Development of a system for anthropometric ear size and shape analysis

Hayoung Jung[1], Wonsup Lee[2], Younggeun Choi[1], Heecheon You[1]

[1]Department of Industrial and Management Engineering, Pohang University of Science and Technology, Pohang, 790-784

[2]Department of Industrial Design Engineering, TU Delft, Netherland, 2628CE

ABSTRACT

Objective: The present study developed an ear size and shape analysis system based on Korean & American 3D ear scan database (Korean: 230, Caucasian: 606) for ear product designs. **Background:** A sizing analysis system is required for efficient analysis of ear size based on anthropometric measurements to find representative ears from a huge amount of 3D ear scan database. **Method**: The Korean and Caucasian ear scan data ($n = 836$) were manually processed to improve a quality of the 3D image. Twenty anthropometric landmarks were marked on the processed 3D ear images to measure 28 ear anthropometric dimensions. Ear shape variation was analyzed based on contour of a representative ear and reference plane generated by referring key landmarks (posterior concha, superior concha, and trigon). A volume of concha area was measured. All ear dimensions, shapes, and volumes were automatically measured and size categories were automatically generated by applying an analysis system coded using Matlab. **Conclusion:** The ear size and shape analysis system which can be used for analysis of ear dimensions and shapes, generation of sizing categories, and visualization of 3D landmark plots was developed based on the measurement of the Korean and American ear scan database. **Application:** The processed 3D ear images and the developed ear size and shape analysis system can be applied to the ear product designs.

Keywords: Ear size and shape measurement, 3D anthropometry, System development, Ear product design