化之設計，其中鞋底開模的模具費用更是非常龐大，因此影響設計者創新設計之意願，本研究以有限元素電腦模擬的方式來代替實體量測的方法，將電腦輔助設計及電腦輔助製造（CAD & CAM）概念應用於鞋底避震結構之設計製造。期能以電腦輔助設計配合精密儀器之測試，提昇鞋類設計之水準。

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The Analysis of Footwear Structure for Cushioning & Energy Return

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ABSTRACT

The shoe sole is the most important interface between human foot and ground during ambulation. Therefore, the structural design of insole directly affects the ground reaction force on foot. To date, "try and error" approach was often used to design the shoe sole. But this approach cannot do most of the analysis before the prototype completed to eliminate the waist of time and work of real laboratory experiment. In order to evaluate the effects of insole more effectively, the finite element method (FEM) was used to construct a dynamic impact model and experimental results were used to validate this model. Consequently, the effects of various contact area of insole were predicted via our model to determine the optimal shoe insole structure. Three different structural design insoles were used to create finite element models including solid trapezoid cylinder, hollow cylinder, and 2-sized solid trapezoid cylinder. The impact acceleration, rebound height, rebound time, and impact time calculated from the FE model were compared with the experimental data. To validate the FEM model, the experimental values of rebound height, impact acceleration, and impact time are similar to the results of FEM simulation. Rebound height of solid trapezoid cylinder model is larger than other models. The hollow cylinder has the largest impact acceleration within these three models. However, the rebound time of FEM is larger than the experimental value about 0.03 second which may be due to the buckling effect of the cylinder shape. In the effect simulation of different contact area, the largest rebound height and the largest impact acceleration could be found both in the results of 75% contact area. According to the results, this study suggested that the rebound height and impact acceleration should be measured from a real experimental model with 75% contact area in the further study.

Keyword: Sole, Finite Element, Cushioning, Energy return

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