A 2-Factor Authentication Safe System using Shape Recognition

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Abstract

A safe is a secure lockable box used for securing valuable objects against theft and/or damage from fire. However, keeping your valuables safe these days is difficult even if you have a safe with security code people can always copy it without your attention and access your belongings. The project adds a second authentication mechanism to a safe that requires shape detection. The implementation of object detection will improve the security or protection of the safe by having to scan a randomly sent shape. The project will be implemented using Raspberry Pi, Finite State Machine(FSM), shape detection will be achieved by using Webcam and Python code.

Raspberry pi, Finite state machine, Multiplexers, detection algorithm name, OpenCV

1. Introduction

According to Wikipedia South Africa has a notably high rate of murders, assaults, rapes, and other violent crimes, compared to most countries. , that's why it is important to keep your money extra safe. A safe box offers that safety, not only for money but other valuable material such as jewelry nevertheless criminals still access the safe, we believe shape recognition can improve the safety of the safe box.

Passwords used to be a created method to protect systems or devices, but with the numbers of hackers or tools available today such as attack it Brute-force, has become much easier to break them. A second authentication method from password can prevent such vulnerability of a protected device.

Sang Hwa LeeSiddharth SharmaLinlin SangJong-Il ParkYong Gyu Park, published a paper title An Intelligent Video Security System Using Object Tracking and Shape Recognition The proposed system integrates the object extraction, human recognition, face detection, object tracking, and camera control.

Our system introduces a third level of authentication on the safe box, to make sure if the owner is the one trying to access the box, first a user will enter a password, then after they've entered a password an SMS will be sent to their phone with a shape that is supposed to be scanned. Once they scan it then they will be able to access the safe box

According to Businesstech, a report on 3 August 2019 a research was conducted in 2016 and "based on in-depth interviews with convicted robbers they found that 8 out of 10 residenti robberies are committed using information from domestic workers, gardeners and former employees." As a result, we assume that the workers or employees may have once seen the codes to access things including a safe in the house so out of fear of their threatened lives or at some point the anger of unfair dismissal they give out the codes

2. Background : related work

Safe boxes are a reliable way to securely keep our most priced items and even money, they are heavily dependent on a combination key(PIN) as security. As much as it is not easy to break this combination key, having an extra-layer of security is important to improve the security. Imagine a safe box with a 2-factor security system; that's our project.

In South Africa, banks were offering it as a service to their select few wealthy customers, however now the demand for safe boxes from banks has significantly declined. This is because of the "Safe box" heist that took place in 2016 at an FNB branch in Gauteng, published by IOL and 947. The outcry was not about the robbery itself but about the bank saying it's not liable for the loss. This made people rely on keeping the safe boxes in their private homes and/or private companies.

Petrol stations and supermarkets heavily rely on safe boxes to store money while waiting for it to be collected for off-premises safekeeping. These are the reasons we decided to add an extra layer of security to safe boxes.

3. Specifications

- One of the 4 USB port from the Raspberry Pi is going to be used to connect a Webcam
- A standard USB Webcam to scan/take pictures of shapes as input
- LCD screen will be used to display input messages e.g. enter a PIN code
- A user will be asked to enter/ key-in a PIN
- A 4x4 keypad will be used to key-in the safe box PIN
- An orange LED will indicate If the PIN is correct, else a red LED will indicate
- If a PIN is correct an MMS will be sent to the person who's responsible in safe box stating which shape to be scanned
- A user will be asked to scan the shape that was stated via MMS
- A green LED will indicate If the shape is correct, else a red LED will indicate

4. Methods

Finite State Machine - Our system will use the finite state machine approach as we are executing steps sequentially until the final step.

Shape detection - The system will have a shape detection as a second step of verification. A randomly sent shape will be scanned using a webcam and compared with the one on the system.

4.1. Operations of the project

Explain all the algorithm that you are using here. List them as A, B C . . . (2 or 3 algorithms are enough.) Algorithm. Flow chart of your project can be put here. You can use any software to draw it and copy the image here (Please don't draw it with words)

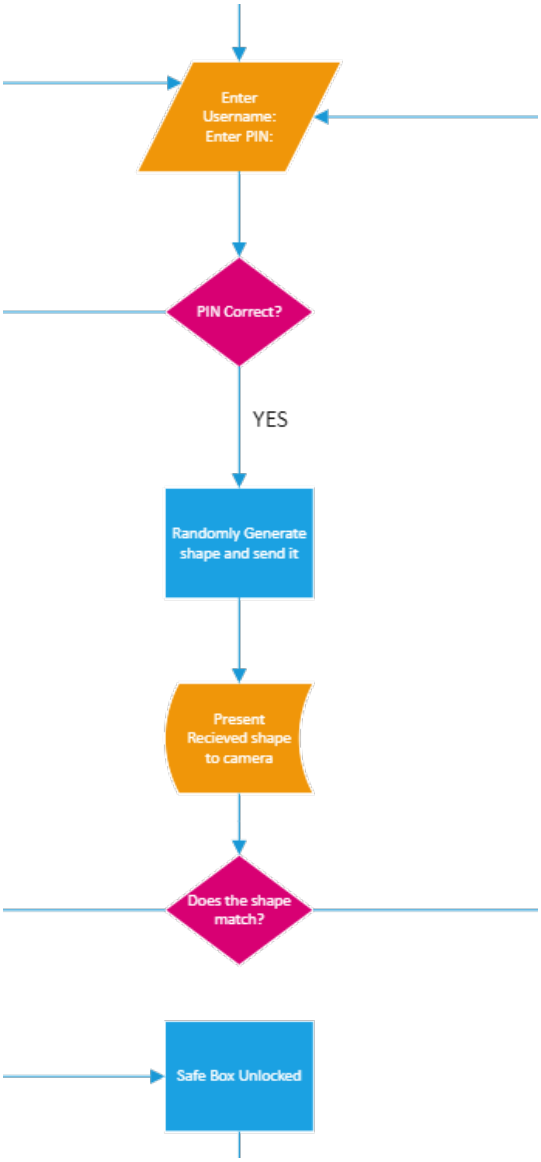

Figure 1. Sample figure with caption.

4.2. Algorithms

Explain all the algorithm that you are using here. List them as A, B C . . . (2 algorithms are enough.) Algorithm/
Flow chart should be used to explain your algorithm.

After explaining the algorithm, you can summarize it as follow:

Algorithm 1:

1. Start the project
2. Upload the image
3. Check if the shape is recognized ?
4. Does it match with any stored or acknowledge shape
5. Give the output message

This is just an example that I have made for you. You can customize it as you want.

4.3. Equations

If you have equations in your report please type them using the recommendation below The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font).

5. Simualtions

Here you can put figures or images of your software simulations, the outputs waves of Quartus can be placed and explain each figure. Put some pictures of your projects simulations, some LCD display output.

Figure 2. Sample figure with caption.

Author names and affiliations must be included in the submitted Final Paper for Publication. Leave two 12-point blank lines after the author's information.

6. Second and following pages

The second and following pages should begin 1.0 inch (2.54 cm) from the top edge. On all pages, the bottom margin should be 1-1/8 inches (2.86 cm) from the bottom edge of the page for 8.5 x 11-inch paper. (Letter-size paper)

7. Discussions

Discuss all the results of your projects Discuss what you have achieve and tell us why it is important. Explain every output figure that you have. What it does and how you understand it.

8. Conclusion

Conclude your paper efficiently by giving the overall statement of your project. State what you have achieved and why it was important achieving. If possible give

9. References

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