Analysis of Signature Using Image Processing on Android Mobile Devices

B Mamatha\(^1\), B Satyanarayana\(^2\)

\(^1\)M.Tech Scholar, Siddhartha Institute of Technology & Sciences, Narapally, Telangana
\(^2\)Associate Professor, Department of ECE, Siddhartha Institute of Technology & Sciences, Narapally, Telangana

Abstract: Internet and Digitalization is everywhere and that is the next and running revolution running around the globe. Everything is digitalized, and the market trends on it. E-commerce plays a vital role in marketing the product, purchasing the product, reviewing the product and mainly in India there were too many start-ups running on E-commerce. The purchase with internet is the most feasible way and reaches the customer satisfaction in majority possible cases. When you see the market, there were Android Smartphones coming up with the new emerging applications that moves the e-Market to next gen. Collecting signature from the customer is the digitalization concept that anyone wants to see. That topic is our main agenda, which is to collect signature from the user and to check whether it is her/his own signature or not. Signature is collected with the help of Android Smartphone from the user and it is uploaded to the dynamic web server for image processing using openCV with Python (Histogram Evaluation). If it matches with the original signature then SMS will be sent to the user. The same application can also be used in accessing the locker at Banks. This application is demonstrated here with a simple security system.

Keywords: Android Application, OpenCV, Signature Verification, Histogram Evaluation

I. INTRODUCTION

Now-a-days, the bank lockers were accessed through a key and there were some demerits by doing that. Out of which, the main demerit is anyone can access the locker if they have a key with them. In this paper, we proposed a solution for bank lockers. A security system is designed with 2-step authentication (Step–1: Password Recognition, Step–2: Pattern Recognition). Pattern Recognition is done with the help of user signature verification using image processing. OpenCV installed with Microsoft Visual Studio 2012 is used for processing the signature and a simple customized web bank interface is also designed along with the android application.

Signature Verification can be done in two ways:

Static: In this verification method, users deliver their signature on a bank document and digitalize it through a scanner. Bankers will recognizes it through a shape analysis. Thus, this method is termed as offline system.

Dynamic: In this verification method, users deliver their signature on an android smartphone/any digitalized device and that signature will be given for image processing with the previous original signature where pattern recognition plays a vital role and making it as an online system.

II. SYSTEM ARCHITECTURE

The system architecture of this proposed system is divided into three different and independent blocks.

ARM7 END: Hardware implementation for this proposed system is shown below with the simple blocks. Power Supply block is designed and developed to generate power source for the ARM processor and its relevant components. Reset Circuit is designed and developed to reset the program whenever necessary and interfaced to the ARM processor for greater stable response. Clock Circuit is designed and developed to generate oscillations and interfaced to the ARM processor for needy response. LCD Display is interfaced to the ARM processor for displaying the status of the system for better understanding. Keypad is used to enter the password as a first step authentication for bank lockers which plays a key role in accessing the locker. The GSM module is the main important peripheral which sends information to the owner asking him to sign on his own android smartphone, the system which we proposed here seems to look like a present OTP system. Laptop is interfaced for processing the image.

Block Diagram – ARM7 END

![Block Diagram – ARM7 END](image)

Android END: The GSM module interfaced at ARM will send a simple SMS stating that someone is accessing
the locker, and please authenticate it with the help of your signature. A simple customized Android application is designed and installed manually in the user’s android smartphone/tablet. The GSM module of android smartphone will receive a SMS coming from ARM end, upon a SMS coming from the bank server a simple android application will be opened automatically. In the application, it will ask you to enter your name and followed by a canvas where the user has to sign there. The signed image will be uploaded to the bank server for signature verification.

![Image](image1.png)

**Figure 2: Block Diagram of ANDROID END**

**SERVER END:** A WEB SERVER is designed and developed for collecting the user signature from the application. A simple UI is designed for better understanding by the bankers and when the signature is received, the bankers will perform the signature verification using openCV. Manual UI is designed for understanding of process with the help of HTML and PHP.

![Image](image2.png)

**Figure 3: Block Diagram of Server END**

### III. IMPLEMENTATION

**Hardware:** In hardware implementation, ARM processor plays a key role in monitoring and controlling the security system. Low-power consumption ARM processor (LPC2148) operating at 3.3V, 50uA is designed and mounted on a PCB along with Reset Circuit and a Clock Circuit. LPC2148, a 32-bit microcontroller with advanced RISC architecture and having 48 GPIO lines with a program memory of 32KB and a data memory of 512Bytes.

![Image](image3.png)

**Figure 4: ARM Overview [LPC2148]**

Here, in the above figure the clock circuit and reset circuits were assembled along with the LCD display circuit. A 16 X 2 LCD display is used for displaying the status of the system. A keypad is also designed as per below the schematic diagram, and interfaced to P0.16 – P0.23 of LPC2148.
The remaining modules like GSM, Motor Driver for controlling the locker were assembled as per the following schematic diagram:

**Algorithm:***

**Step 1**: Initialize ARM, LCD and GSM Module.

**Step 2**: Wait until you see READY on LCD.

**Step 3**: PRESS ‘0’ TO ACCESS LOCKER.

**Step 4**: ENTER PASSWORD AND PRESS ‘#’.

**Step 5**: If the password is authorized, send OTP to owner mobile.

**Step 6**: If the password is unauthorized, display you can’t access locker and send SMS to the owner stating that someone is accessing locker.

**Step 7**: Whenever OTP has received by the owner mobile, then immediately a built-in android application will be opened.

**Step 8**: There, he has to enter name and have to sign on the space allocated and move to next page.

**Step 9**: There, he has to upload the signature into the bank server make sure that smartphone is having valid internet connection.

**Step 10**: Display the status “SUCCESS” on banker’s web user interface.

**Step 11**: Banker will process the signature by using a pre-defined image processing technique (Histogram Evaluation with the previous signatures).

**Step 12**: If the signature is matched, then send data from the server to the system stating that you can access it and a simple SMS will be sent to the owner for intimation.
Step 13: The status of the processing will also be displayed on bankers web user interface for better understanding.

Step 14: If the signature is not matched, then also a data will be sent to the ARM processor for intimating the owner stating that someone is trying to access locker without your information.

Step 15: Locker will be opened successfully with a two-step authentication.

Step 16: Repeat Step – 3 to Step – 15 for infinite times until the server shut down.

Flowchart:

The flowchart of this paper is shown below:

V. RESULTS

Figure 9: Flow Chart

Figure 10: Server Login of Bank

Figure 11: Login ID and Password

Figure 12: Status of the Process

Figure 13: Signature Uploaded to the Server

Figure 14: Text Bridge Between HTML and Image Processing
Figure 15: Python Bridge Between the Python Program and Serial Communication

Figure 16: Python Web Server

Figure 17: Hardware Assembled for the System

Figure 18: Asking to Access the Locker

Figure 19: Enter the Password

Figure 20: Entering the Password

Figure 21: Authorized and Going to Second Authentication

Figure 22: Waiting for the Server to Communicate
VI. CONCLUSION

Here, in this paper signature verification is done with two-step authentication is designed and proposed for accessing the locker in the bank with a password and signature verification as authentications. Now-a-days, digitalization is everywhere and in every digital product that designed and purchased. Making a signature on a digital device plays a key role in making authentications for various applications and field areas.

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to N.Umarani, HOD, ECE, Siddhartha institute of Technology & Sciences as well as our, Director Prof. Dr. Lt. Col. Md. Lateef Khan, Siddhartha institute of Technology & Sciences who gave me the golden opportunity to do this wonderful project on the topic (Web Framework, Signature Verifiction, and Android Applications), which also helped me in doing a lot of Research and i came to know about so many new things we are really thankful to them.

And, secondly i would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.
VII. REFERENCES


[9] Referenced GSM, AT COMMANDS.