

# Two Step Design for Personal Authentication Using Finger Vein Recognition and GSM Technology

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**Abstract**— This paper has proposed another methodology of constant implanted finger vein distinguishment alongside GSM innovation for individual validation and security is made. [1]Unique human attributes are utilized to distinguish an individual or to confirm a character. Finger vein recognizer, is utilized as a first level security for a confirmation process furthermore for showing or alarming unapproved individual if entered. The equipment is the procedure with the assistance of Finger vein recognizer and transformed utilizing MATLAB programming, which is modest and dependable in all the structures. GSM innovation is utilized as a second level security, where the client sends a Novel code to the GSM recipient which on distinguishment sends a secret key to the Client for opening. [2]The proposed framework takes just 0.5 seconds to confirm one info finger vein test and the normal mistake rate (ERR) of 0.06.

**Index Terms**— finger vein technology, GSM SIM 300 technology, Security, MATLAB, Personal authentication.

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## 1 INTRODUCTION

These days security assumes an imperative part in our surroundings, on the grounds that they are utilized as a part of different purposes, for example, for individual confirmation, managing an account and for all different purposes. Two essential outlines, for example, Finger vein distinguishment which is finished with the assistance of the MATLAB programming, where the examined pictures are preinstalled in the framework amid the security handle the finger is kept in the finger vein equipment and with the assistance of the USB cam and the IR sensor the picture is checked and checked with the preinstalled picture and GSM SIM 300 advancements has been utilized as a part of the framework for sending an OTP(one time password) to the particular client furthermore for cautioning the unapproved client by communicating something specific.[3]. This will bring protection everywhere throughout the world, so with the assistance of these strategies we propose a novel configuration for two level security framework for individual verification.

## 2 SYSTEM ARCHITECTURE

### 2.1 FINGER VEIN RECOGNITION

The finger-vein is a biometrics pattern for personal identification for security purposes. Vein patterns are the vast network of blood vessels underneath a person's skin. The finger-vein has the more advantage than the other systems. The vein is hidden inside the body and is mostly invisible to human eyes, so it is difficult to forge or steal. [5]The finger-vein pattern can only be taken from alive body.

Therefore, it is a natural and convincing proof that the subject whose finger-vein is successfully captured is a live. These workings are still in progress and they are a little bit not fancy. The quality of finger-vein images can be highly influenced by the imaging conditions; vein patterns can be distorted from the finger pressure in a conventional setup [6], [7]. They are unique for each and every one and are stable. Due to its uniqueness, stability, to criminal tampering, vein pattern recognition offers a more reliable solution for secure biometric authentication systems. Below we are going to discuss about structure of the finger vein pattern.

### 2.2 PROCESS

Finger vein recognition is explained with its components. In the first stage of security, the finger is kept in the finger vein system hardware and it is processed for authentication. The finger is kept on the sensor for processing the device, it consists of a USB camera, IR sensor, Power supply, cover for protecting the screen, after is it placed on the screen, the NIR sensor sends a signal to our fingers and with the help of the USB camera the images are captured and it is processed. The hardware is connected to a memory device which stores the original scanned finger vein images and when the person keeps the finger it will match with the stored images and display the result for in this case. Few images aren't clear while scanning, which is overcome by using the MATLAB process.

**2.3 BLOCK DIAGRAM**

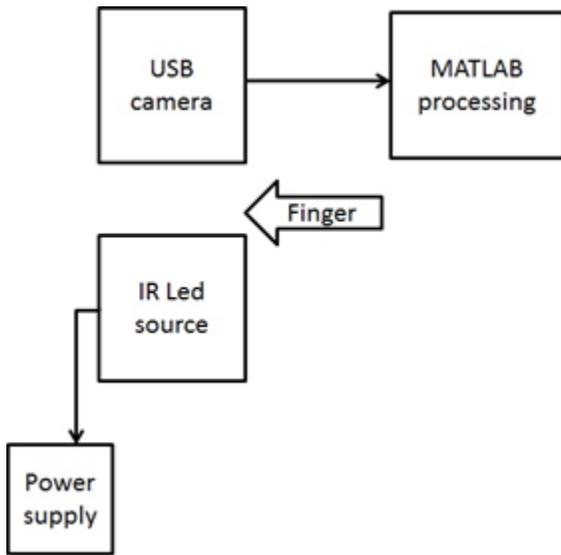


Fig 1.1 block diagram of working of Finger vein system linked with MATLAB process

**2.4 WORKING**

[1] Once our finger is kept on the sensor, the image is captured and it is sent for matching. The matching process is done with the help of the MATLAB process. Fig 1.2 tells us about the working of the MATLAB process where each and every block is explained in detail. The Structural image of the finger vein is shown below. First the image is acquired and then it is processed which is shown in Fig 1.3(a). In order to obtain a clean image the excessive and the lossy parts should be removed from the sampled image. First, the image is converted into a binarized image as shown in Fig 1.3(b) and the edge mapping is done. This is done in two steps. First, the edge detector which we are using here is SOBEL edge detector which is applied to the entire image(c), and the output edge map is removed from the binarized image. And then sampled image is compared with the saved image



Fig 1.3. (a) Acquired image sample. (b) Binarized image. (c) The subtracted edge mapping image (d) ROI mask from the Image in (e) ROI finger vein image. [1]

On the off chance that in case the picture is not clear or the picture is mutilated we need to take after an alternate strategy for transforming the picture. Initially an imprint is kept in the beginning of the picture and afterward the fact of the matter is augmented, bending in the picture or the lossy disengagement is acquired. This is then corrected and prepared as a solitary picture and afterward it is sent for the coordinating procedure.



Fig 1.4 (a) Acquired finger vein image. (b) ROI mask from (a). (c) ROI mask after refinement. [1]

The same process, for example, 1) Division 2) Improvement 3) Extraction 4) Coordinating with the database is completed in the above procedure once in the wake of discovering the disengaged district or the intruded on an area in the examined picture. It then matches with the preinstalled picture in the database and then it sends a data to the Microcontroller.

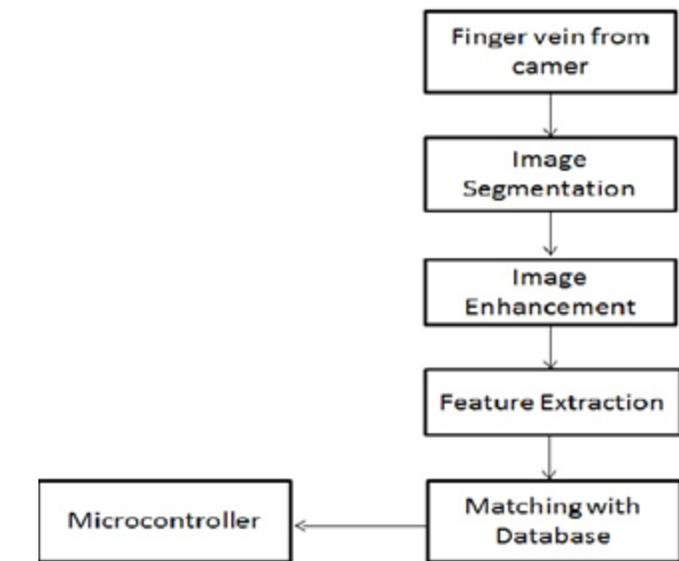


Fig 1.2 Block diagram of what's happening inside the MATLAB processing.

The principle work of the microcontroller, it gets the sign from the MATLAB processor and on the off chance that it is a "YES" then the Entryway is opened (we are considering an entryway in this clarification) on the off chance that it is a "NO" then it gives a ready that an unapproved individual is attempting to enter inside.

### 3 GSM SIM 300

Wrongdoing is heading consistently and it is vital to take essential measures on security. In present day innovation, we must utilize vital structures with simple establishment in evading manual work. Our task gives the best approach to ensure home, office and so on through GSM innovation by sending OTP (ONE TIME PASSWORD) to the separate client. In the present day development of remote correspondence, we thusly utilize this framework to upgrade the security that satisfies the need of advanced innovation. The utilization of GSM framework in security applications, controls the use of wired structures which gets to be more muddled and very problematic. In such case, this GSM model can enhance the productivity of the methodology considered, supposed security framework. It likewise improves as an alternative.

### 4 OUR WORK

The Fundamental idea of our undertaking is to give GSM based security by sending an interesting secret key through SMS the security framework which comprises of its own GSM module and perceives the watchword and itself checking it sending an OTP to the client. This GSM Modem can acknowledge any GSM system administrator SIM card and act much the same as a cellular telephone with its own extraordinary telephone number. The client on getting the OTP through SMS from the framework, sorts the relating OTP in the keypad, as data, which checks coordinating, lastly the secured framework under lock is opened. We therefore utilize GSM in light of the fact that it is shabby, simple and promptly accessible innovation. Further the framework itself comprises of GSM modem for sending and tolerating messages. ATMEL 89S52 microcontroller is utilized to control the framework. The LCD is utilized for presentation. A key cushion is utilized for entering the secret word. Here the individual who is approved has the general control. As said before, the person who has to open the corresponding security system has his own password which is preloaded in the end system. Now the person has his own password. He has to send the password as SMS to the system. Once the password is matched, the microcontroller operates the system and initiates the sending of OTP to the user. The user who had received OTP via SMS uses this to type as key on the keypad. The microcontroller checks the match. Depending on the response it decides to open or stay closed. Once the match is authorized the microcontroller itself switches the relay and turns it on. The relay works and opens the corresponding security system. The GSM system used makes the communication mechanism between user and system through SMS. Microcontroller is growing filed when the present day situation is considered. Embedded designs can also be installed easily. The project, explained above is also a good example of embedded system design. Significantly, we can develop the project using this embedded design and much easily. As we know the basics of embedded design is microcontroller. Microcontroller is a chip which consists of all support functions such as clock, reset, memory and I/O built inside the device. Also the basic block diagram of this system is given below.



Fig 2.1 shows the block diagram of the basic block diagram of the working of this method

SMS is defined as a SHORT MESSAGE SERVICE also defined as a text based service that enables us to use 160 characters for communication. It is also similar to email where the texts are stored and forwarded from a center that is normally associated for SMS. If the person is not available immediately for the process the message is stored and retrieved automatically. Unlike calls they cannot be excluded from the user if he is not available at a right time. The message is retrieved later, whenever the user is available. It is also one of the major advantages of Short Message Service.

### 5 TECHNOLOGY INSIDE

Microcontroller is the central core of the present day embedded system. Here we are using ATMEL 89S52. It has 6 clock cycles per period instead of 12. So the system speed can be increased further. Thus the communication can be increased by 115200kbps. The core of the circuit is ATMEL 89S52. It is a single chip 8-bit microcontroller. It has I/O ports of 8 bits. Timer event counters of 16 bits. It also consists of enhanced UART, oscillator, and timing circuits. It is also inbuilt with 4kb flash memory. It enhances the use of parallel programming, in-system and in-application programming. Further the controller consists of various ports. Port 0, 1, 2, 3. Each performing its own tasks. The pin associated with controller consists of RST input, i.e. reset that resets whenever the pin becomes high. ALE pin or address latch enable. It is also used as program pulse input during flash memory operation. If desired, the operation can be stopped by setting 0 of SFR location 8EH. PSEN is the Program Store Enable strobe to external program memory. Further the XTAL is the oscillator used. The next part in our project is IC MAX 232A. It's used for serial communication in the design. It also acts as a voltage converter. We all know that RS232 is not compatible with a microcontroller. So we need a voltage converter which converts Transistor Logic voltage levels that will be acceptable to the 89S51.

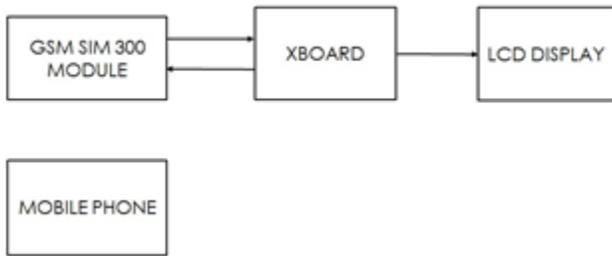


Fig 2.2 shows the basic block diagram of the working of the GSM SIM 300 module embedded with the XBOARD attached with the LCD display

Finally, it uses RS232 cables to send the data. The IC is a dual driver or dual receiver. It also has a capacitive voltage generator for supplying TIA/EIA 232F. The receiver converts those inputs to 5V TTL/CMOS. Each driver converts them back to TIA/EIA 232F. Further, this is the first IC which contains the set of the necessary drivers and receivers, each 2. It is also easy in adapting the RS 232 signals TTL logic. It also finds its way in simplifying or minimizing the circuitry. The introduction of MAX232, there is also the net level IC of same family i.e. MAX 232A. But MAX232A is just a driver and receiver. Further, it does not generate necessary RS232 signals or provide serial/parallel conversion. But it converts signal voltage levels. Extra circuits can be used to decode serial data and to generate serial data at the correct timing. The recent MAX233 can be used, the difference between the prior versions is that it has built in capacitor while the last version has to be attached with an external capacitor. It is used under fixed voltages for one device. But planned cabling can be used to avoid those distortions. It also loaded with protocol ability to send and receive to and from the attached device. We use TTL logic or CMOS, the prior step is connecting RS 232 port. Hence serial communication is enhanced mainly due to these couplings at particular voltage levels. GSM stands for Global System for Mobile communications. The modem used here is GSM modem. It is not similar to other conventional modems used. It also send or receive calls/SMS using Subscriber Identity Module (SIM), which is used as an identity. The system is connected to the RF antenna that transmits and receives data. The advantage of using this is it is digitally processed. It refers to Subscriber Identity Module. It stores the information of the operator and user and it also acts as a separate identity for each user. It allows the handset to stay connected to the particular network by constant connectivity through the information through the SIM.

## 6 WORKING OF THE SYSTEM

Finger vein innovation is utilized as a first level security framework and the GSM SIM 300 innovation is utilized as a second level security framework. Inevitably, the finger vein recognizer is appended to the entryway. On the off chance that a man needs to enter through the entryway, the individual ought to pass the individual security i.e. the finger vein perceiving innovation. The individual ought to keep his finger in the locator, which filters the picture and matches with the database introduce inside the framework. This methodology is completed utilizing MATLAB programming. The individual's tested picture is now nourished into

the database. To begin with, the filtered picture is binarized and the inordinate area and lossy territories are disposed off. The picture is further refined through the MATLAB process and the first district of investment is put away inside the database. At the point when the individual who needs to gets past the entryway must keep his finger on the identifier. The identifier is contained USB cam above and IR Drove underneath.

The picture of the finger once kept is examined and caught with the cam and the picture is send for further handling. After a few courses of action of picture division, and picture improvement the ideal picture without commotion is send to the database in pairs arrangement. The coordinating of the constant result is finished with the effectively put away information in the database. The coordinated is carried out by the microcontroller. When the outcome is sure, the microcontroller works the transfer and make access to gets past the entryway. Subsequently the client completes his first level security. The second level security is GSM innovation. Once the client goes into the room. He himself utilizes his cellular telephone to send a SMS to the end security framework which is as of now preloaded with the GSM module. The framework on getting the SMS checks for its uniqueness with the operation of the microcontroller. In the event that the coordinating is carried out the yield of the microcontroller is certain. When the outcome is certain the framework is made to produce the arbitrary one time secret key and make it answer to the client. The client on accepting the one time secret word by means of SMS needs to sort this as a key on the keypad. Once the framework created one time secret word is coordinated with the particular case that is being written, the microcontroller works the hand-off joined to it and opens the locker. Along these lines the two level verification makes high security and further improved security to enhance the framework wellbeing.

## 7.1 CONCLUSION

This paper has proposed another level of security frameworks for individual confirmation furthermore for different applications. With the assistance of the finger vein indicator, we can secure a steady, novel and a secured biometric framework with the assistance of the above segments the framework can be solid and transformed with no deviations. Despite the fact that the gadget is expensive it can transform consistently and the level of the security is high when contrasted and alternate techniques for biometric filtering. With respect to second level security is concerned, which is GSM SIM 300 innovation, it is a shabby and dependable framework which conveys between the client and the gadget continually with no obstruction. What's more the fundamental focal point of this framework is the novel arbitrary code which is produced by the gadget and sent to the client for confirmation which makes this framework profoundly securable. Although more work is to be transformed, our outcomes to the blend of the Finger vein innovation and the GSM SIM 300 innovation is guaranteed and it is a superior development in the field of security. This is particularly utilized as a part of the field of security frameworks and all different fields identified with it.

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