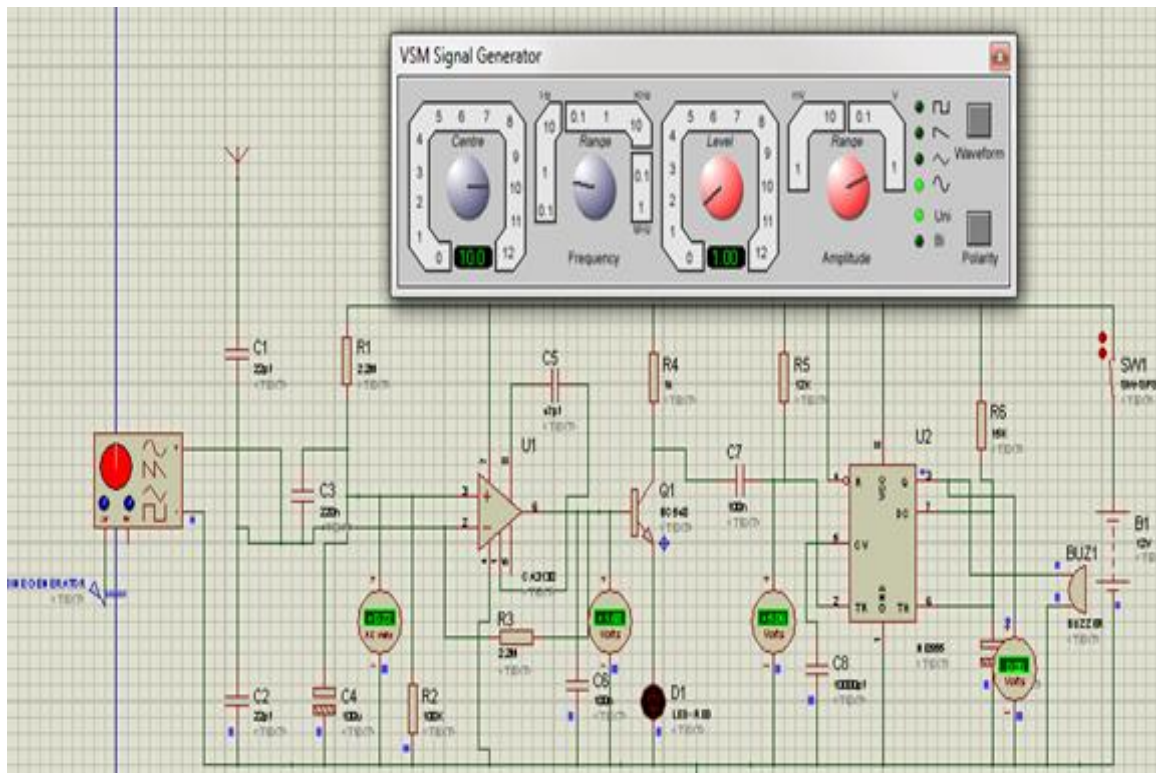**Figure 4: Voltage Controlled Oscillator Circuit (VCO)**

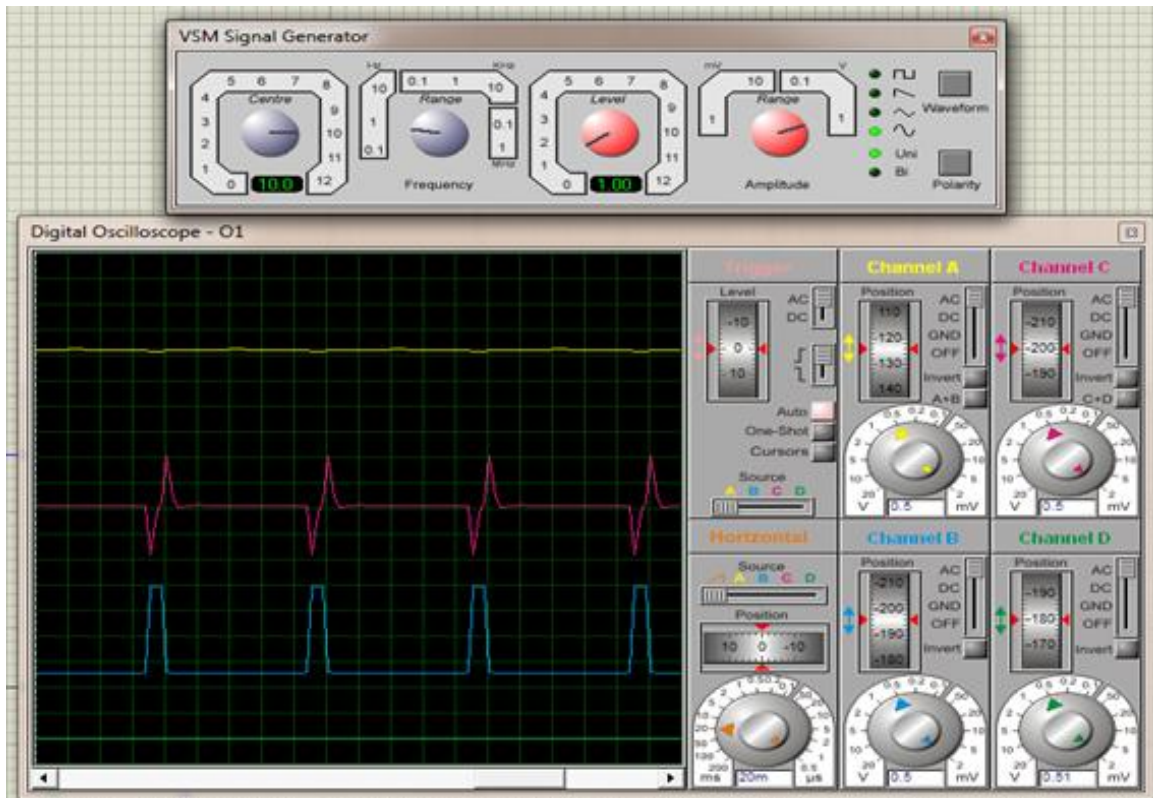**Figure 5: Simulation of Detector RF input Signal**

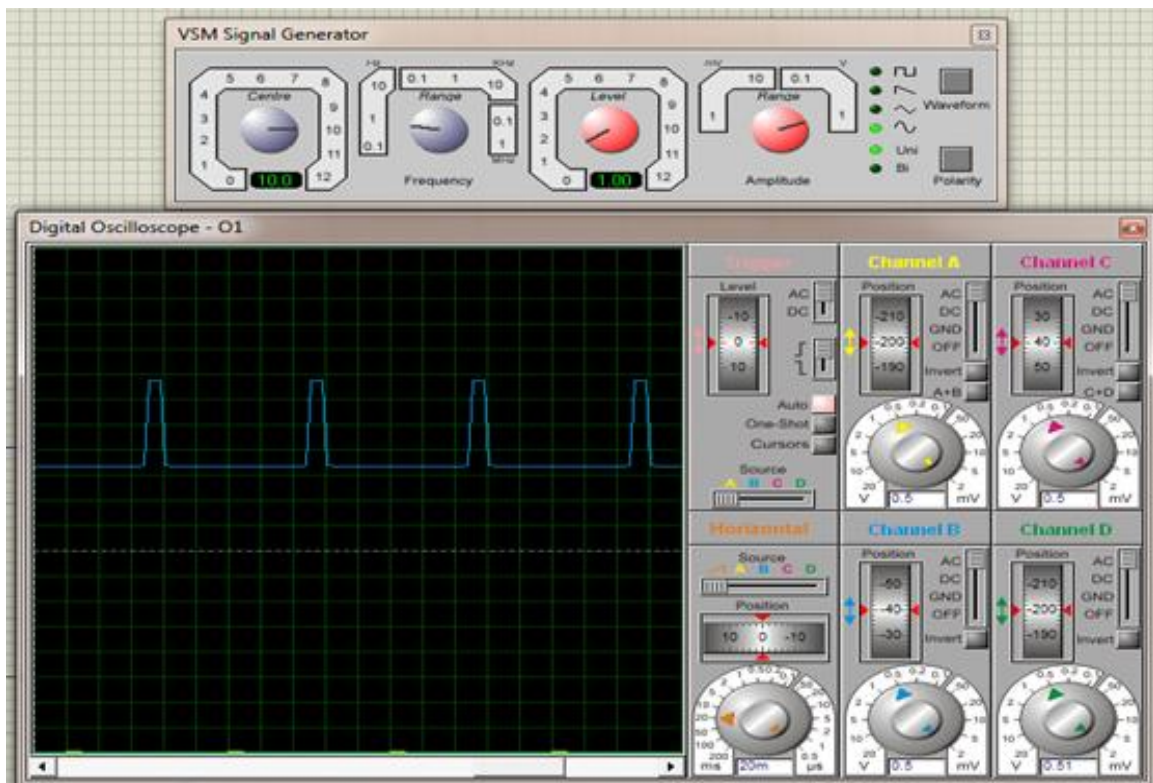**Figure 6: Simulated wave form of the Detector circuit**

Figure 7: output signal of the Detector Op-Amp

The output signal of the Detector Op-Amp is expected to at least double the input signal. The result is 1.97 volts at 100Hz frequency; this is shown in figure 7.

CONCLUSION

This project is very useful for the private meetings, examination hall, defense establishments, military camp, Hospitals; Petrol pumps etc., where the uses of an active Mobile Communication (GSM) device are prohibited. With the aid of this system, one can detect the active mobile phone device-like objects and GPS systems from the range of few centimeters to few inches depending upon the objects transmission strength and other useful parameters. This device can detect objects within a radius of 1.5 meters in a given area and operating frequency of the phone is between 900-1870MHz at the range of 5-10 meters. The system has no way of discriminating between two phones within the same frequency range. Therefore it is expected that future research will look into this area.

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