

EMPLOYMENT OF FOOTPRINT RECOGNITION SYSTEM

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Abstract

A wide range of applications for Foot Print Recognition System is discussed in this paper. The whole concept works under the principle that foot print is a parameter associated with biometrics that is very common as well as distinct. Its foremost application is at the government hospitals in the under developed and third world nations where there aren't the best of facilities. This system can be applied in the maternity ward of the hospitals for the identification or differentiation of the infants. Till date there has been no specialized system adopted for this purpose. The Foot Print Recognition System will overcome all the defects of any biometrics when applied here. Since the child will be very delicate for an iris scan and it will not be able to open its eyes wide or to correctly place its finger print on the sensor since the hands of a new born infant will be closed for a while. The Foot Print Recognition system can also be implemented in temples where there are cases of theft often reported. This can be used to grant access to the karpagraham of the deity by authorized users alone. These 2 applications of FPRS are discussed in this paper.

Keywords: Footprint; Temple; infant; Maternity Ward; Information Security.

1. Introduction

With the rapid growth in population around the world there is a need for more and more unique identification techniques. It can be defined as a stream which deals with the identification of individuals through their physical characteristics or traits. This biometric authentication is used as a form of access control or identification. They are used in surveillance of groups. The concept of Biometric authentication has evolved at a very high pace starting a few years back. However the basis for this concept dates back to the 14th century when the Chinese had used this for differentiating people. This term has today become a synonym of security since access of any area, range or data by individuals can be allowed or restricted with this. Some of the already existing biometric authentication types are Finger Print Recognition, Face Recognition, Hand geometry, Iris Recognition, Voice Scan, Signature, and Retina Scan.

These are the several biometric patterns that are being used at various places today but still there is something that these lack. This causes the security breach and inconveniences at places where people will have to wait in large Q's to follow a certain procedure for the biometrics to validate. Hence we come forth with this new biometric authentication of FOOT PRINT RECOGNITION. The working pattern and style might be similar to any other biometric means but this system has its own salient applications.

This Foot Print Recognition system can also be referred to as one that has come out after rectifying all the errors that have been detected in the previous biometric methods mentioned above.

Salient features of Foot Print Recognition System:

1. The system can be made invisible, as it operates with the foot print there is no necessity for an individual to operate any device.
2. It is time saving since the user can just walk over it.
3. None of the vital organs of the body are being detected or tested electronically and hence is no source of harm to the human body.
4. It can work on two basis as: STATIC-stand still mode and DYNAMIC [1][2]- walk over mode

As mentioned earlier when the biometric authentication was found as a means of identification in China it worked on by people placing their fingers on ink and then pasting it on papers for it to be studied carefully by individuals.

This has changed and today there are several ways by which the Foot Print Recognition System can be made to work.

Types of working mechanisms of Foot Print Recognition System

- Physical Contact: By making a physical contact of the foot print on the electronic mat.
- High efficiency cameras: By using the high-end cameras to compare images of the foot print.
- Ultra Sound Waves: To detect the foot print using the concept of Sound Reflection and Imaging.

Foot print recognition is one such technique which will be of great use in the near future. By the working principle this technique is similar to finger print recognition which is already being used in companies and institutions to mark the entry and exit time of the employees and students. Basically the foot print recognition works on the idea that the foot print trace on every person's bottom leg is distinct as it is on the finger.

The foot print recognition method might not be able to outdo the work of finger print recognition but it will have its own salient applications where finger print recognition will not be of apt use.

This foot print recognition can be done in two ways

- 1.By using neural sensor floor mats
- 2.By using high end digital cameras

In the first method of using neural sensor mats the matching method is used to check if the foot print of the person on the mat matches with the ones stored in the server to provide access. The foot print is converted into electronic images and then compared.

In the second method high accuracy cameras are used to perform the operation of capturing the picture of the leg. Here there is no need for the person to touch the sensor tab or mat. This method is already proved efficient in a project of touch less fingerprint recognition by the usage of cameras and hence this can be adopted for foot print recognition too [3].

2. Proposed Method

As we know the foot print is considered as a parameter with very accurate trace and not much change even over a really long period. Its application in the maternity ward of hospitals will substantiate this principle. In this section we propose this system to be adopted in the maternity ward of hospitals for the identification of infants. In the government hospitals, the infant after birth is kept in a common room with several other infants. This is where the confusion arises where there could be a case of mismatch. Hence at that situation it is necessary for a tedious process of DNA testing to take place and to match the DNA of the parent with that of the infant. Such real time instances have been discussed later in this paper.

The schematic representation of the working of the FOOT PRINT RECOGNITION SYSTEM (FPRS) in the maternity ward is shown in Fig 1.

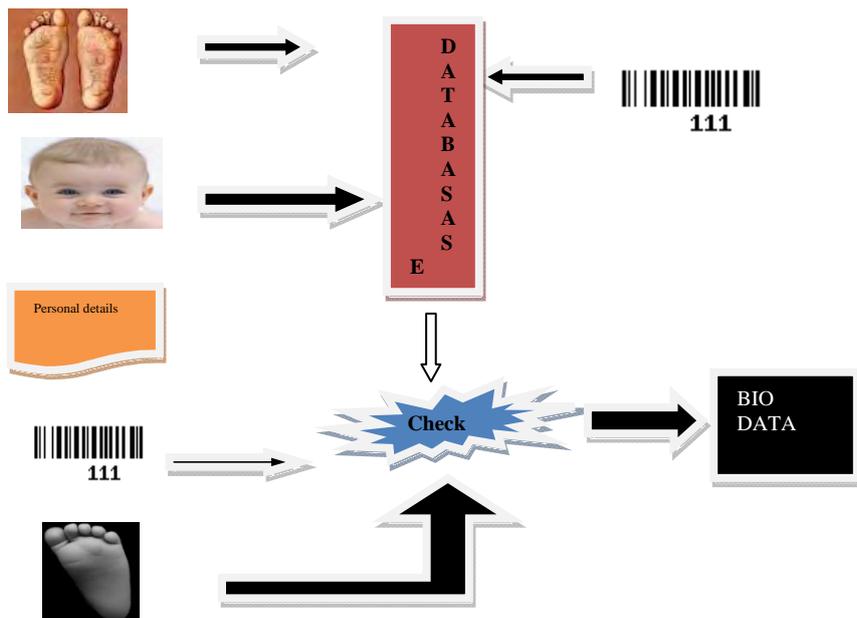


Fig.1. Schematic FPRS Architecture

The usage of FPRS in the maternity ward is basically to create a dynamic database. Initially a high accuracy image of the infant's foot is obtained. Then the pre-processing is performed to get the image of a desired format. Now the specific detailing of the image is obtained under this section of Feature Extraction. In the case of infants we take the detailing (image) of minutia (ridges).The unwanted or corrupt details in the image are neglected and the rest is stored in the Database. Parallel to this details about the mothers such as the name, age, blood group are also stored in the database. This whole record of the database is given a unique identification number which is made secure by the usage of barcodes. This will prove effective as a link is made between the infant, mother and the barcode tag.

Maternity Ward in Government Hospitals

In general in India and other third world countries with a poor economy the maternity ward in hospitals have a major disadvantage, these hospitals do not have enough resources to provide a room for every infant after its birth and hence as soon as an infant is born it is taken to a common room and kept along with several other infants. There arises a case of confusion at times. The nurses in these hospitals to keep track of the children follow some vague methods such as tying different colour threads to the hands of the children as shown In fig 2 Various Government hospital have the tendency to allocate tags for new born babies and keep them in general wards as shown in fig 2. This may lead to abduction or exchanging of individual infants.



Fig.2. Tag on Infant's Hand



Fig.3. General Infant's ward of Government Hospital

Tagging babies is an elusive method followed in many hospitals since its is easily managed and less time consuming. In some worst cases this may lead to exchanging of babies and the parents might not be aware of it until the DNA test is been taken. It may lead to family disputes in case of further investigation regarding the personal DNA test in future. For this reason each individual baby footprint is separately taken as personal identity so that its stored in the database from which we can recognize the baby easily. In this case fingerprint cannot be opted whereas all the just born palm will be shrunk. Allocating babies individual rooms is very difficult so in order to manage it in groups high authentication should be implied.

There have been numerous cases of babies being switched in hospitals[4] and infant theft as indicated in articles [5] and [6]. The main motive behind this is money and the reason is sadly the lack of security.

From the above incidents it leads to numerous problems that causes complexities.

- The problems that might arise due to this system is the confusion of which child belongs to who when the thread falls.
- Theft of children from the ward by family members due to family feuds.
- Theft of children by robbers

According to these problems it must be carried out with high authenticity and hence the footprint recognition is implied and bar code is generated from which the new born complete details are obtained.

Tagging using numerical or data are of no proper security so barcode is introduced from which its derived with the details acquired from the database. In cased of lost tag footprint database will be found secure and for mismatch of babies barcode tagging is used and displayed as shown in the example given below as shown Fig 4.

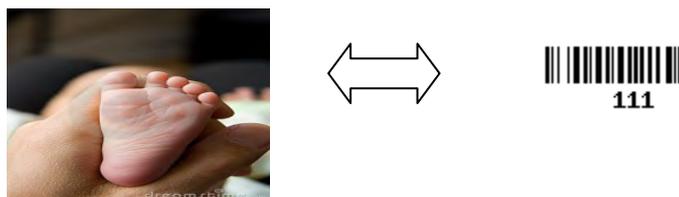


Fig.4. Footprint bar code conversion

A solution for this problem in hospitals can be obtained by installing the system of foot print recognition in the maternity ward. This data can be stored onto to the computer along with the parents name with details like ward number so that it will b completely invisible for a stranger to figure out which child belongs to who until the foot print examination is done.

There have been cases where such confusion has aroused and then it was the DNA testing and matching which helped connect between the parent and infant. But this foot print recognition is a very simple process when compared to DNA testing and hence it can very well be implemented in hospitals.

There has also been a case where a child born to a couple was stolen by a family member and killed because of some family feud. Such cases can also be avoided since a stranger will never know which child he is looking for among the many infants in the ward.

There have also been numerous cases of child theft rackets from the hospitals in the recent past. Thus, Footprint recognition system improves the security system of the hospitals.

Security in Hindu Temples

The foot print recognition will be of best use for security at the Hindu temples. In all Hindu temples there is this ancient practice of dressing the statues of the almighty with very expensive ornaments. There are certain big temples like the Tirupati where the diamond crown on the lord is worth more than 30 crores.

The basic structure and working of a Hindu temple is that the statue of the lord is placed at the centre of the temple and it is covered by walls on three sides. This area is known as the Karpagraham. So everybody gets to see the lord only in one direction.

In an incident that took place recently [7] the lord’s crown was stolen in a very casual manner. It was hours later identified by the CCTV camera footage which showed a man walking away with it.

If the foot print recognition system had been installed at the entrance of the Karpagraham an alarm would have been raised by the system when this man had attempted to move into it.

The working of the Foot Print Recognition System here is very simple. Initially after it is installed at the entrance of the Karpagraham the foot print of the authorised persons must be recorded onto it. This system works under the principle of acceptance and rejection. That is if the system recognizes the foot print as one of those initially recorded it grants access else an alarm is raised. The working of this system here is dynamic since the Brahmin while moving about does not have to stand over the foot print recognition mat but can just walk over it .

There has been another recent mishap[8] where dacoits broke into a temple at around 2am and stole all the valuables.

A very negative irony in this case is that the world outside the temple did not know about this theft until the temple was opened the next morning. This gives us an exact idea about the weakness of the security systems at Hindu temples. Hence the application of foot print recognition system is apt for Hindu temples to improve its security.

3. Result and Discussion

Here we create an interactive database for storing the details of the infant. We store personal details such as the date of birth, infant’s weight, sex, parents’s name, blood group, address and most importantly the foot image of the infant which is acquired through the FPRS. This data is assigned a bar code value which is used for the creation of a secret tag. As mentioned earlier the use of multiple parameter helps us create the database in a more efficient way and to help perform faster searching operation even with thousands of records. The fig. 5 (a), (b), (c) is a sample representation of the database dialog boxes carring options for the adding of a record and to fetch information from the record with the recognition of the footprint or barcode.



Fig.5. (a) Main FPRS Database (b) Creating and Adding a Record (c) Viewing of record based on Barcode

4. Conclusion

The usage of this system in the maternity ward and temples will not require much maintenance. It will be acclaimed as a flawless one. Since this concept of FOOT PRINT RECOGNITION (FPRS) works under the principle of a very confined and simple algorithm there is almost zero percent possibility of breaking the system which ensures its use even at a large scale and at high risk prone areas.

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