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Implementation of a New Born Child Authentication System Using Image Processing

Mr. Akash Ulhas Nandurkar¹, Prof. Z. I. Khan²

¹ M.E 2nd Year (Computer Sci. and Engg.) ² M.E (Computer Sci. and Engg.) D.R.G.I.T & Research Amravati

Abstract: *The Missing, swapping, mixing, and illegal adoption of new born child is a global challenge and research done to solve this issue is minimal and least reported in the literature. As per our knowledge, there is no biometric system currently available that can be effectively used for new born child identification. The manual procedure of capturing inked footprints in practice for this purpose is limited for use inside hospitals and is not an effective solution for identification purposes. Hence, a new born child personal authentication system is proposed for this issue based on multi biometrics. The biometric traits considered are the footprint of the new born child and the fingerprint of the mother. An appropriate fusion scheme is implemented to overcome the drawbacks of a single modality. The experimental results are promising and prove to be an effective system.*

Keywords: Newborn, Footprint, Fingerprint, Biometric etc.

I. INTRODUCTION

The newborn swapping and child abduction are challenging issues. Traditional methods of identification of such child have some drawbacks. Such as, method of practice is to tie a number band around the hands/legs of the newborn as a measure of identity. This number band is same as the one which is also tied to the mother of the infant. At the time child kidnapping or abduction, mixing of babies, multiple claims for an infant in any hospitals, birthing centers causes emotional breakdown and confusion. This raises a question on the effectiveness of the such offline methods and the method of tying number bands (ID bands). This eventually leads to the DNA test at times. Hence, biometrics can be used to solve such identity issues. In the online system, by a digital source and computers are used for processing and storage. The newborn's footprint images captured using a high resolution camera. The fingerprint of the newborn's mother acquired by a fingerprint scanner. wherein footprint of newborn and finger print of their mother is used for recognition. Biometric system is a pattern-recognition system recognizes a person based on feature vector derived from a specific biological characteristics such as Physiological biometric identifiers include fingerprints, hand geometry, ear patterns, eye patterns (iris and retina), facial features, and other physical characteristics. Behavioral identifiers include voice, signature, key stroke, and others. The Present method of footprint, fingerprint acquisition in hospitals is inked footprint of the newborn along with the fingerprint of the mother. This is stored in a file which forms the medical database. This method of image acquisition is offline. The image acquisition done in the primary health centre. Further, implementation of bimodal authentication in hardware as embedded system enhances the overall performance of the system as a standalone device. A complex IC that integrates the major functional elements such as programmable processor, on-chip memory, accelerating function hardware e.g.: GPU, both hardware and software, analog components into a single chip or chipset is called system on chip (SoC). Thus, reduce overall system cost, increase performance, lower power consumption and reduce size and draws low power.

II. LITERATURE REVIEW

Weicheng shen, Marc surette and Rajiv khanna works on the problems in identity of an individual. The technology used is automated biometric based identification. Method is classifying automated biometrics-based systems into two major categories: one-to-one systems and one-to-many systems. A one-to-one system compares the biometric information presented by an individual, these systems are designed to detect the identity of an individual when it is unknown or it is provided. One-to-many system compares the biometrics information presented by an individual with all the biometric information stored in a data base and decides whether a match can be declared. These systems typically contain a series of complex technologies that work together to provide the desired result.[1] Oscar Coltell, JosC M. Badia and Guillermo Torres comes with the solution for problem that biometric authentication system have low result regarding computational and economic cost. Hence, suggested a first prototype of a software system to elicitate sets of 20 password stroke samples, named attacks, with a population of 10 different users totaling 200 attacks. The results obtained demonstrate that users follow generally certain patterns when they are writing their password, and are possible to reinforce the user's password authentication method by means of the analysis of user stroking patterns. This is very cost effective and need

not require expensive device. In addition to, it is necessary to increase the population size and number of samples to establish standard and reliable rules. Finally, it is very difficult to find a general user pattern applied to every password and when password are letters and number without specific mean method is less effective.[2] In this paper author implement a multimodal biometric identification system based on the features of the human hand, Because single physical behavior characteristics can fail in identification. They describe a new biometric approach to personal identification using Eigen finger and Eigen palm features, with fusion applied at the matching-score level.

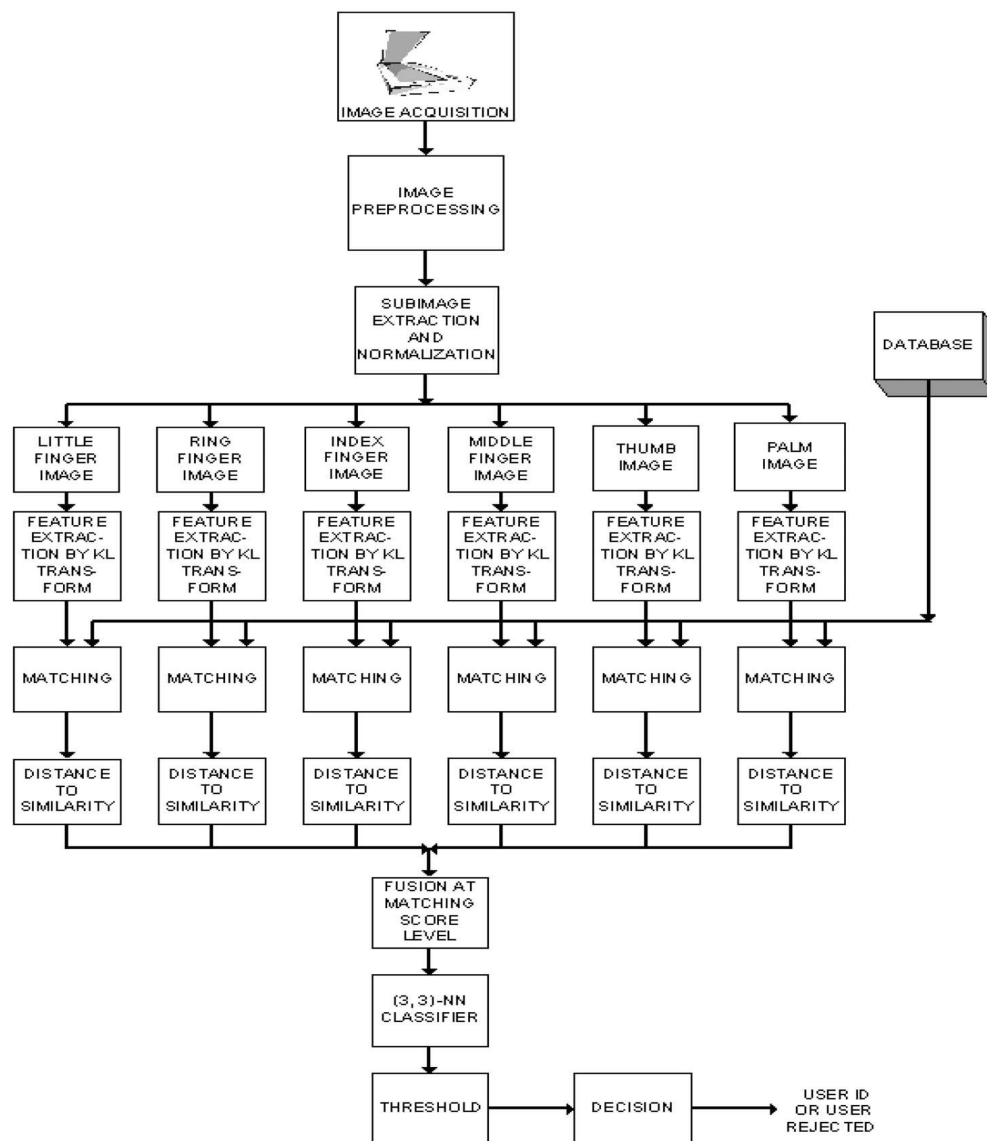


Figure1. Block diagram of implemented system

The identification process can be divided into the following phases: capturing the image, preprocessing, extracting and normalizing the palm and strip-like finger sub images, extracting the Eigen palm and Eigen finger features based on the K-L transform, matching and fusion and finally, a decision based on the (k, l)-NN classifier and thresholding. The system achieves better result in terms of total error rate. The time required for system is 0.565 sec.[3] S.Sivaranjani and S.Sumathi implemented a system for newborn swapping in which, required images are acquired for recognition consists of 6 samples of same newborn footprint and corresponding 6 samples of their mothers fingerprint. Then the collected samples undergoes 5 main steps namely (1) Image Acquisition (2) Image enhancement (3) Binarization (4) Thinning (5) Feature Extraction.



Figure 2. Thinning of fingerprint

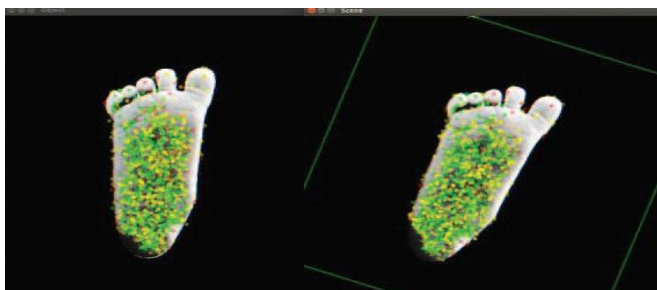


Figure 3. equalize image of footprint

The extracted features in the form of template are stored in database. When the input image is given to their system it undergoes all the pre-processing stage followed by pattern matching stage finally and uses SIFT, GUO, Hall's and RANSAC algorithm. A decision is made based on match score if the given input is authenticated or not. It is a low cost solution for child swapping.[7] Mr. Ashish R. Dandekar and Prof. M. S. Nimbarde implemented system in which there are many social networking web sites used by people and number of photos is uploaded by them. But from photos it is difficult to predict the relationship among the people if necessary. So there is need of system for automatic identification and prediction of relationship among them, specifically kinship from photo. So, they implemented system, which uses Computer Vision, Face recognition, Feature extraction and classification to solve this problem. Implemented system first detects all the features from given photo then extracts them from the faces using Local binary Pattern.

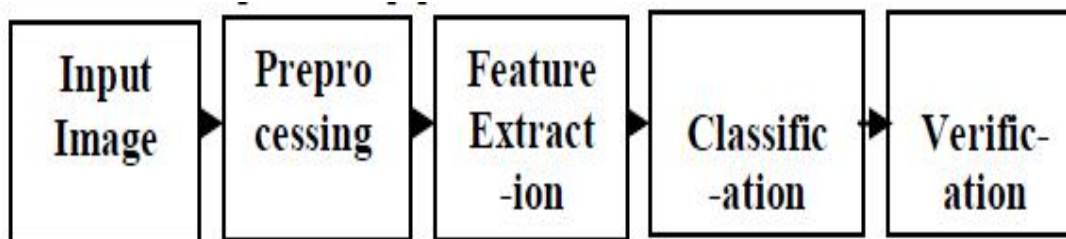


Figure 4. Block diagram of verification

They observe in experiment that LBP features perform stably and robustly over a useful range of less resolutions of facial images. They implemented an algorithm to predict the most likely kin relationships embedded in an image from three input images of child, mother and father. Experimental results have shown their system can effectively annotate the verification of family relation. time required for system is 12.499sec.[8] In this paper author investigates a novel method in order to extract the optimal discriminant features from FKP images. This method use the 1D-Log Gabor filter, the Gabor filter bank and the Linear Discriminant Analysis (LDA). In the first step, the Region of Interest (ROI) of a FKP images is analysis with a 1D Log-Gabor wavelet to extract the preliminary feature which is presented by the real parts of the filtered image. In the second step, a Gabor filter bank is applied on the preliminary feature in order to selection only the discriminative features of FKP image. Finally, in the third step, the LDA technique is used to reduce the dimensionality of this feature and enhance its discriminatory power.

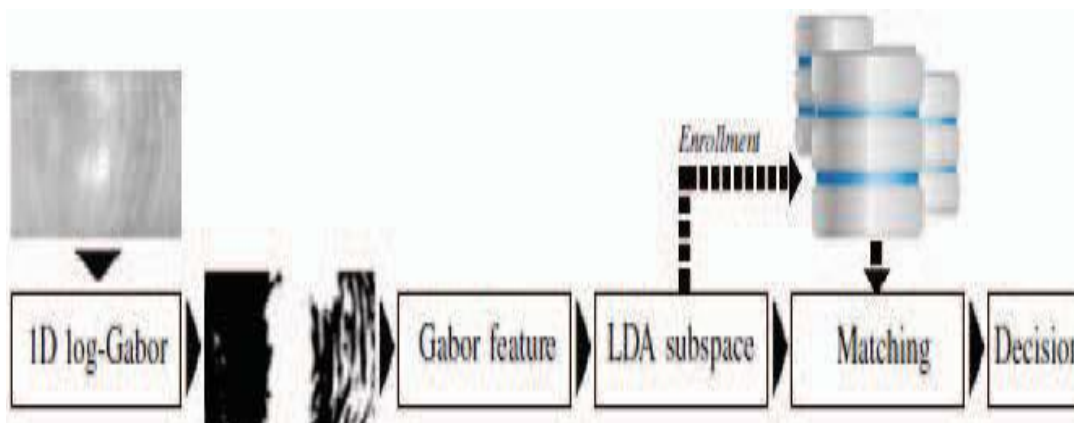


Figure 5. Block diagram of proposed system

Their biometric system is based on Nearest Neighbor classifier which uses the cosine Mahalanobis distance for the matching process. the method achieves higher accuracy but single finger types yield not give better result compare to multiple finger.

III. ANALYSIS OF PROBLEM

Children's may get kidnapped or abduction, sometimes mixing of babies leads to multiple claims for an infant in any hospitals, maternity center's causes emotional breakdown and confusion. This raises a question on the effectiveness of the present recognition method on the basis of existing technologies.

Here a newborn personal biometric authentication system is proposed to solve such identity issues in effective manner with less time and maximum accuracy.

IV. OBJECTIVES

In developing countries the new-born swapping and abduction in hospitals are challenging issue and occurs all over the world. Traditional methods to recognise the same baby have their own drawbacks.

Providing the solution to the above said challenge, suggests that how a low cost ambient new born authentication system based on biometric traits of the Infant mothers fingerprint which can easily recognize & identify the swapped baby belonging to own mother.

New-born personal authentication system is proposed for this issue. The biometric traits considered are the footprint of the new-born and the fingerprint of the mother

A. Proposed Work

Now we adopt a more rigorous approach which involves the multi-biometric system to be exploited fully to render a decision over the new-born identity claim. An effective fusion scheme is implemented to fuse the information available from the multi-biometric sources and optimally give the final decision. The block diagram of the proposed system is shown in figure 6.

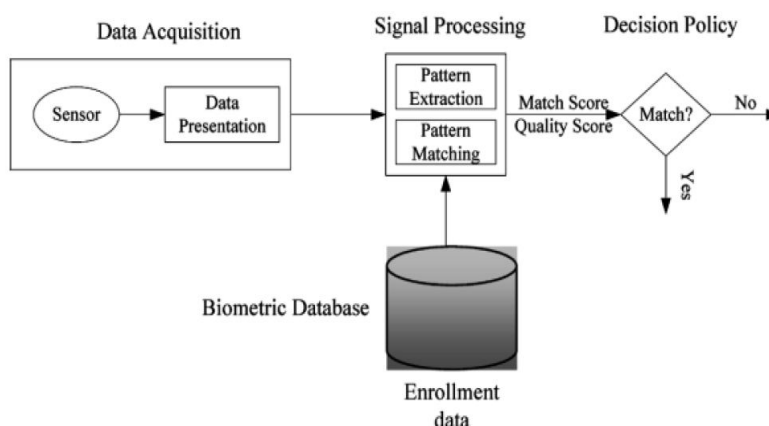


Figure 6. Proposed system

V. SYSTEM DESIGN

A. Footprint database

There are no available new born footprint databases in the web. Hence, our own new born footprint database is created. The new born's footprint images are captured using a digital SLR (DSLR) camera, Since there is no available new born footprint database, the images must be captured in real time. The image capturing work was done in the Primary Health Center (PHC), , which is one of the Government run hospitals. After getting the legal permission from the health services officials, the images were captured. When capturing images, two persons are needed. One person is the author of the paper whose task is to pacify and hold the foot of the new born and the other person is a well-qualified professional photographer to take pictures of the new born foot.

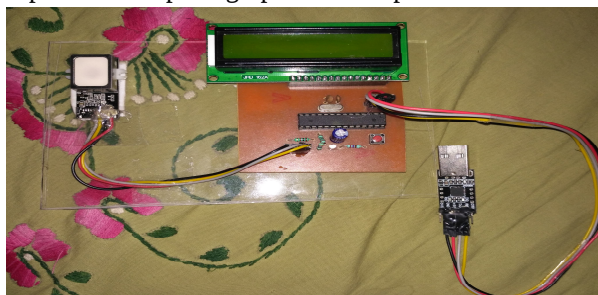


figure 7. Fingerprint Scanning devise with LED display

A black cloth was wrapped around the ankle to facilitate image segmentation. All the images were collected in one session during the first 2 days following birth. After we explained some knowledge about the importance and significance about New born biometrics to new born parents, they consented that we can capture footprint images once. In image acquisition stage, a crucial problem is to select an opportune time to capture images. If a new born is hungry, crying or suffering from any minor illness, he/she will ceaselessly move his/her hands, feet, and whole body. In this time, it is difficult to hold and capture footprint images with desirable quality. On the contrary, if a new born is calm or sleeping, the task of image capturing will become easy. In this paper, all images were captured when new born were calm or sleeping. The sample footprint database is shown in figure 8.



Figure 8. Footprint database

B. Fingerprint Database

The fingerprint of the new born mother is also collected by means of a fingerprint scanner. The fingerprint scanner used is digital Persona U. are U.4500 Reader, USB fingerprint reader as shown in figure 4. The images were captured simultaneously from the infant and the mother.

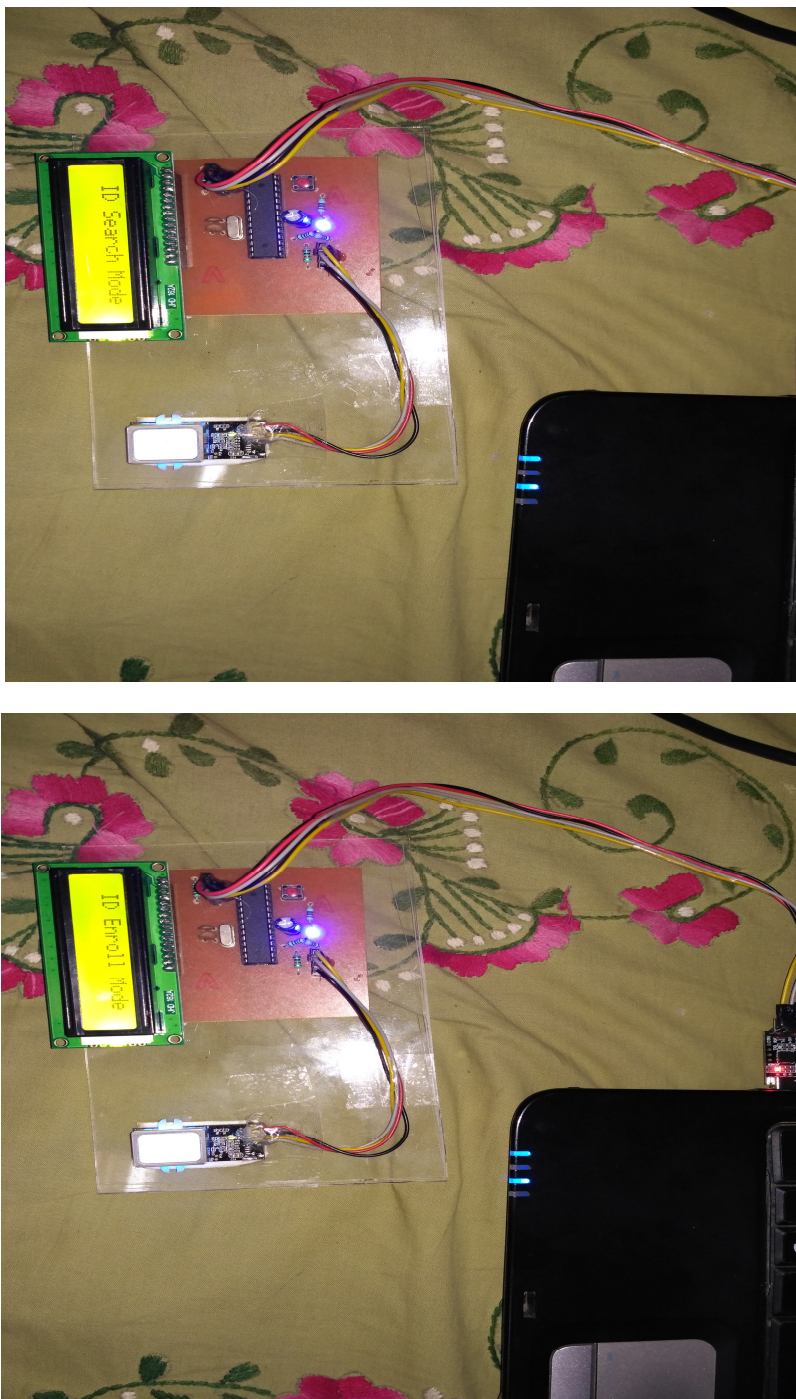
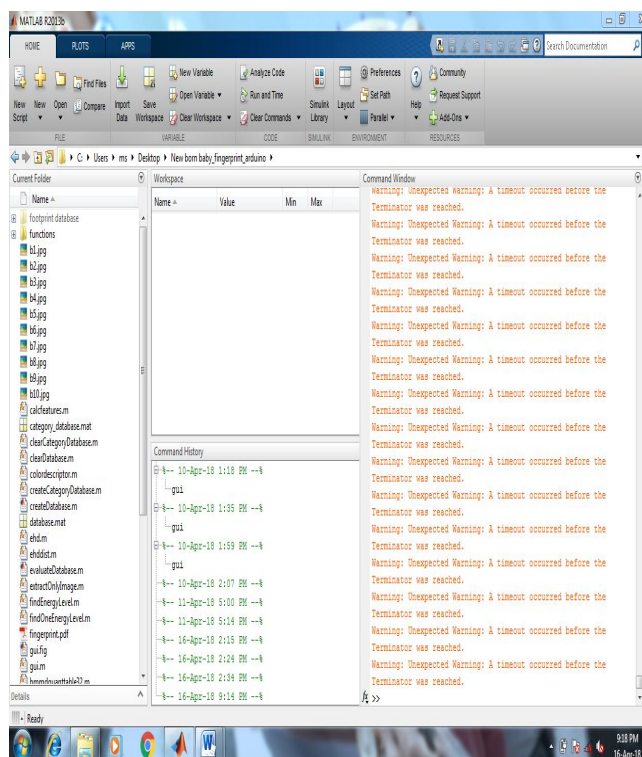


Figure 9. Two modes of device.

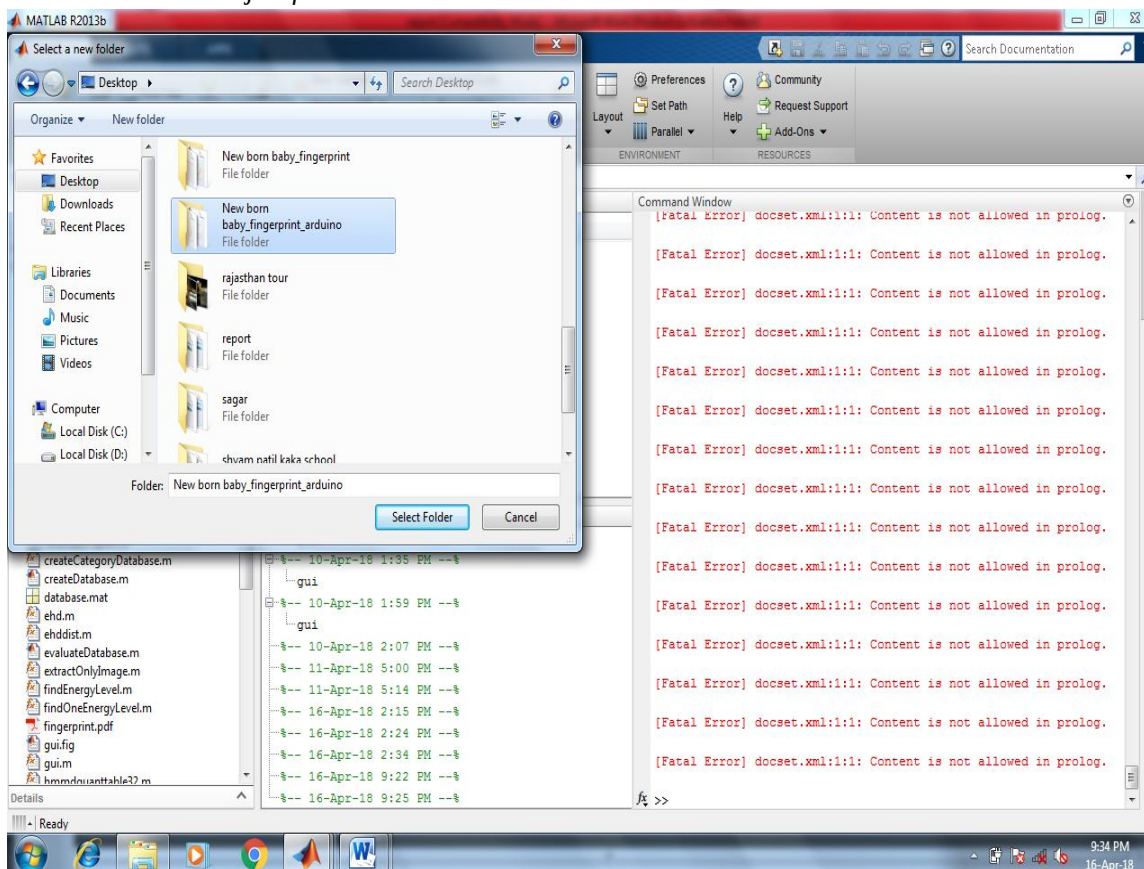
The database consists of 10 new born-mother biometric images and from each new born and his/her mother 1 footprint and 1 fingerprint images were collected respectively. Hence, the database consists of 20 (10+10) images which are stored together with the name of the mother and birth details like date and time of birth.

VI. IMPLEMENTATION

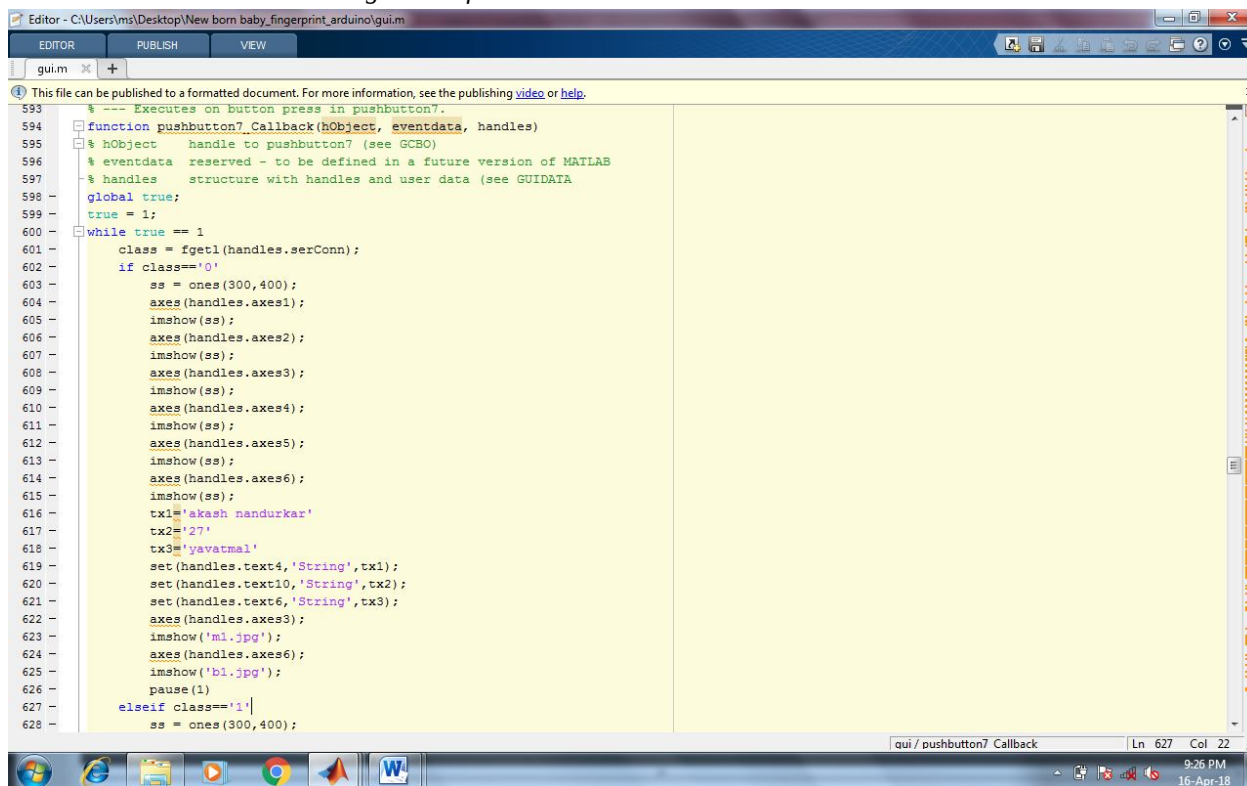
A. Open Matlab 2013b.



B. Select Folder Where Your Project file has Been Located.



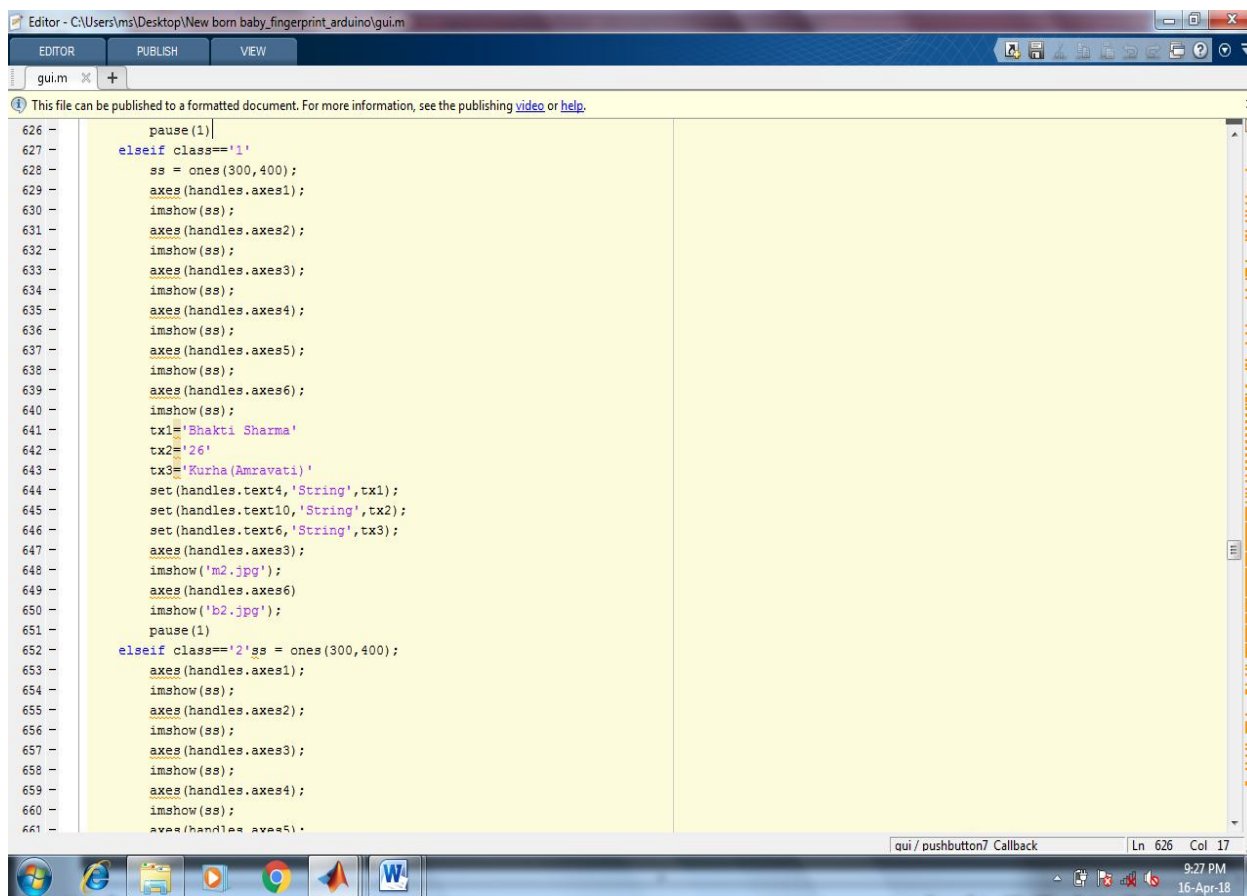
C. Write a code Into Matlab For Adding User Information.



```

593 % --- Executes on button press in pushbutton7.
594 function pushbutton7_Callback(hObject, eventdata, handles)
595 % hObject handle to pushbutton7 (see GCBO)
596 % eventdata reserved - to be defined in a future version of MATLAB
597 % handles structure with handles and user data (see GUIDATA)
598 global true;
599 true = 1;
600 while true == 1
601     class = fgetl(handles.serConn);
602     if class=='0'
603         ss = ones(300,400);
604         axes(handles.axes1);
605         imshow(ss);
606         axes(handles.axes2);
607         imshow(ss);
608         axes(handles.axes3);
609         imshow(ss);
610         axes(handles.axes4);
611         imshow(ss);
612         axes(handles.axes5);
613         imshow(ss);
614         axes(handles.axes6);
615         imshow(ss);
616         tx1='akash nandurkar';
617         tx2='27'
618         tx3='yavatmal'
619         set(handles.text4,'String',tx1);
620         set(handles.text10,'String',tx2);
621         set(handles.text6,'String',tx3);
622         axes(handles.axes3);
623         imshow('m1.jpg');
624         axes(handles.axes6);
625         imshow('b1.jpg');
626         pause(1)
627     elseif class=='1'
628         ss = ones(300,400);

```

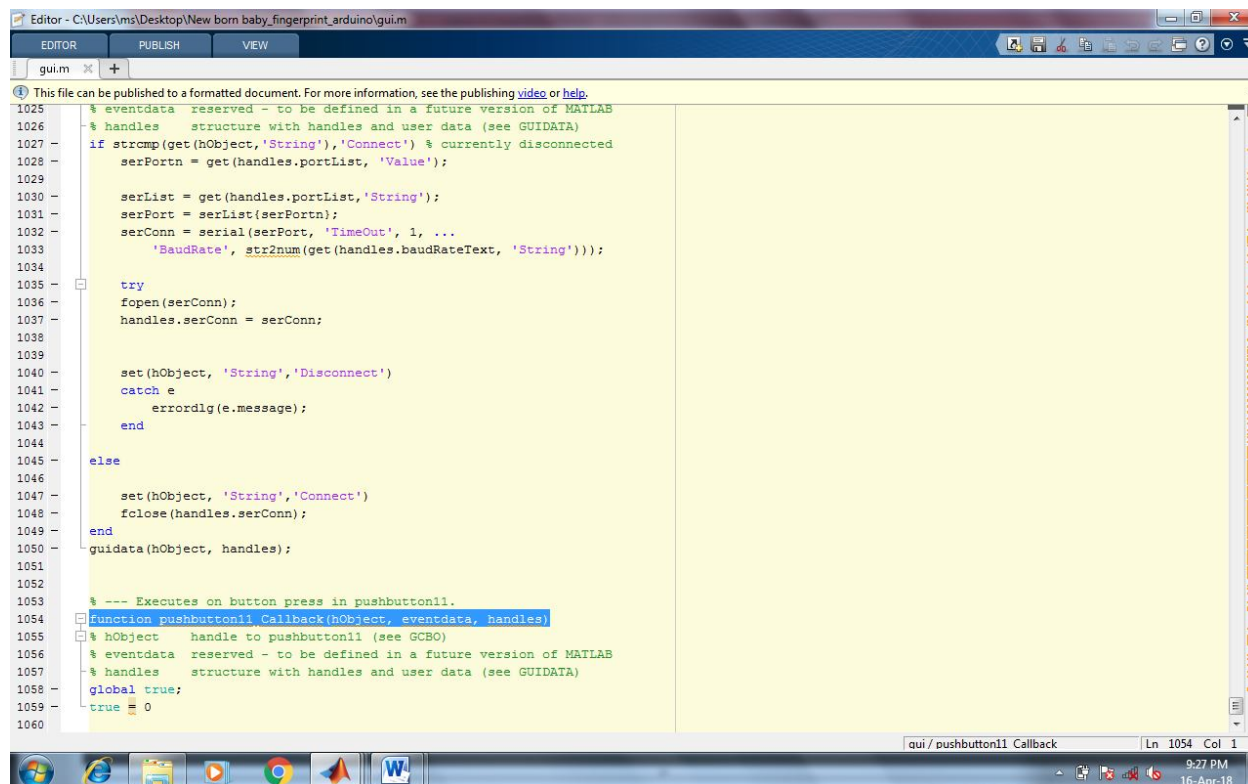


```

626         pause(1)
627     elseif class=='1'
628         ss = ones(300,400);
629         axes(handles.axes1);
630         imshow(ss);
631         axes(handles.axes2);
632         imshow(ss);
633         axes(handles.axes3);
634         imshow(ss);
635         axes(handles.axes4);
636         imshow(ss);
637         axes(handles.axes5);
638         imshow(ss);
639         axes(handles.axes6);
640         imshow(ss);
641         tx1='Bhakti Sharma';
642         tx2='26'
643         tx3='Kurha (Amravati)'
644         set(handles.text4,'String',tx1);
645         set(handles.text10,'String',tx2);
646         set(handles.text6,'String',tx3);
647         axes(handles.axes3);
648         imshow('m2.jpg');
649         axes(handles.axes6);
650         imshow('b2.jpg');
651         pause(1)
652     elseif class=='2'
653         ss = ones(300,400);
654         axes(handles.axes1);
655         imshow(ss);
656         axes(handles.axes2);
657         imshow(ss);
658         axes(handles.axes3);
659         imshow(ss);
660         axes(handles.axes4);
661         imshow(ss);
662         axes(handles.axes5);

```

D. To close Established Connection

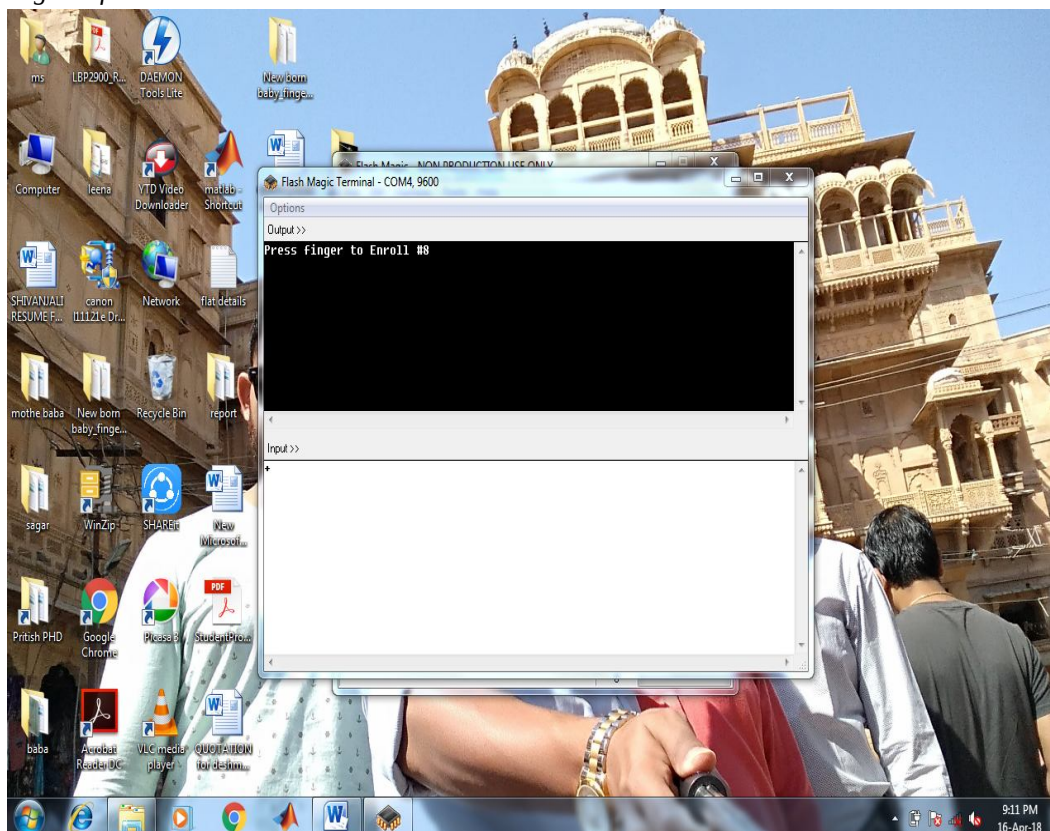


```

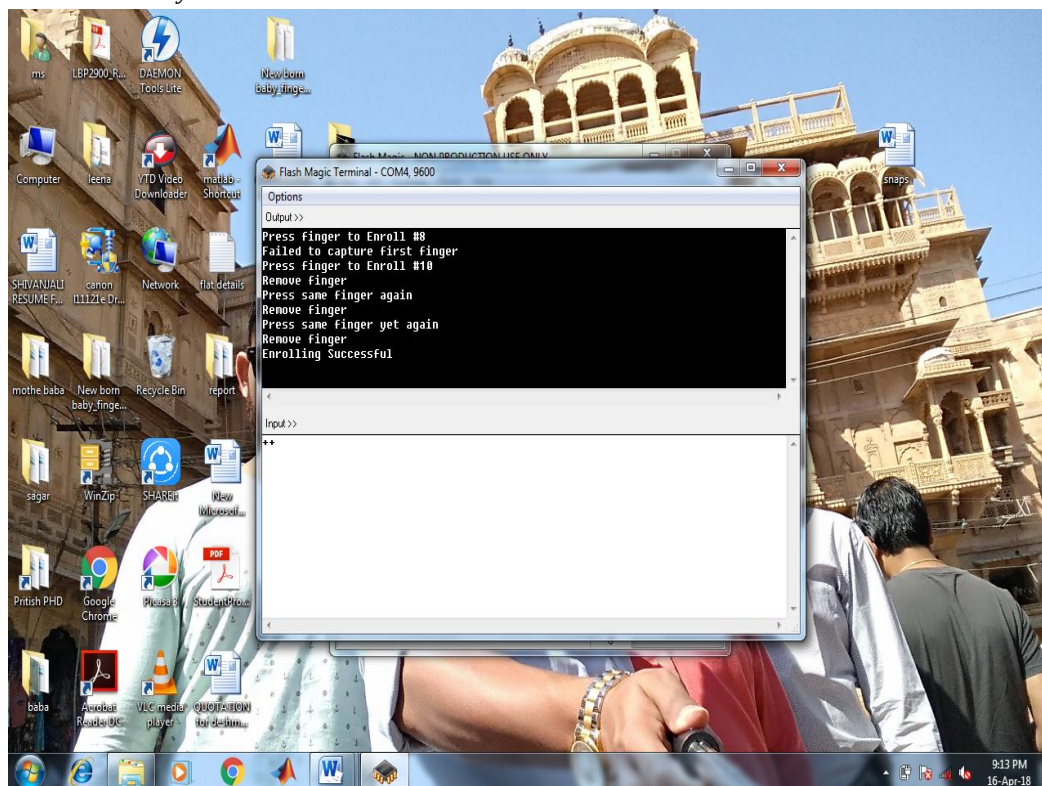
1025 % eventdata reserved - to be defined in a future version of MATLAB
1026 % handles structure with handles and user data (see GUIDATA)
1027 if strcmp(get(hObject,'String'),'Connect') % currently disconnected
1028     serPortn = get(handles.portList, 'Value');
1029
1030     serList = get(handles.portList, 'String');
1031     serPort = serList(serPortn);
1032     serConn = serial(serPort, 'TimeOut', 1, ...
1033         'BaudRate', str2num(get(handles.baudRateText, 'String')));
1034
1035     try
1036         fopen(serConn);
1037         handles.serConn = serConn;
1038
1039
1040     set(hObject, 'String', 'Disconnect')
1041     catch e
1042         errordlg(e.message);
1043     end
1044
1045 else
1046
1047     set(hObject, 'String', 'Connect')
1048     fclose(handles.serConn);
1049 end
1050 guidata(hObject, handles);
1051
1052
1053 % --- Executes on button press in pushbutton1.
1054 function pushbutton1_Callback(hObject, eventdata, handles)
1055 % hObject handle to pushbutton1 (see GCBO)
1056 % eventdata reserved - to be defined in a future version of MATLAB
1057 % handles structure with handles and user data (see GUIDATA)
1058 global true;
1059 true = 0;
1060
  
```

VII. RESULT ANALYSIS

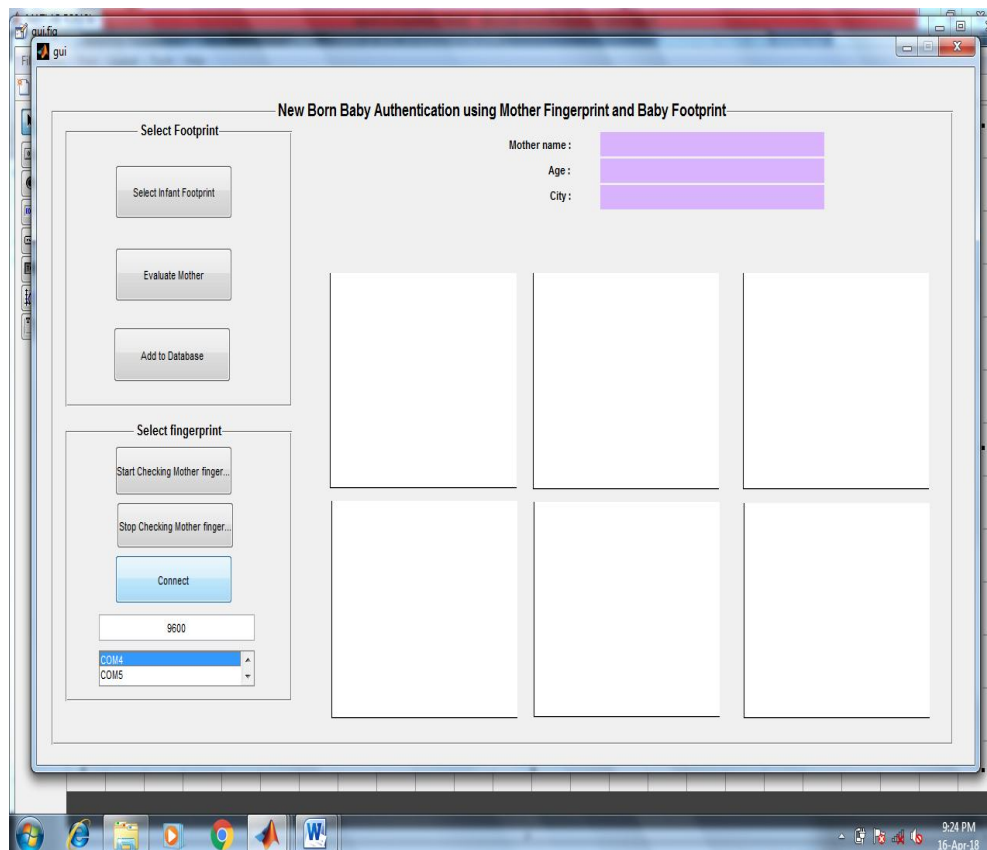
A. Open flash Magic Software



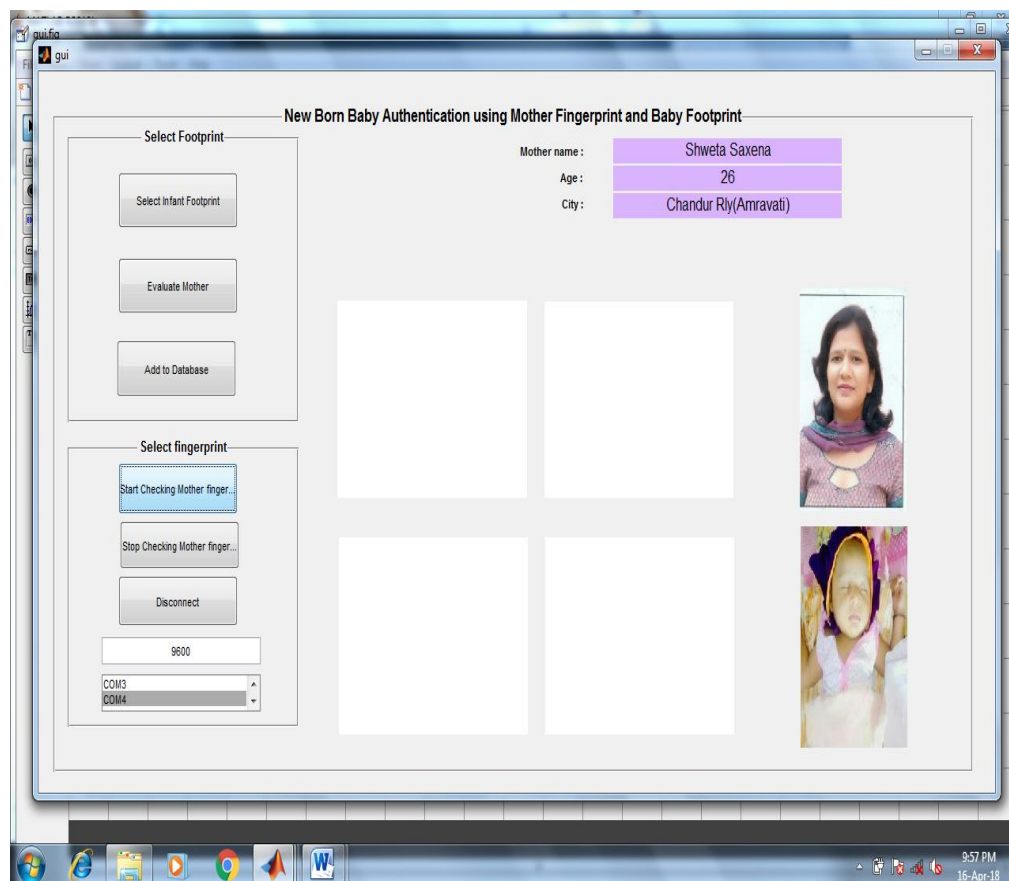
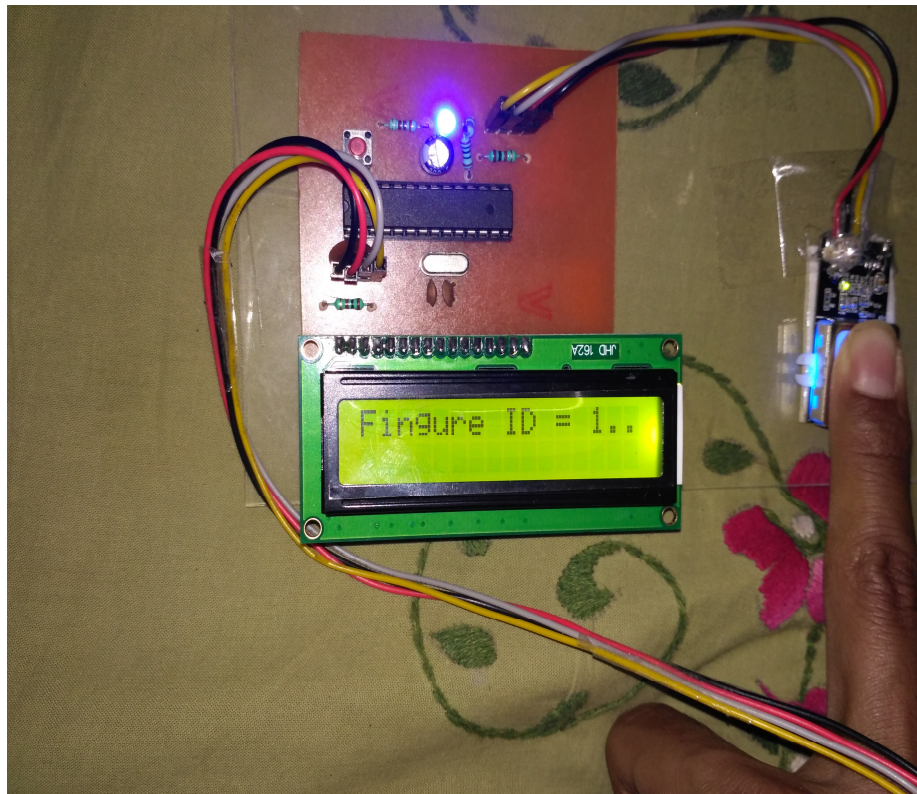
B. Enroll A Candidate To The System



C. Run program and Connect Device with Com4 Por.



D. When you want investigate a case only take a fingerprint of mother.



VIII. ADVANTAGES

A. *Easy To Operate*

We implemented a system which is easy to use that means it can be handle by anyone who has not knowledge about a system. Because it simply capture a picture and load onto system apply algorithm on it.

B. *Easy To Handle By Non-Expertise*

It can be handle by anyone because it does not require any prior knowledge to use this software system its just like capture, feed and process.

C. *Cost Will Be Less As Compared To The Hardware System*

We know that hardware system always more costly as compared to software system that's why our project will be ultimately reduced.

D. *Just Capture A Picture And Store Whenever You Want*

In this system we have to just capture a image by smartphone or HD camera and store in a system or a platform like laptop etc.

E. *No Need To Wait Long Time For A Result It's A Quick Process*

After applying feed forward back propagation algorithm it doesn't require more time for a result whole image is scanned division of image takes place after that whole image is converted into binary form and testing, matching and training applied on it. In this way it gives a quick result.

F. *Also Use Smartphone To Capture A Picture Which Is Having High Definition Camera*

in our system we have to capture a HD image no matter by which device it can be a smartphone it can be a tablet or it can be a HD camera because we only need high definition image for better result in our system when fingerprints and footprints are clear then only division and matching process will be processed with good result.

G. *No Need Wait For Dna Test*

In past years, such a condition occurs sometimes at that time mother has to wait till DNA reports but now need to wait cz it gives quick result.

IX. LIMITATION

A. *The Newborn Swapping And Child Abduction Are Challenging Issues So If Baby Is Kidnapped Then Other Security Application Will Help*

This system has limitation that we can't use spy camera here so in case of baby's kidnapping our system is not helpful for that reason we can use spy camera over baby's

B. *Hardware Have Accuracy Is More Than Software*

Hardware system is more accurate in scanning fingerprint but it is tedious to operate and it is time consuming process also to store data about scanning and identify which baby belongs to which mother we have simple motive that if baby is misplaced then within a minute baby has been identified with his mother name and picture.

C. *Scalability*

Biometrics systems can be quite flexible and easily scalable. You can use higher versions of sensors and security systems based on your requirements. At the lowest level you can use characteristics that are not very discriminative however if you are looking for a higher level of security for large scale databases then you can use systems with more discriminable features, or to increase identification accuracy.

D. *Software Require More Than Hardware*

It require less time than software system because it has stored with a actual data so it can process fast with hardware system than software system.

E. Accountability

Biometric log-ins mean a person can be directly connected to a particular action or an event. In other words, biometrics creates a clear, definable audit trail of transactions or activities. This is especially handy in case of security breaches because you know exactly who is responsible for it. As a result you get true and complete accountability, which cannot be duplicated.

X. CONCLUSION

To avoid the problems facing during matching of kids and mother after the newborn swapping and child abduction Biometric identification techniques is a great tool. While discussing of all the available biometric authentication systems, technique of matching of fingerprint and footprint of mother and infant is very effective because it is low cost solution to the newborn swapping. The use of various algorithms such as SIFT, Fingerprint enhancing algorithm, GUO, Hall's algorithm and RANSAC & implementation on raspberry pi enhances the overall performance to shoot out the problem.

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