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The High-Tech Anti-Fraud System in Examinations

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Abstract: ***Nowadays, the development of information technology has brought about more and more sophisticated frauds in examinations. Candidates can use high-tech devices such as wireless headphone, mini phone, camera pen to exchange information about test with other people outside. The high-tech anti-fraud system in examinations made by us helps invigilators detect and prevent the frauds using hi-tech devices in the examinations.***

Keywords: The high-tech anti-fraud system in examinations, anti-fraud equipment, prevent cheating on exams, wave detector circuit, mobile phone signal detector.

1. Introduction

Education is always considered a top national policy, to ensure that the contests take place seriously and quality, not only based on the self-awareness and honesty of the candidates, but also the monitoring and supervision systems for notifying and preventing acts of fraud.

Currently, in developed countries, mobile phone signal detectors are gradually being applied for ensuring quality and transparent education. However, these systems are very expensive and have a negative impact on human health. Therefore, with the desire of having a system that contributes to detect frauds in the examinations with low cost and easy-to-use, we have invented an anti-fraud system including hardware and software.

- The hardware is responsible for detecting waves and sending data to a computer.
- The software is responsible for receiving information and handling the violating candidates, and helping invigilators to manage the exam room.

2. Solution and Design

2.1. Solution

The solution for the high-tech anti-fraud system:

- Designing device for detecting GSM, 3G, wifi...signals. As soon as the detection devices detect waves within the prescribed frequency range, they will report to the central equipment.
- The central equipment connects to a computer that is put on the teaching table. Whenever receiving the signal from the detector, the central equipment will send a message along with the position of the detector to the computer.
- The monitoring software on the computer with a visual interface displays the position of fraudulent candidates using high-tech fraud devices. Besides, it can release the minutes of sanctions when the test ends.

2.2. Design system

2.2.1. System context diagram

When candidates use a high-tech device such as wireless headphone, mini phone... the microcontroller on the detector will discover the candidate's position and send it to computer through com gate. The monitoring software on computer will process data, then displays information about the fraudulent candidates such as name, candidate number…

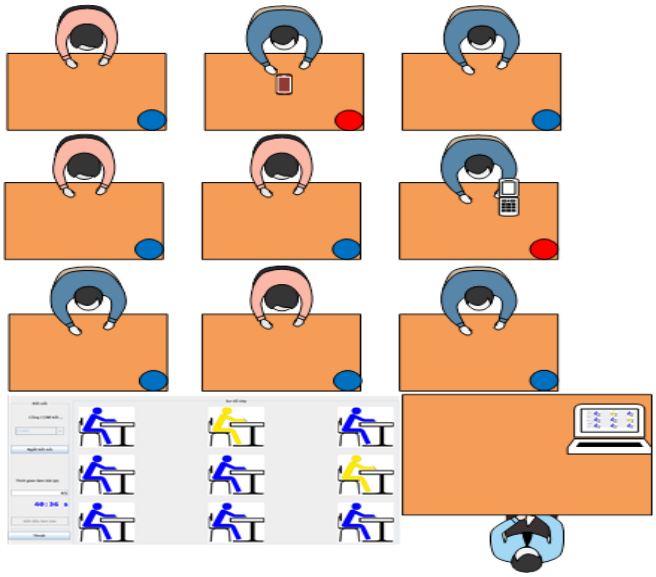


Figure 1: System context diagram

2.2.2. System block diagram

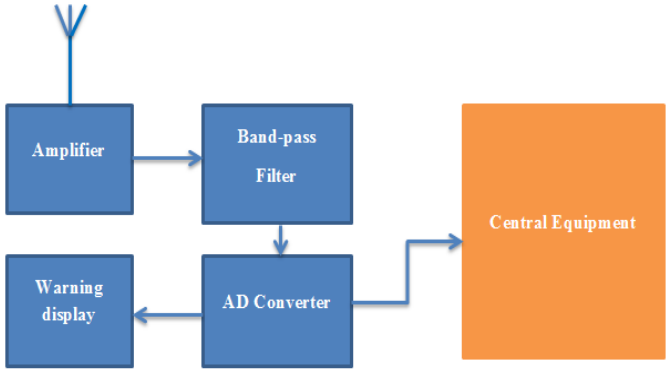


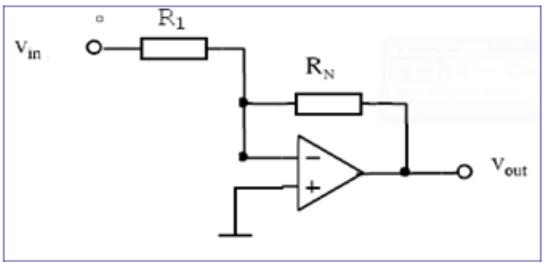
Figure 2: System block diagram.

The antenna is responsible for receiving RF wave surround the detector. Then signal is transmitted to an operational

amplifier for amplifying and stabilizing the signal.

a. Amplifier

Amplifier is to amplify the input signal by a certain factor. In order to amplifying the radio signal and stabilizing the input signal, we use an inverting amplifier [5]:



Firgure 3: Inverting amplifier.

Parameters of inverting amplifier:

$$V_h=V_p-V_n \quad (1)$$

Because $V_p=0$, so that $V_n=0$.

Assuming the current through R_1 (I_1) directs from V_{in} to V_n and the current through R_N (I_2) directs from V_{out} to R_N, we have:

$$I_1 = \frac{Vin-Vn}{R1} = \frac{Vin}{R1} \quad (2)$$

$$I_2 = \frac{Vout-Vn}{RN} = \frac{Vout}{RN} \quad (3)$$

Applying the Kiffchop 2 law at point A on Vn, we have: $I_1+I_2=0$.

$$\frac{Vin}{R1}+\frac{Vout}{RN}=0 \Rightarrow \frac{Vin}{R1}=\frac{-Vout}{RN} \quad (4)$$

$$\Rightarrow V_{in}R_N = -V_{out}R_1$$

$$V_{out} = -\frac{RN}{R1}\,Vin \quad (5)$$

Thus the output signal is increased by the factor of R_N/R_1. The output signal is phase-inverted with respect to the input signal. In order to modifying the amplification, we will adjust the value of resistor.

After amplification, the signal is passed through a band-pass filter to filter out the signal within the specified frequency range (800 MHz ~ 2200 MHz).

b. Band-pass filter

A band-pass filter is a device that passes frequencies within a certain range and rejects frequencies outside that range.

The filter is characterized by a frequency response, which is a quantitative measurement of the output spectrum of a system or device when responding to a stimulus, and is used to describe the dynamics of that system. The band-pass filter is featured by the amplitude of the frequency response. Ideally, the amplitude has a rectangular shape, but in fact it is bell-shaped [5].

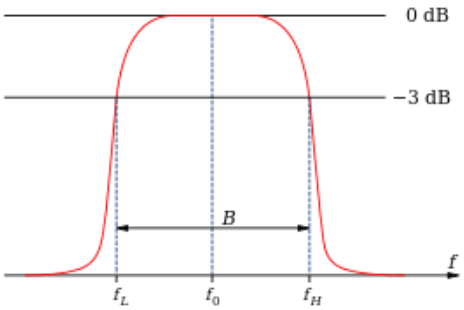
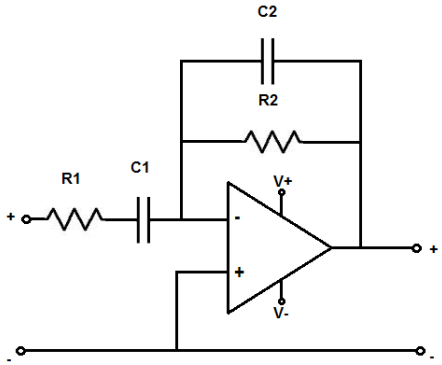


Figure 4: The frequency response of a band-pass filter.



Firgure 5: The band-pass filter.

After passing through the band-pas filter, the signal is transmitted to a AD converter. Then, the digital signal is displayed on the detector and sent to the central equipment.

3. Result

3.1 Result

The high-tech anti-fraud system in examinations is easy to use. The process of installing and operating includes these steps:

- **The 1st step**: set up nodes according to the number of candidates and supply power to the detector.

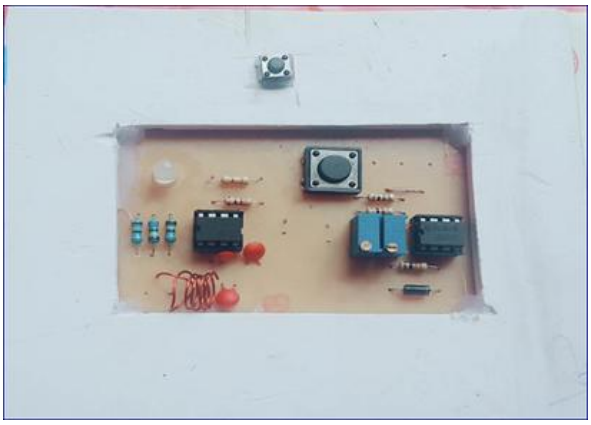


Figure 6: Node at the position of candidates.

- **The 2nd step**: The monitoring software

- Connect the nodes to the microcontroller [1, 4], start the software.
- Select exam room, testing time, start the test.

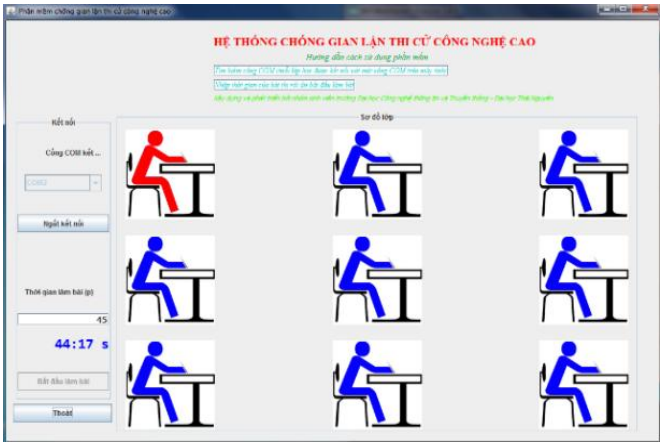


Figure 7: The software interface.

When the system detects a candidate who uses a high-tech equipment, it will turn the blue icon into red (figure 7) [2,3].
- Print out a .txt file generated by the system. This file contains information about the cheater-candidate.

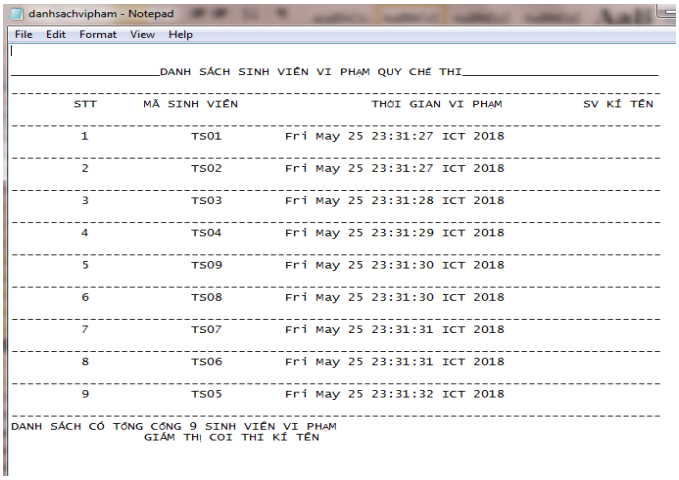


Figure 8: The file is self-exported at the end of the test.

3.2 Scale and scope of application

The high-tech anti-fraud system can be used in education and recruiting competitions of companies. This system helps to detect and prevent fraud by using high-tech equipment. The number of nodes can vary flexibility according to the amount of seats in the exam room (the average number is about 50).

4. Conclusion

The high-tech anti-fraud system is built based on the communicating among the node placed in the position of candidate, microcontroller and computer. The system is very useful in education. By using this system, invigilators can easily detect and prevent candidates using the high-tech devices in examinations.

The system owns many advantages such as simple design, low cost, easy to use, high stability and high accuracy. Currently, we continue to upgrade this system to improve the sensitivity of nodes, make software interface becoming better-looking and having more facilities.

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