Finger Vein Based Secured Authentication System

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Abstract—*The advancement in technology has made possible improvements in identification systems. In the recent times systems based on biometric features are widely used for authentication purposes. Finger vein recognition is one biometrics feature that is based on images of human vein patterns beneath the skin surface. A system of finger vein based authentication implemented using ARM11 controller is presented in this paper. The proposed system is well suited for person identification and can be used in a number of applications.*

Keywords: Finger vein , Biometrics, Advanced RISC Machine(ARM)

I. INTRODUCTION

In earlier times the identification of a person is based on identity cards, passwords or personal identification number (PIN) [1][2]. With advancements in technology new techniques are employed to improve the accuracy of identification and reduce the error rate. The Biometric features are unique for every individual and any authentication system based on biometric features are expected to yield better results[3][4]. There are several biometric features like Finger prints, Face features, Iris properties, Hand geometry, Voice, Signature, etc. which can be conveniently used in authentication processes. Biometric authentication systems need to be cost efficient and easy to implement. Finger vein is a promising biometric pattern for personal identification in terms of its security and convenience [7-9]. Finger vein is a unique feature like iris and thumb. Vein features are different for even identical twins and because it is beneath the skin surface and invisible to human eyes it is difficult to forge or steal. The non invasive and contactless capture of finger veins ensures both convenience and hygiene for the user and is more acceptable. So Finger veins can be considered as the best when compared to other biometric features. The identification systems based on finger vein patterns can be integrated with ATMs(automatic teller machines) and other applications which require high security.

II. SYSTEM IMPLEMENTATION

The proposed Finger vein based secured authentication system consists of a device for vein pattern acquisition, ARM controller ,Memory, display unit as shown in figure1.The finger vein pattern is captured using CMOS Camera under NIR light source of wavelength 850 nanometer . Usually, vein images can be captured based on Light transmission or Light reflection. In case of light reflection NIR source and CMOS camera are placed on the same side of the finger, reflected light from the surface of the finger is being captured by camera[5]. To get a better image Light transmission method will be employed. In this finger is placed in between NIR light and CMOS camera, the NIR light passes through the tissues of the finger and is blocked by hemoglobin which causes the veins to appear as dark shadow lines in the captured image.

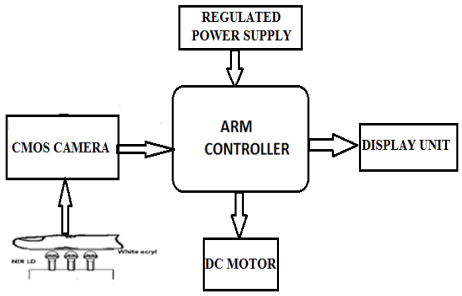

Fig 1: Arrangement of proposed system

The captured image is given to ARM controller for processing. The finger vein image captured by the device is a 24-bit color image . In order to reduce the computational complexity, the original image is to be transformed into an 8-bit gray image based on the RGB to Grayscale Equation:

$$Y=R*0.299+G*0.587B*0.114 \text{ [10]}$$

where R, G and B denote the decimal values of the red, green and blue color components As the acquired finger vein image has an unwanted black background which may interfere with the recognition process, edge detection method is to be used to segment the finger vein region,

which is defined as the Region of Interest (ROI), from the grayscale image. The size of the ROI is different from image to image due to personal factors such as different finger size and changing location. Therefore it is necessary to normalize the ROI region to the same size before feature extraction. In order to extract efficient features, gray normalization is to be done to obtain a uniform gray distribution. Then the Histogram Equalization is to be applied to improve contrast in an image , in order to stretch out the intensity range[6]. Image gray processing, ROI extraction, size normalization, gray normalization, histogram equalization takes place in ARM controller. After processing the image template is stored in database. The given test image also is processed in the above manner and then compared with the templates stored in data base. Then any matching is displayed on display unit. If no image matches then no match will be displayed. The proposed scheme can be used for various applications wherever correct person identification is necessary. The present scheme is tested for proper operation.. For testing data base taken from literature [11]and a DC motor is used in place of door. The clock wise rotation of motor corresponds to locking of door and anticlockwise rotation is treated as unlocking of door. The test results are reported.

III. RESULTS

The result obtained are given in figure2 below. When test image matches with one in base the motor runs in anti-clockwise direction opening door. When no match is found the same is displayed and motor do not rotated and door is kept closed.

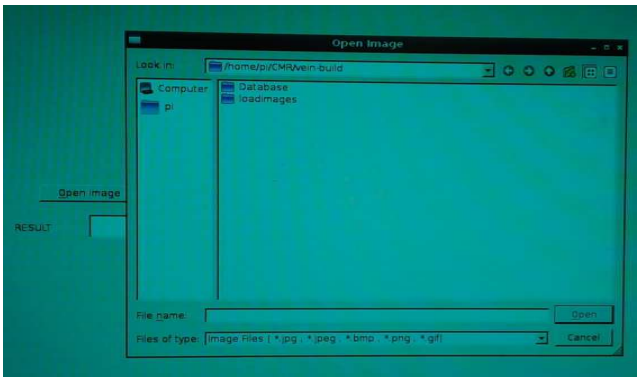

Fig 2 Input image windo

When the test image is given that is verified with the database and if it is not matched then the result displayed in the windoe as match is not found.

Here the test image is taken from a set of test image templates.

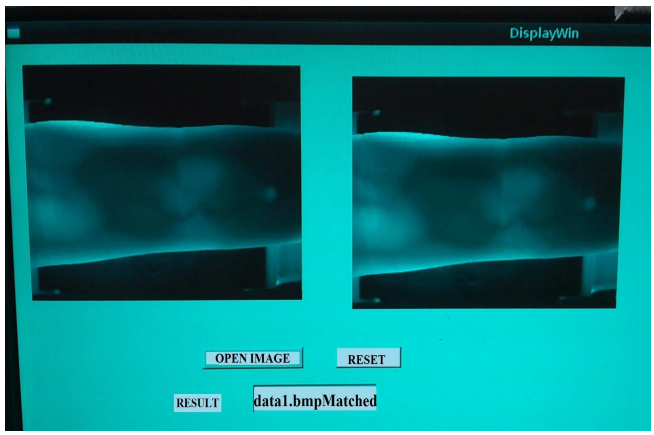

Fig 2a: Result displaying window

2a.1. When the match is found:

When the test image is given that is verified with the database and if it is matched then the result is displayed in the window as matched.

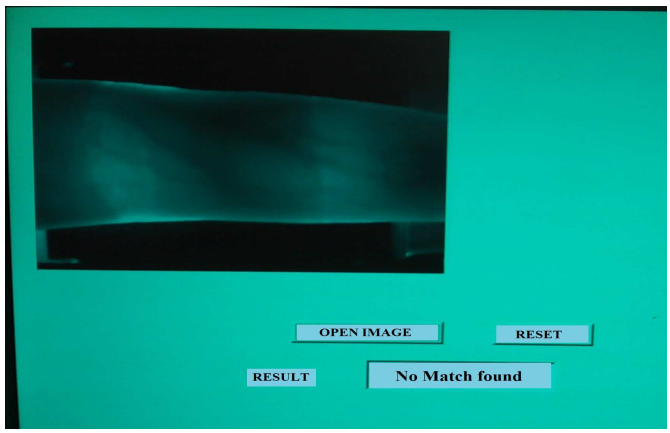

Fig 2a.2 When the match is not found

IV. CONCLUSION

In this paper, a finger vein based biometric authentication system is developed and tested. The authentication system is suitable for number of applications.

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