

## **A Robust System for Foot Arch Type Classification from Static Foot Pressure Distribution Data Using Linear Discriminant Analysis**

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**Abstract :** Foot posture assessment is important to evaluate foot type, causing gait and postural defects in all age groups. Although different methods are used for classification of foot arch type in clinical/research examination, there is no clear approach for selecting the most appropriate measurement system. Therefore, the aim of this study was to develop a system for evaluation of foot type as clinical decision-making aids for diagnosis of flat and normal arch based on the Arch Index (AI) and foot pressure distribution parameter - Power Ratio (PR) data. The accuracy of the system was evaluated for 27 subjects with age ranging from 24 to 65 years. Foot area measurements (hind foot, mid foot, and forefoot) were acquired simultaneously from foot pressure intensity image using portable PodoPowerGraph system and analysis of the image in frequency domain to obtain foot pressure distribution parameter - PR data. From our results, we obtain 100% classification accuracy of normal and flat foot by using the linear discriminant analysis method. We observe there is no misclassification of foot types because of incorporating foot pressure distribution data instead of only arch index (AI). We found that the mid-foot pressure distribution ratio data and arch index (AI) value are well correlated to foot arch type based on visual analysis. Therefore, this paper suggests that the proposed system is accurate and easy to determine foot arch type from arch index (AI), as well as incorporating mid-foot pressure distribution ratio data instead of physical area of contact. Hence, such computational tool based system can help the clinicians for assessment of foot structure and cross-check their diagnosis of flat foot from mid-foot pressure distribution.

**Keywords :** arch index, computational tool, static foot pressure intensity image, foot pressure distribution, linear discriminant analysis

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