

DESIGN EXPLORATION OF A SYSTEM DIAGNOSING FOOT SOLE DIMENSIONS AND ITS QUALITATIVE DISTRIBUTION OF PRESSURE BY MEANS OF IMAGE PROCESSING

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INTRODUCTION

Rehabilitation experts utilize different methods such as using pressure distribution sensors to diagnose sole abnormalities [1, 2]. Since these devices are too expensive to be used in rehabilitation centers, they are only available in research centers in the country. In this paper sole characteristics are determined by image processing method is used and a system consisting of software and hardware is designed and built which is capable of assessing sole abnormalities.

METHODS

In this paper the methods of image processing have been used to diagnose the foot sole abnormalities. For this purpose, a system including one scanner and a special structure resisting the body weight was designed. The patient is supposed to stand on the scanner (transferring the body weight to ground by means of the special structure), and the image of patient's sole is implemented in the computer. By means of a program written in Matlab software the image will be processed pixel by pixel and the outer curvatures of foot is determined. Then by counting the pixels between the points determined by the user the software would measure the desired distances. In addition the software is capable of finding the points which is under more pressure and their color has changed more compared to other points, and also it can calculate the area of these parts. Therefore a simple distribution of pressure on the sole would be achieved.

RESULTS AND DISCUSSION

In figure 1 the disorders of pressure distribution is obviously seen. Also the high pressure region is different in two feet. Additionally the difference in foot dimensions is obvious.

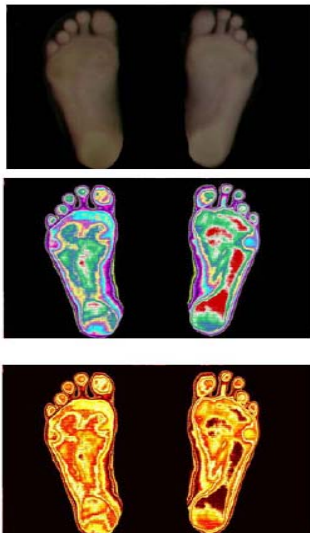


Figure 1: The disorders of pressure distribution

CONCLUSIONS

According to the results attained, the system has capabilities such as:

- 1- Showing the pressure distribution on foot sole in order to diagnose the foot disorders
- 2- Comparison of pressure distribution in two foot soles to find out the differences
- 3- Determination of dimensions of foot for designing medical insoles
- 4- Calculation of each segment's area (noticing the weight) to have quantitative analysis of pressure upon feet.

Assuming the capabilities mentioned, in comparison with traditional foot sole assessing methods [4,5], this system costs a lot less. According to the process utilized in this paper the method can only be performed for one patient at a time, so quantitative comparison of different patients is not possible. However in further works by combining the results of this paper and other devices, the achieved values can be calibrated.

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