

Characterization of South Indian Ladies Foot And Generation of Last Thereof

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Abstract –Shoe-last design is a highly significant aspect of footwear design. This project aims to develop a shoe last with an accurate fitting system for young females in Tamil Nadu by collaborating the knowledge of reverse engineering and 3D modelling software. The data will be collected using a 3D foot scanner for better exactness of measurements. After analysing collected data, the existing last will be crossly checked with measured value to realize deviation from actual foot size. The new fitting from scanned data will determine possible discomfort.

Keywords–Customized shoe-last, parametric design, mass-customization, shoe-last design.

I. INTRODUCTION

A shoe last is a 3-dimensional wooden or plastic mold upon which a shoe is constructed. The last used during shoe assembly can affect the overall fit of a shoe, and all lasts include dimensions like heel width, instep height, forefoot width, and toe box depth. The design and production of the last are at the essence of footwear technology. The design of the last limits the types of the upper and other associates. For instance, the shape of a sole is decided by the footwear last base pattern; the pitch of a heel should resemble a shank arch of the last; and also, the design of the forepart of a last can alter the look of the upper. The footwear last is that the mold likewise because of the support for assembling of the upper, sole and other associates within the producing approach.



Fig.1. Types of Footwear Last.

Thus, influences not solely vogue and aesthetics, however additionally fit and luxury of shoes. Footwear lasts are often classified in line with the material, heel height, toe style, etc. Footwear lasts are made up of a variety of materials; wood, metal or plastic. Before the age of mass production, hardwood was whittled or chiselled into a wooden last.

1. Shoe Last Dimensions and Terminology

Footwear last is often divided into areas like toe, forepart, waist and heel region, and uppermost part, in accordance with the similar parts of the foot. A last could also be viewed as consisting of many exteriors and curves, that embrace the last bottom, the inside arced surface, the outside arced surface, and therefore the top line.

- Ball girth
- Instep girth
- Heel girth
- Foot length

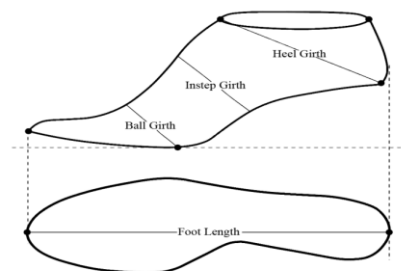


Fig.2. Last Parameters.

III. APPROACH

There are several types of foot measurements; fundamentally are classified as manual foot measurement and scanner foot measurement. Scanner foot measurement has an advantage over manual foot measurement for it avoids human errors better.

1. Foot scanner

Foot scanner is a 3-dimensional foot scanner which is the optical laser scanning system. A three-dimensional foot scanner provides a performance that assists the user to create an accurate foot measurement. 3D foot scanner

measures based on the anatomy of the foot, so that Landmark points are suggested by the system based on the anatomy of foot automatically. the suggested landmark points shall be reviewed by a person who operates the scanner. This measure usually uses Markers to work out Landmark points. The data for this paper is collected by "INFOOT 3D FOOT SCANNER". INFOOT scans a foot form and the anatomical landmark points, and measures automatically approximately twenty different measuring items.



Fig.3. Infoot 3d Foot Scanner.

2. SPSS

SPSS stands for Statistical Package for the Social Sciences, and it's employed by numerous varieties of researchers for advanced applied mathematics information analysis. SPSS has four programs that support researchers with their advanced information analysis desires. The main roles of SPSS are Statistics Program, modeler Program, Text Analytics for Surveys Program, visualization Designer and conjointly provide solutions for data management, which permit researchers to perform case choice, produce derived information, and perform file reshaping. SPSS additionally provides the feature resolution of data documentation that permits researchers to store a data dictionary. This data dictionary acts as a centralized repository of knowledge referring to data like that means, relationships to alternative information, origin, usage, and format.

3. Last making

As an input for the last making different parameters can be fed an input. Last can be made using information from Sole, Pictures, Shoes and last. Heel height, Toe springs, and Required size information must be fulfilled before the last making process begins. The main part is developing an original mother last by the process in which most of the operation is manual. After the mother last has been developed it will be scanned to import the data in the processor, editing and modifying using software is another basic process in the computerized designing section. The 3D model modification is performed by specialized engineering software called "EASY LAST".

III. DATA COLLECTION AND ANALYSIS

While the present fitting system is custom-built based on the European footwear market; the last has a fitting downside, that results in affect locomotion of Tamilian customers. Throughout the project section, the foot of population representatives from Tamil Nadu is scanned using a 3D foot scanning machine. The girth size of the Indian foot is assumed to be wider. due to the weather and customary outfit (Saree) the ladies prefer to wear open footwear. This typical usage of open footwear brings wider ball girth compared to the European fitting system. Demographically the sample of the population is 16 - 21 years aged female who came from different parts of Tamil Nadu. Data has been collected from 55 subjects in total.



Fig.4. Data collection process.

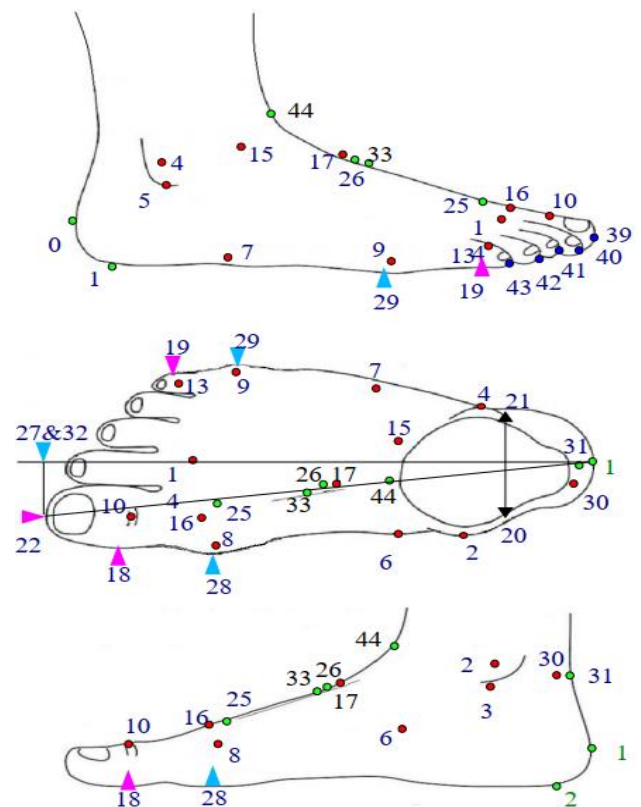


Fig.5. Landmark point

Table I: List of Landmarks.

1.	Sphyrion
2.	The most lateral point of lateral malleolus
3.	Sphyrion fibulare
4.	Navicular
5.	Tuberosity of 5th metatarsalis
6.	Metatarsale tibiale
7.	Metatarsale fibulare
8.	Toe #1 joint
9.	Toe #5 joint
10.	Head of 2nd metatarsal bone
11.	Tentative junction point
12.	Top of Ball Girth point
13.	Top of Instep point
14.	Sphyrion
15.	The most lateral point of lateral malleolus
16.	Sphyrion fibulare
17.	Junction point (Tentative point is needed)
18.	Tip of #1 toe
19.	Tip of #2 toe
20.	Tip of #3 toe
21.	Tip of #4 toe
22.	Tip of #5 toe

FOOT DISCREPANCY PERCENTAGE

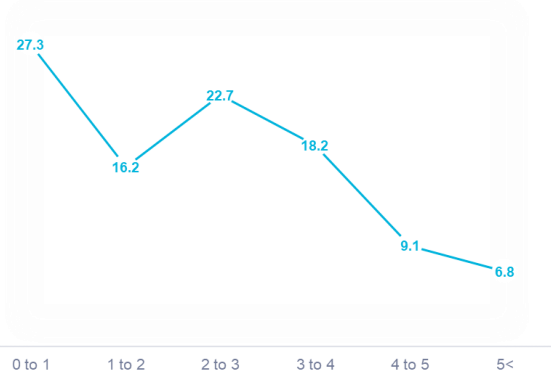


Fig.8. Foot length discrepancy

Table II: Ball Girth fitting Percentage (%).

Fitting	Frequency	Percent	Cumulative Percent
E	4	9.1	9.1
F	10	22.7	31.8
G	5	11.4	43.2
H	10	22.7	65.9
SE	2	4.5	70.5
XH	6	13.6	84.1
XXH	7	15.9	100.0
Total	44	100.0	

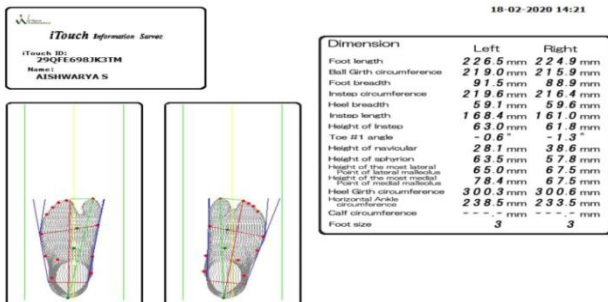


Fig.6. Sample raw data.

Ball Girth fitting Percentage (%)

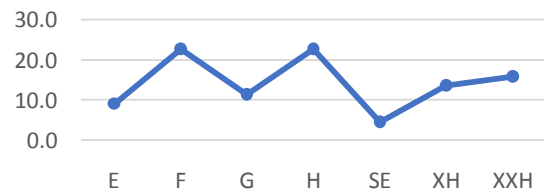


Fig.9. Ball girth fitting percentage

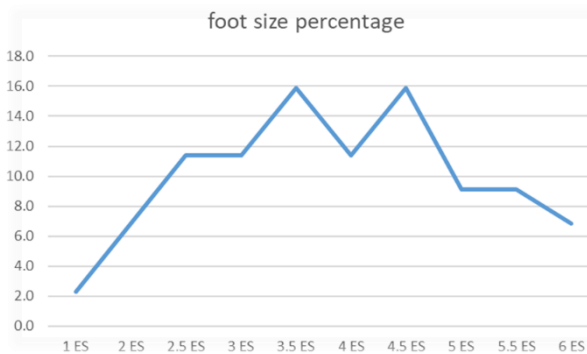


Fig.7. Foot size percentage and discrepancy

Instep Girth fitting Percentage

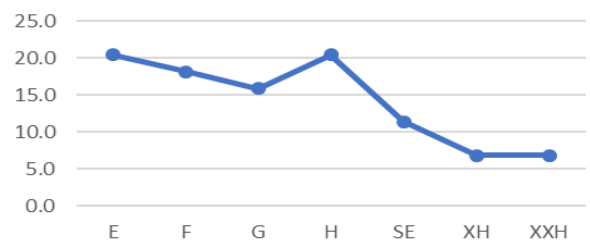


Fig.10. Instep girth fitting percentage

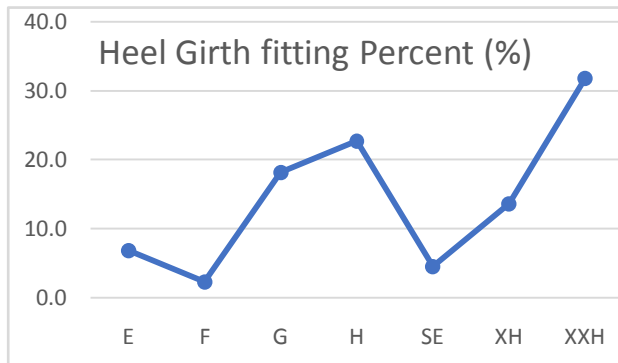


Fig.11.Heel girth fitting Percentage

IV. CONCLUSION

Foot size 3.5 and 4.5 conquer the top of on percentage graph. 6.8% of the population has abnormal foot discrepancy. H fitting is more suitable for both ball girth and instep girth. More than 30% of population is not embraced by “Indian Standard Specification for Sizes and Fitting of Footwear”

Foot size; 1, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6,
Ball Girth; H
Instep Girth; H
Heel Girth; H

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