Designing/ Prototyping a Cell Phone Detecting System

Inkindi Mutoni Sabine, supervised by Lecturer Hitiyise Emmanuel, University of Rwanda

School of Engineering, Department of Electrical and Electronics Engineering

(i) Introduction

The cell phones usage in primary and high schools has shown challenges to the education [1]. Those challenges include attraction to drugs, teens' pregnancies, distraction… All these challenges resulting from the fact that they interact with the outside world and they forget their core duty of studying.

The proposed research aims at conducting and analyzing the successfulness of the system which will be used to detect the cell phones and know if there are students who are using them while the lectures are being given.

(ii) Methodology

The research was conducted using two simulators (Multisim and LT spice) and was developed using Arduino IDE.

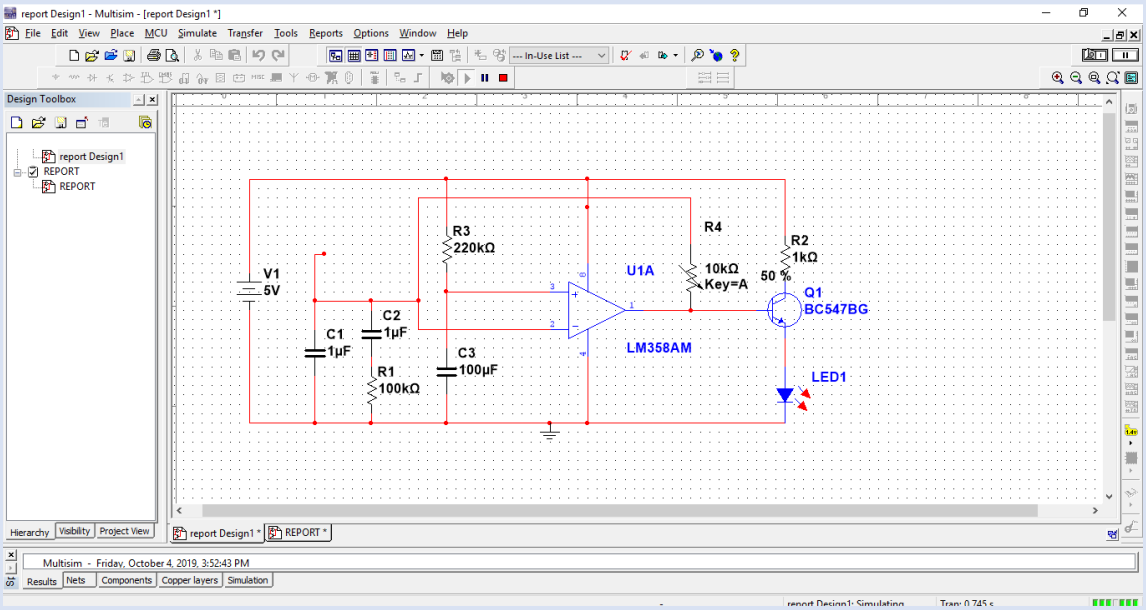
(iii) Description:

The transmission frequency of mobile-phones ranges from 0.9 to 3GHz with a wavelength of 3.3 to 10 cm. So a circuit detecting those signals (Gigahertz signals) is needed. The circuit aims at detecting 2G, 3G, and 4G mobile phones. It can detect calls (incoming and outgoing), SMS, video transmission… even if the phone is in silence mode.

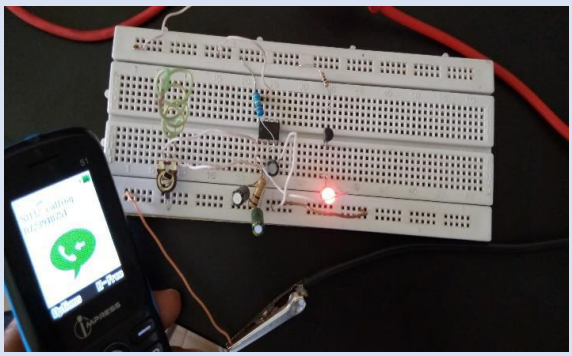
(iv) Results:

Step 1: the 2G circuit

The simulation under multisim

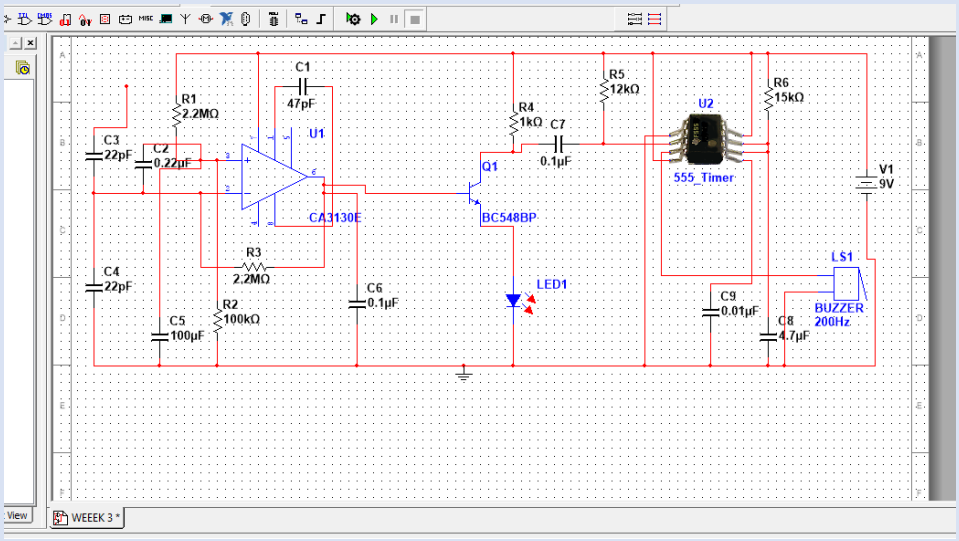


The hardware implementation

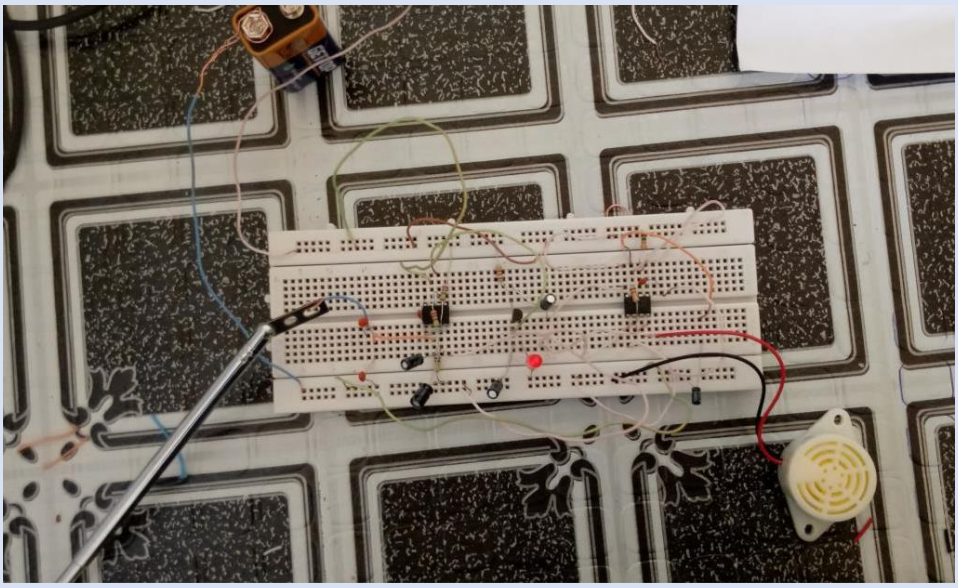


Step 2: the 3G circuit

The implementation under multisim



The hardware implementation



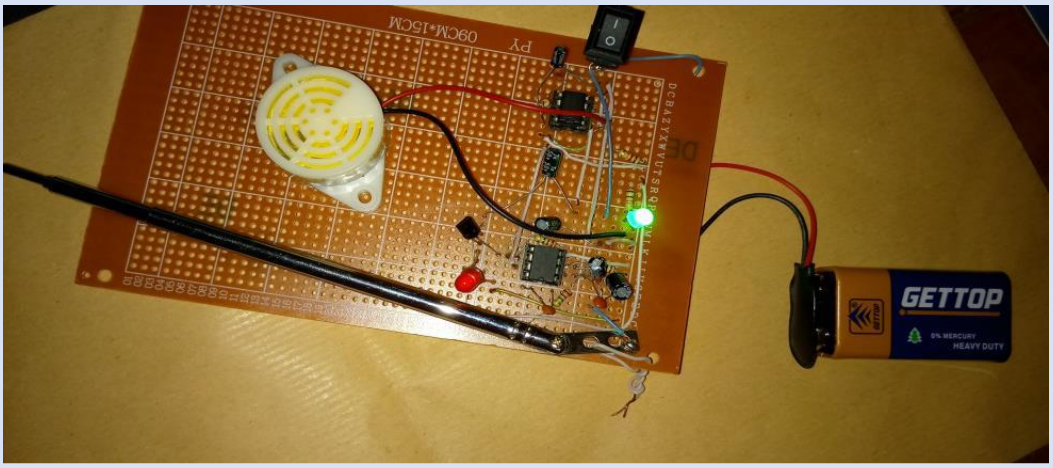
Explanations:

- The first circuit for detecting 2G mobile phones has been successful since it reacted in the presence of those cell phones. i.e. when the phone got closer to the circuit, the LED (light Emitting diode) blinks and gave the signal indicating that the 2G phone is closer.
- The 3G circuit reacted slowly and the soldering was made in order to fix all connections.

Step 3: the new soldered circuit

The circuit below didn't give the result required as the following were observed. i.e. The buzzer kept producing the sound:

- Whenever the antenna touched the stand of the soldering wire,
- When the wide multi socket was being supplied,
- When the cell phone was on even though it wasn't on the call,
- When the phone call even stopped.

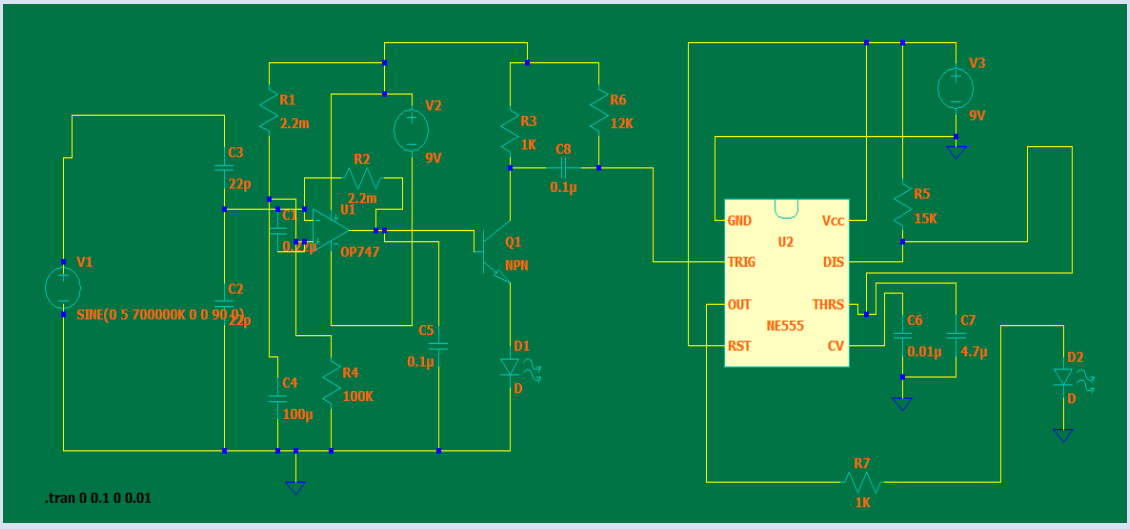


The observations above were due to:

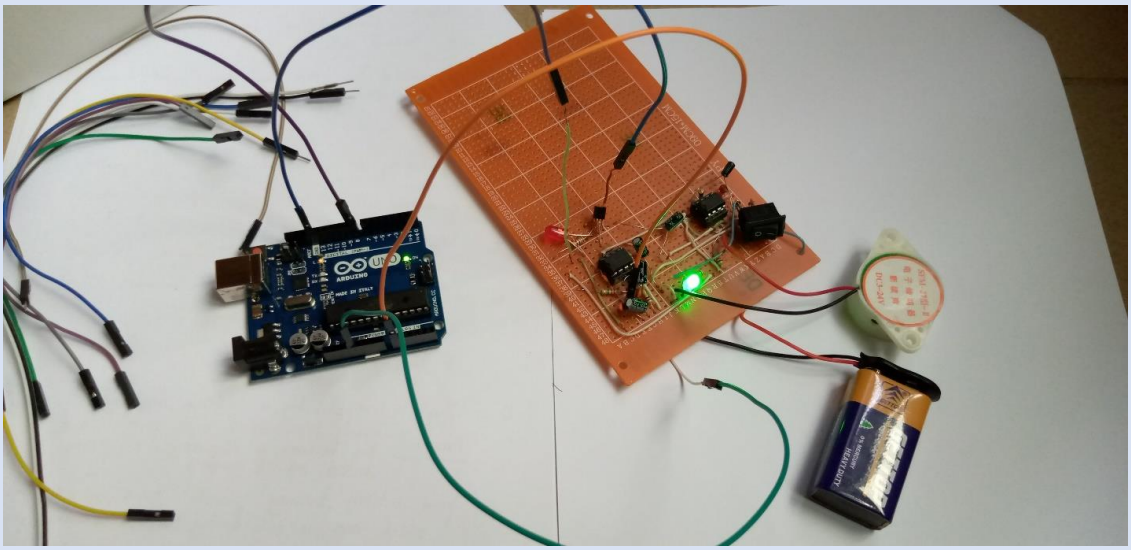
- The blinking of LED and the sound of buzzer when the antenna touched the soldering wire, when the wide multi socket was supplied, it was because they were sending the signal at a certain frequency. And, the antenna couldn't reject that signal.
- The blinking of LED and the sound of buzzer continued even when the cell phone wasn't calling because the phone which is active is also able to transmit the signal. And the antenna can easily receive that.

Step 4: Using Arduino to improve the circuit and the simulation using LT spice

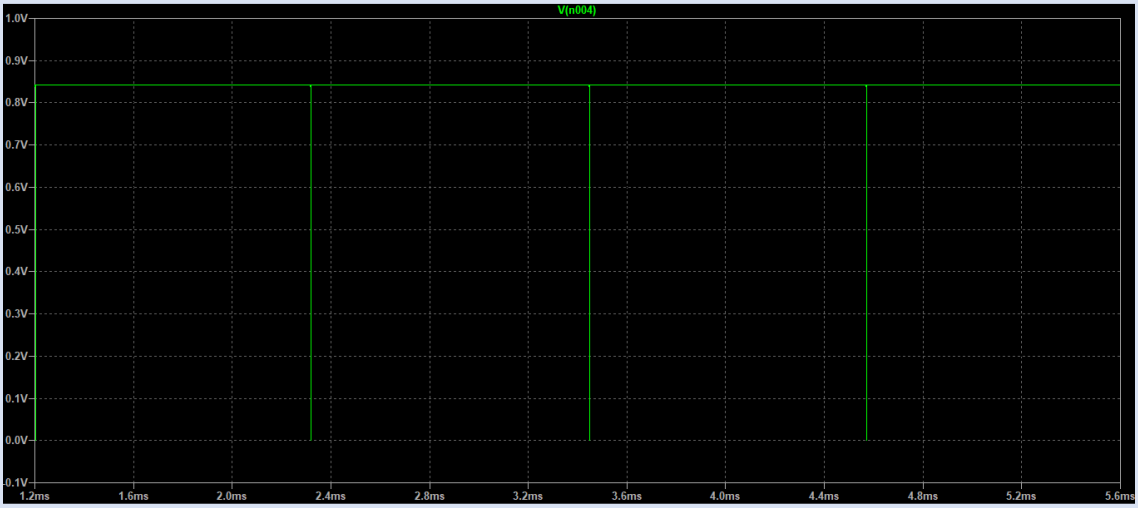
The simulation using LT spice



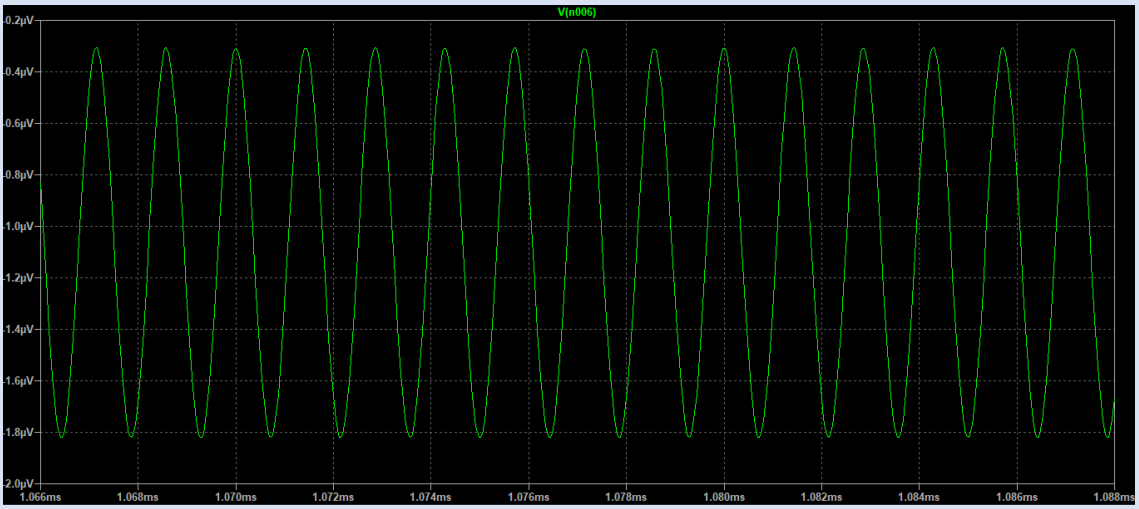
The circuit using the Arduino



The output from the monostable multivibrator



The input at low frequency to the monostable multivibrator



Why Arduino is introduced:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language based on the wiring, and the Arduino software (IDE) based on processing [2].

Arduino is introduced in this project because:

- The circuit showed variable results in the same conditions, so using Arduino could easily solve this problem but codes are still being developed.

I've tried to use the Arduino because I was learning it during this time.

(v) Conclusion

The circuit is still being improved by dealing with Arduino codes. Due to different working conditions, the results are not predictable since the signals we are dealing with are analog signals and therefore there should be a general condition to consider while carrying out this experiment.

(vi) Acknowledgement

I would like to thank a lot my supervisor Lecturer Hitiyise Emmanuel who helped me with the resources to improve my project and for the today's continuous support.

I would also like to thank Lord Laidlaw for the Laidlaw scholarship which has improved my skills in ways I couldn't explain and also which made it possible to keep doing this research.

(vii) Reference

- [1] Buhungiro.E.(2018, Aug). *Know your rights: Mobile phones are not allowed at school* [online]. Available: https://www.newtimes.co.rw/lifestyle/know-your-rights-mobile-phones-are-not-allowed-school
- [2] *Getting started* [online]. Available: https://www.arduino.cc/en/guide/introduction