

## Review Paper on Automatic Foot Detector

Bhavika v.kharat<sup>1</sup>, Pooja B. kute<sup>2</sup>, Swati P. gaikwad<sup>3</sup>, Pratiksha S. metange, Aarti B.jadhav<sup>4</sup>  
Neha R. Pawar<sup>5</sup>

Department of Computer Science and Engineering PLIT & MS Buldana  
Email: nehapawarabdce@gmail.com

**Abstract-** The purpose of this system is to supporting footwear sales. The goal is to increase the accuracy of the foot size and footwear selection when buying from the shop. We propose a system which improves the accuracy of classification and is based on foot and shoe.

In this paper we try to achieve the technology of the foot geometry which is based on the fact that every person has different foot shapes. This presents a new method for extraction features from human foot based on the shape geometry of its boundary frame by extracting 16 different geometric features from a human foot that measures different angles of the foot which indirectly specify center, height, width of the foot. For extracting the exact foot size, we develop special device for measuring the actual foot size of the human. The extraction of individual characteristics to deal with people will help users to get accurate and quick results.

**Keywords-** MATLAB, Biometric recognition, Foot Geometry.

### 1.INTRODUCTION

In some cases, a customer is encouraging to buy more shoe sizes, selects one and returns the other. For this, sometimes a special electronic or mechanical device is used to measure the feet.

A good shoe size recommendation system considers a following component:

- Geometrical shape of foot
- Personal preferences of customer
- Inner dimension of the foot
- Technical characteristic of the foot such as material, construction.... etc. [2].

The reliability of this system based on the use of biometric information that compared with the reliability of the traditional systems to recognize a query person. In fact, using the biometric information gives the accuracy and easily recognition ability between authorized and unauthorized users [1]. To recognize the reliability of the foot size data we introduce the foot measurement scanner. By using this scanner, we are able to define the foot size more efficiently and even to get more information about the foot scan. The foot

Scanner is a fast reliable and simple and create 2.5D scan with the relevant measures of the foot. By using relevant foot measures, we define the actual foot size. The actual foot size is defined by the following equation

The goal is to increase the accuracy of foot and model selection when buying the footwear from the foot shop [2].

$$\text{Foot size} = f(\text{length, Meta, girth, instep girth, heel girth, toe shape})$$

We know that biometrics contain a number of properties and these properties are divided into some behavioral biometrics which are the physical and behavior characteristics. The behavior characteristics such as signature, Hand-Writing print .... etc., while physical characteristics such as structural pattern of human like ear print, palm print, fingerprint ...etc. The geometric description of the foot surfaces that involved in the equivalent material properties and in the contact have an extra importance. In this paper, some geometric features are extracted to any person [1]. In this paper, an explanation of all the different blocks of the foot geometry biometric identification system design will present the feature extraction blocks including optimization, image preprocessing of the foot size to selection of the representative features. In this the classification and verification problem will be studied. Although we present the database and final figures in classification and verification. The

conclusions according to the obtained result on direction of the future research that will be presented and final section means visualization where user will get the actual foot size [3].

### **Paper 1: Foot Features Extraction Based on Geometry**

**Author:** Prof. Dr. Kadhem M. Hashem, Fatima Ghali

#### **Description:**

The reliability of the system based on the use of biometrics information such as foot that takes a spread significantly compared with the reliability of the traditional systems to recognize a query person. In fact using the biometric gives high accuracy and ability of easy recognition between the authorized and unauthorized users. The advantage of using the biometrics depends on the personal attributes to identify the users. In addition, it doesn't need to save multiple passwords that are vulnerable to theft or forgetfulness that gives these systems a great acceptance among users. The extraction of the individual characteristics to deal with people will help users to get quickly and high accuracy results.

### **Paper 2: Shoe Size Recommendation System Based on Shoe Inner Dimension Measurement**

**Author:** Damir OMRČEN, Aleš JURCA UCS, Universal Customization System, Slovenia

#### **Description:**

Internet is a multi-billion dollar economy and the Internet's economic potential is growing every year (BBC news, 2010). On the other hand the Internet sales in footwear lag behind. In our opinion the main reason for the poorly developed Internet footwear sales is the inability to estimate the fit of shoes. There have been a number of attempts to make the footwear Internet sales more efficient and successful. In some cases a customer is encouraged to buy more shoe sizes, selects one and returns the others. Sometimes a special electronic or mechanical device is used to measure the feet (Boër, 2007). A good shoe size recommendation system should consider the following components in the recommendation: - geometrical shape of the foot, - personal preferences of the customer, - inner dimensions of the shoe, - technical characteristics (material, construction, ..) of the shoe. Based on the findings we developed UCS recommendation system. One of the crucial components in our recommendation system is a foot scanner. There are number of foot scanners available on the market (Boër, 2007). Some of them use set of cameras to define the exact 3D shape of the foot. The others only produce scan of the sole. In this work we shortly describe a foot scanner, which generates a 2.5 dimensional scan in only a fraction of a second and can be successfully used in a recommendation system.

### **Paper 3: Shoe Size Recommendation System Based on Shoe Inner Dimension Measurement**

**Author:** UCS, Damir OMRČEN, Aleš JURCA Universal Customization System, Slovenia

#### **Description:**

security, but with several advantages compare other techniques:

1. Medium cost as it only needs platform and a low/medium resolution CCD camera.
2. It uses low computational cost algorithms, which leads to fast results.
3. Low template size: from 9 to 25 bytes, which reduces the storage needs?
4. Very easy and attractive to users: leading to a nearly null user rejection.
5. Lack of relation to police justice, and criminal records.

There are nearly no bibliography references about hand geometry biometrics, although there is one commercial system available, developed by recognition systems Inc. The hand geometry identification system detailed in this work has the typical architecture of any other biometric system

**Paper 6: Design of hand geometry Based verification system.**

**Author:** Ms. Gagandeep kaur, assistances professor, EIED

**Description:**

As the personal and institutional security requirements increase, a person has to remember lots of passwords, pin numbers, account numbers, voice mail access numbers and other security codes, however passwords have their own weaknesses. The weak passwords can be easily guessed and the strong ones can be broken. It is recommended that people should not use the same password for different applications and should change them regularly. In the modern world that would mean memorizing a large number of passwords. Biometric authentication is the ideal solution to all these requirements. In future, biometric systems will take the place of this concept since it is more convenient and reliable

**Paper 7: Shape-Based Hand Recognition**

**Author:**

**Description :**

Erdem Yourk, Ender Konukoglu, Bulent Sankur Member, senior Member, IEEE, and Jerome Darbon  
**Description:** The emerging field of biometric technology addresses the automated identification of individual, based on their physiological and behavioral traits. The broad category of human authentication schemes, denoted as biometrics encompasses many techniques from computer vision and pattern recognition. The personal attributes using biometric identification system can be physiological, such as facial features, fingerprints, iris, retinal scans, and finger geometry; or behavioral, traits idiosyncratic of an individual, such as voice print, gait, signature, and keystroke style. Depending on the complexity or the security level of the application, one will opt to use one or more of these personal characteristics, possibly under a multimodal fusion scheme for performance in enhancing.

**Paper 8: Palm Print Recognition Based on Sub-Block Energy Features Extracted by Real 2D-Gabor Transform**

**Author:** Yu ZANG, Dequn ZHAO, Guangmin SUN, Qiang GUO and BO FU

**Description:**

In the traditional offline palm recognition and initial online palm recognition, physical structures such as points and lines are widely used as identification features. With the introduction of time frequency analysis, which involves sub space transform and the auxiliary solution statistical features, the method of features extraction palm print has been developed rapidly. Some of algorithms even can directly extract relevant features from

original palm image. That is because image in space domain have weak ability of noise resistance. Transforming image from space domain to frequency domain and then making feature extraction and description may reinforce the robustness of algorithm and even reduce some preprocessing steps.

### Literature Survey

<b>Sr.No.</b>	<b>Paper name</b>	<b>Author</b>	<b>Published Year</b>	<b>Description</b>	<b>Advantages</b>
01	Foot Features Extraction Based Shape Geometry	Prof. Dr. Kadhem M. Hashem, Fatima Ghali	May 2015	The reliability of the system based on the use of biometrics Information such as foot that takes a spread significantly compared with the reliability of the traditional systems to recognize a query person.	The advantage of using the biometrics depends on the personal attributes to identify the users.
02	Shoe Size Recommendation System Based on Shoe Inner Dimension Measurement	Damir OMRČEN, Aleš JURCA UCS, Universal Customization System, Slovenia	25-26 October 2011	Internet is a multi-billion dollar economy and the Internet's economic potential is growing every year (BBC news, 2010).	By this we can recognize the exact shoe size of the foot.
03	Biometric identification through hand geometry measurements	Raul sachez-reillo, student member, IEEE, Carmen sachez-Avila, member, IEEE, and ana Gonzalez-Macros	10 October 2000	The hand geometry identification system detailed in this works has the typical architechre of any other biometric system.	Biometric identification will provide Authentication to the users.

04	<a href="http://users.cs.cf.ac.ak">http://users.cs.cf.ac.ak</a>			Image Acquisition is the first stage of any vision system. After the image has been obtained various methods of processing .	Captured image will differentiate the humans by recognizing their foot by the camera.
05	<a href="http://en.m.wikipedia.org">http://en.m.wikipedia.org</a>			Feature extraction starts from an initial set of measured data and builds derive features intended to be non-reluctant, informative, facilitating the subsequent learning and some generalization steps.	Feature Extraction will differentiate the foot size by identifying the foot length, width and center point.
06	Design of hand geometry Based verification system	Ms.Gagandeep kaur, assistances professor, EIED	July,2010	Biometric authentication is the ideal solution to all these requirements.In future, biometric systems will take the place of this concept since it is more convenient and reliable.	It will provide convenient environment for the user for the verification which will provide authentication.
07	Shape-Based Hand Recognition	Erdem Yörük, Ender Konukoçglu, Bülent Sankur, Senior Member, IEEE, and Jérôme Darbon	7 July 2006	The emerging field of biometric technology addresses the automated identification of individual , based on their physiological and behavioral traits	It is useful to identify the behavioral traits of the users.
08	Palm Print Recognition	Yu ZHANG, Dequn	2010	In the	On the basis

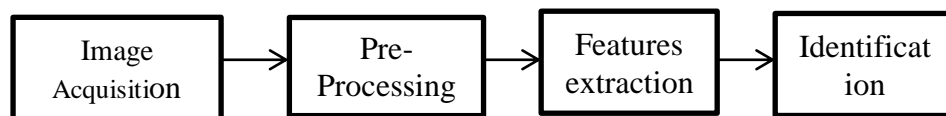
	Based on Sub-Block Energy Feature Extracted by Real 2D-Gabor Transform	ZHAO, Guangmin SUN, Qing GUO and Bo FU		traditional offline palm recognition and initial online palm recognition.	of palm print of the user it will differentiate and provide the authentication.
--	--	--	--	---	---

## 2. FOOT GEOMETRY

Person has a special shape of foot belongs to him only and this technology based on this fact which is not affected by factors of time and aging. If the human has completed the growth phase then foot size is relatively stable, this is same for those who are in the growth phase of their life. In the other words, adult persons owning a distinctive unique foot among the rest of the people, foot geometry system always consider the biometric features of the foot and some specific features of the foot such as length and width of the foot which is useful to comparing the different foot shapes of the humans [1].

### System architecture of the foot geometric recognition:

In this paper, the existing system architecture containing different techniques for the verification, recognition and extracting the geometric features which is consist of the following modules [1]:



**Figure 1: System Architecture**

**Image Acquisition:** - Image Acquisition is the first stage of any vision system. After the image has been obtained various methods of processing can be applying to the image to perform many different vision task required today [4]. In the image acquisition system, the image of the foot captured by the digital camera. This is the simple one process where camera is placed in this way that it can be capturing the image of the foot in different angles. Images taking by a fixed distance from the camera to almost 2 meters with fixed lighting and background [1]. In this stage, digital camera, placed above a platform designed to guide the foot to a fixed location. Different foot shape views can be represented as follows [3]: -



**Figure 2. Images of 10 Persons**

This image contains not only a view of the palm of the foot but also contain the lateral view of the foot [3].

**Preprocessing:** - After the image is captured, preprocessing is performed. In this stage, color images are transform into a black and white where the background of it is eliminated [3]. Preprocessing of the images is used to processing on those particular images for the further use. This stage is used to refining the noisy images. Because some time it may happen that we get the blur images so, that time preprocessing of that image is must. The role of the preprocessing module is to prepare the images for feature extraction. The first step of the preprocessing is to transform the color images into gray scale images and this gray scale images will have transformed into the noisy images. To acquiring the pure one image there is filtering concept is use, which convert the noisy images into pure one [1].

We used preprocessing technique that will also describe the samples of foot-palm prints obtaining from the database.

**Feature Extraction:** - In the preprocessing stage, after getting the pure image from the noisy image of the foot we will get the prominent edge of that foot, that represents the boundary of the foot shape [1]. The aim of this step is to capture the biological data of the users which will proceed then extract a set of features that represent univocally that user among all the population that use the system [3]. This stage describes in the various features of the foot that is width, height, center of the foot. Feature extraction starts from an initial set of measured data and builds derive features intended to be non-reluctant, informative, facilitating the subsequent learning and some generalization steps. Feature extraction is related to dimensionality reduction [5].

There are several classes for the selection of features in order to discriminate between foot in a biometric application. We used foot recognition scheme that are quite and different in nature. The first method is based On distance measurement between two points (finger-point to toe point) and hence it is shape-based. The second measurement considers the whole foot palm image. However, this approach can equally be applied to gray level foot image which include texture of foot and palm print patterns [7].

**Identification:** - Identification is the last stage of the foot geometry architecture, where it helps to identifying the foot image from the database which is displaying by the monitor. Simply, the identification step in the foot geometry is used to recognizing the foot of the particular person from the database.

**Biometric Recognition:** - The term biometrics is derived from the Greek words 'bio' means life and 'metric' means measure [6]. The biometric identification is gaining more importance. Biometric system based on foot geometry identification is presented here [3] by the different features of the foot. Biometrics is use for identifying human beings that offers some unique advantages. It can be used to identify you as you. The advantage biometric recognition and their authentication provide the ability to require more instances of authentication in a quick and easy manner. By this, users are not bothered by additional requirements [6].

**Working of Biometric Technologies:** - The synonyms for the pattern recognition system is biometric recognition technology which use image acquisition procedure in which different scanners and digital cameras are used for capturing or scanning purpose [6].

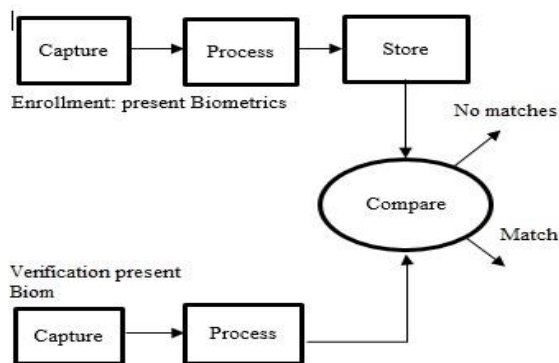


Figure 3: Generic biometric processes

This device will recognize the biometric patterns or characteristics of the foot. There are different biometric technologies use various features and benefits, which should be analyzed based on how and why they will be used. They will be change in performance, capabilities, infrastructure, cost and requirements and all have their unique limitations, and operating methods [6].

In figure 3, the initial stage is capturing the image which is used digital camera. After capturing the image, particular processes will have done on that image by which we will extract the different features of that image. Store is the procedure which is used to storing the image into the database. After storing, the captured image will be compare with stored image in database. If this both images will match, then it will recognize particular size of the image otherwise it will return.

### 3. Geometric features System

Geometric features are used in biometric systems due to their robustness to the all environmental conditions, and there a large number of possible features fall into this category. If suppose someone is having injury on foot palm in this case also system is able to recognize foot size of the person. One reason for this is that many hand recognition schemes rely on a robust identification of finger tips and finger valleys. When inter finger valleys cannot be detected reliably, a normalization, i.e., correct placement of individual fingers, is hard to achieve. The extraction of these characteristic landmarks is often facilitated by pegs [10], while more advanced schemes like [11] are peg-free but demand high contrast between background and palm. Since an introduction of pegs is unacceptable for the image acquisition step, and spread toes are not the default case, the reliable detection of inter toe valleys deserves closer attention in foot biometrics.

**Conclusions:** - Thus we have studied the extraction of foot system and conclude that, these system uses image processing concepts which determine different geometric features of the human foot, which help to determine the foot size of the human. This system uses image processing concept through which customer get exact foot size.



**References: -**

- [1] Prof. Dr. Kadhém M. Hashem and Fatima Ghali, “Foot Features Extraction Based Shape Geometry.” Vol 4, Issue. 5, May 2015, pg.1108-1116.
- [2] Damir OMRČEN, Aleš JURCA UCS, Universal Customization System, Slovenia,” Shoe Size Recommendation System Based on Shoe Inner Dimension Measurement”.
- [3] Raul Sanchez-Reillo, Student Member, IEEE, Carmen Sanchez-Avilla, Member, IEEE, and Ana Gonzalez – Macros, “Biometric Identification through Hand Geometry Measurements”, vol 22, No. 10, OCTOBER 2000.
- [4] [http:// users.cs.cf.ac.uk](http://users.cs.cf.ac.uk).
- [5] [http:// en.m.wikipedia.org](http://en.m.wikipedia.org).
- [6] Vivek Yadav,” Design of Hand Geometry Based on Verification System.
- [7] Erdem Yörük, Ender Konukoçlu, Bülent Sankur, Senior Member, IEEE, and Jérôme Darbon, 7 July 2006,” Shape-Based Hand Recognition”.
- [8] Yu ZHANG, Dequn ZHAO, Guangmin SUN, Qing GUO and Bo FU, 2010,” Palm Print Recognition Based on Sub-Block Energy Feature Extracted by Real 2D-Gabor Transform