Multiple Security System Using Signature Verification On Android Smartphone

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Abstract — **Multiple security system is developed by providing a dual security to the system. Firstly using keypad the password is to be entered. Now if correct password is entered we get an SMS on Android Smartphone. Automatically android application opens and the signature is to be performed on the Smartphone and hence uploaded to web server. The status of image is seen the web page. Now the signature comparison is done using Histogram Evaluation in openCV. If the signature matches with previously stored ones the locker system can be accessed.**

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:

A. Static:

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

B. 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 signatures comparison is done where pattern recognition plays a very important 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.

A. ARM7 control section

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 [9] 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.

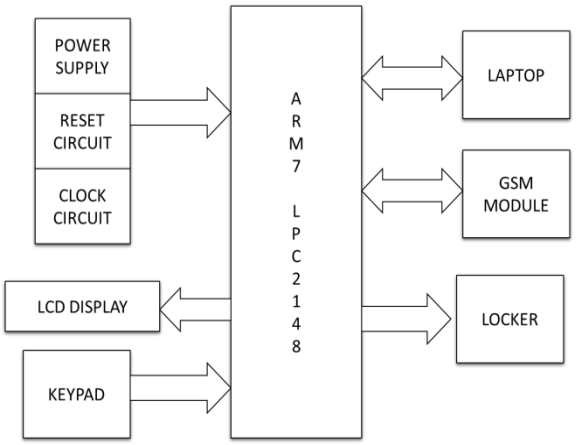

Figure-1: Block Diagram of ARM7 Control Section

B. ANDROID SECTION

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 [8] is designed and installed manually in the user's android smartphone/tablet. So now if the password entered through keypad is correct then android smartphone will receive a SMS coming from ARM Control Section, 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 [2].This upload takes place using WAMP Server.

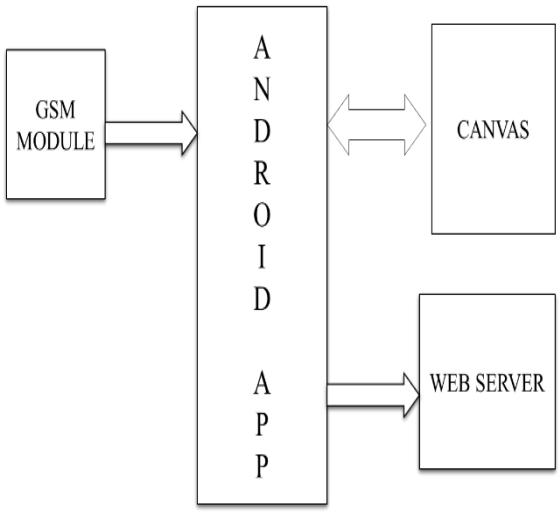

Figure – 2: Block Diagram of ANDROID Section

A. SERVER SECTION

A Web Server has been designed and developed for collecting the user signature from the android smartphone. A simple User Interface is designed for better understanding by the bankers so that a high security is provided. Now when the signature is received, signature verification [2] is performed using openCV.

The uploading of signature is done using the WAMP server. The WAMP refers to a set of free applications combined with Microsoft Windows, which are commonly used in Web server environments. The WAMP stack provides developers with the four key elements of a Web server: an operating system, database, Web server and Web scripting software. Manual UI is designed for understanding of process with the help of HTML and PHP [7]. Using HTML a login page is developed for admin login purpose. And using HTML and PHP the processing and the image status is displayed in PC.

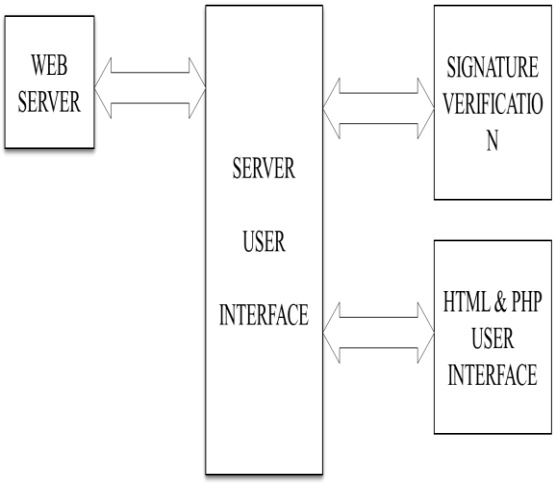

Figure – 3: Block Diagram of Server Section

III. IMPLEMENTATION

A. HARDWARE:

In hardware implementation, ARM processor plays a key role in monitoring and controlling the overall security system. Low-power consumption ARM processor (LPC2148) that is 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 512 Bytes.

GSM is an open, digital cellular technology used for transmitting mobile voice and data services.AT stands for Attention that is attention commands are used for controlling the modem.

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. Depending on the logic state of pin RS the pins D0 to D7 can be interpreted as command or else as data.When RS=0 indicates D0-D7 are interpreted as commands and when RS=1 then D0-D7 are interpreted as data. When R/W=0 to write data to LCD and R/W=1 is used to read data from LCD controller. A keypad is also designed as per below the schematic diagram, and interfaced to P0.16 – P0.23 of LPC2148. Motor was interfaced to L293D (Motor Driver) at P0.3 – P0.5 of LPC2148 as shown in above schematic which is used to enable the locker action. The remaining modules like GSM, Motor Driver for controlling the locker were assembled as per the following schematic diagram:

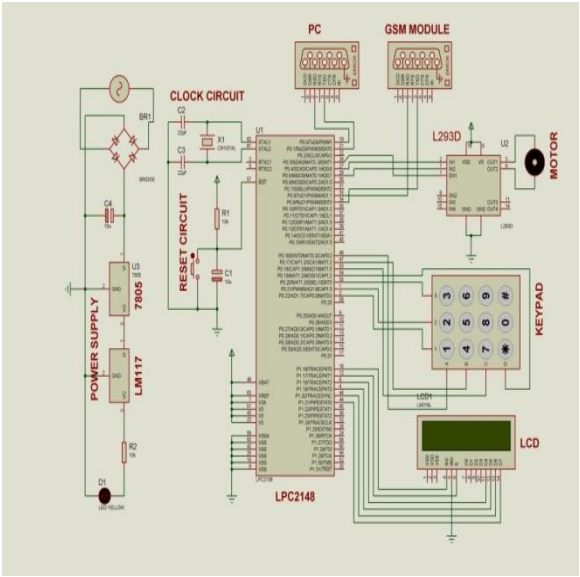

Figure – 4: Schematic Diagram

PC/Laptop was interfaced at UART0 of LPC2148 as shown in Figure - 4. GSM Module was interfaced to UART1 for communicating with the user. Keypad (4 * 3) was interfaced at P0.16 – P0.23 of LPC2148. LCD Display of (16 * 2) was also interfaced at P1.6 – P1.22 of LPC2148. Reset Circuit and Clock Circuits were interfaced at RST, XTAL1, and XTAL2 of LPC2148.

B. SOFTWARE:

Here, in order to program the ARM processor Keil uVision 4 was used as a cross-compiler and Flash Magic was used as a programmer for dumping the hex file in to the controller. Signature evaluation is done using openCV with Visual Studio 2012 using the evaluation of histograms. The signatures are converted in to histograms and hence comparison is performed using image processing functions in openCV. The Web server interface was designed using HTML and PHP [7] to display the status of the system. Android application was designed using

Android Developer Tools with Eclipse. WAMP Server was used in order to upload the signature to web. And finally, if the signature matches then using pyserial [6] data is sent to ARM7 for activating the motor.

IV. FLOWCHART

FLOWCHART:

The flowchart of this paper is shown below:

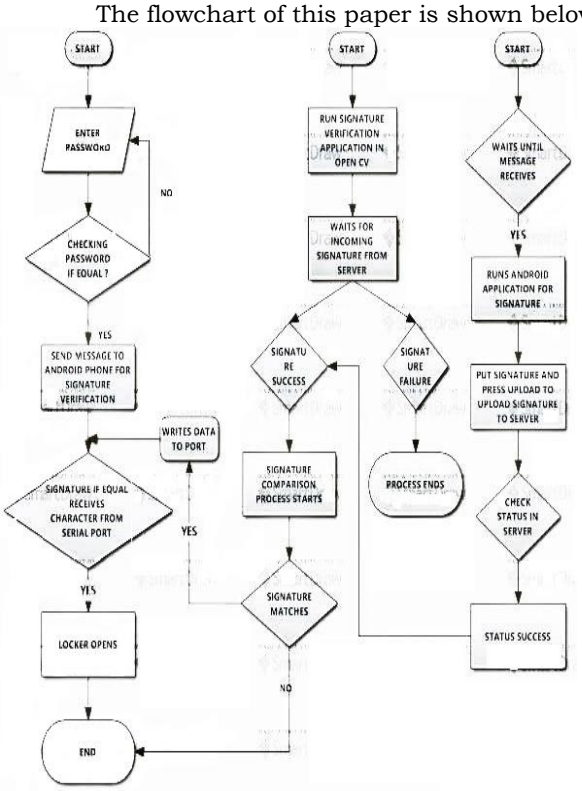

Figure – 5: Flow Chart

Algorithm:

Algorithm for developing Software:
Step – 1: Please Press '0' to access Locker
Step – 2: Enter your Password?
Step – 3: If password is authorized, send security password to owner's android smartphone
Step – 4: If SMS is received, then Android application will be opened and there the owner has to sign.
Step – 5: Then the owner has to upload the signature into the web server.

Step – 6: The banker will get an alert when signature is received through the status on the web page.
Step – 7: Banker will now perform Histogram Evaluation, and then if the result is positive then locker will be opened automatically.
Step – 8: If not, unauthorized locker will not be opened. A sms will alert the user if someone is trying to access it.
Step – 9: Repeat Step – 1 to Step -8 forever.
Using Keil Software developed the Embedded C code for interfacing all the modules with ARM7.
Interfaced ARM7 with Keypad, GSM module, LCD and DC motor. Firstly developed separate Programs for interfacing all components. And using UART0 of ARM7 for connecting to the web server .i.e., Laptop and using UART1 for interfacing the GSM module.

V. RESULTS

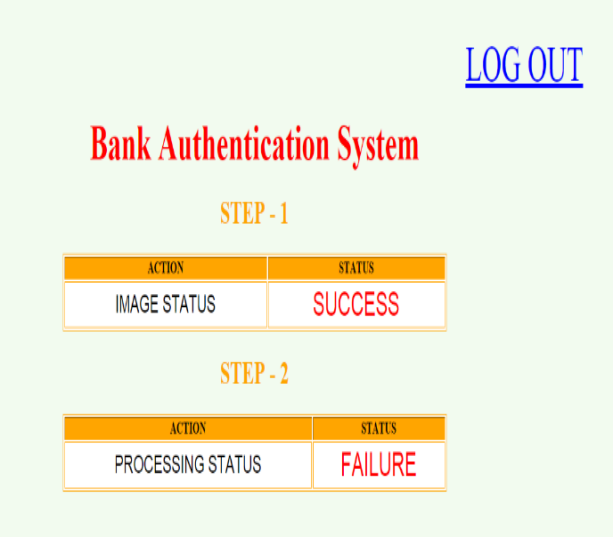

Figure – 6: Status of the Process

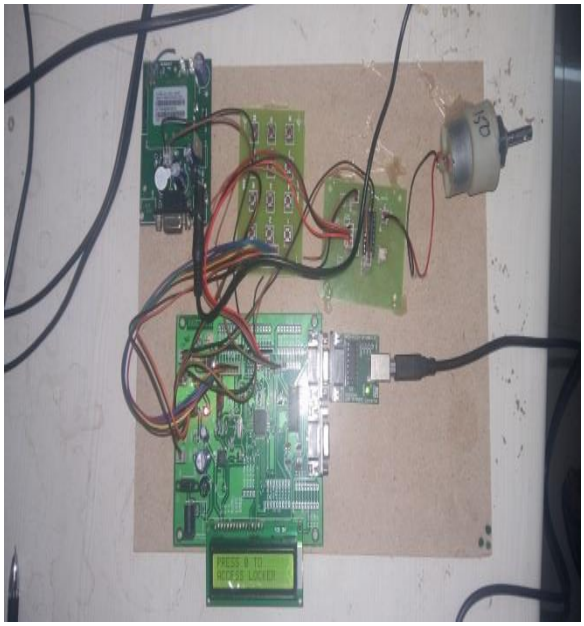

Figure – 7: Hardware Assembled for the system

Figure – 8: Asking to access the locker

Figure – 9: Signature collected from Smartphone

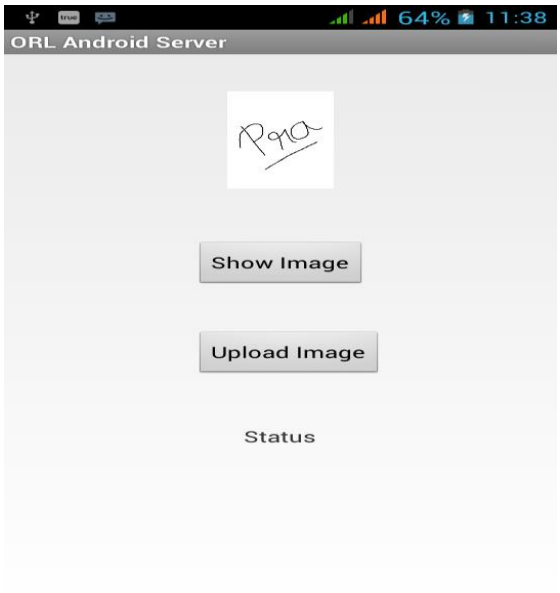

Figure – 10: Signature Stored

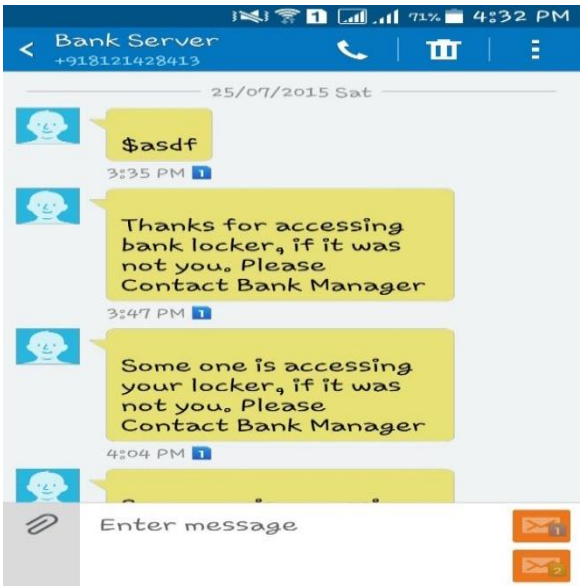

Figure – 11: SMS Feedback from the server

Conclusions

Here, in this paper a two-step authentication is designed 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. A simple, low cost, well secured system has been designed successfully.

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