

Mobile 3D Scanning Facilitated Custom-Fit Hearing Aid Shell Manufacturing Process

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Abstract

Hearing loss is the third most prevalent chronic health condition that seniors face. Globally, over 1.5 billion people are impacted by hearing loss, yet fewer than 20 percent of those who require intervention and treatment seek help for their condition because of the high cost and inaccessibility. Patients prefer custom-fit hearing aids because they provide better comfort and retention. However, the conventional custom-fit hearing aids manufacturing process is lengthy and expensive, involving processes such as making physical ear impressions, shipping physical impressions to manufacturers, 3D scanning the ear impressions, digital sculpting, and shell fabrication and electronic assembly. In this paper, we present a low cost and accessible mobile platform-based hearing aid shell optimization and rapid prototyping method. Our method involves real-time mobile 3D scanning, cloud-based hearing aid shell modeling, and local office 3D printing. Patients at home will be able to self-scan their ears and upload the 3D scan data through a cloud-based server program; then, their hearing aid shells will be generated and can be downloaded for 3D print. Through preliminary studies, we estimate that the processing time from hearing aid scanning to 3D shell modeling would be about 10 minutes. To evaluate the 3D printed hearing aid shells, we created a 10-point Likert scale to gauge ease of insertion, comfort, tightness, retention, and voice quality. We conducted a comparison study among our 3D printed shells, a receiver in the canal (RIC) hearing aid, and a non-custom foam earpiece. Results indicated that our shells achieved comparable or superior fitting and retention scores on the Likert scale.

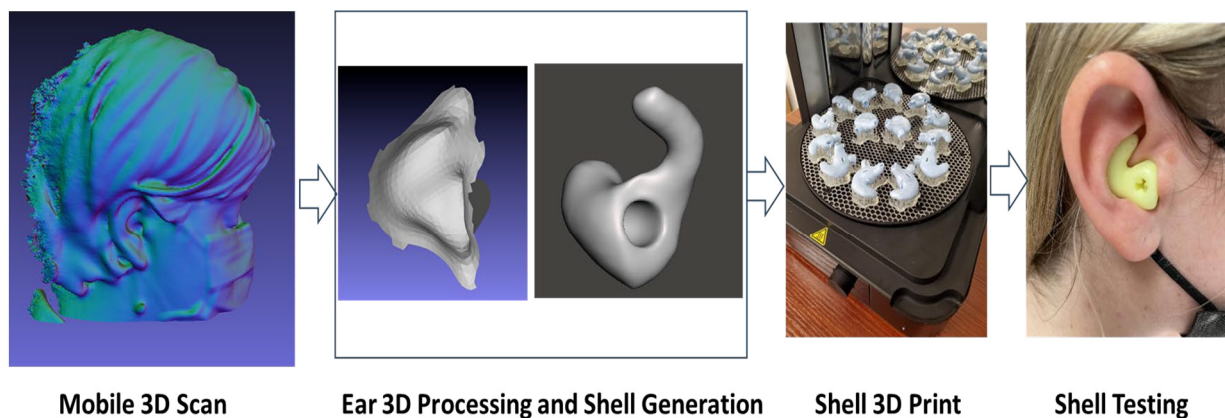


Figure 1. Mobile 3D scan-based hearing aid shell generation process.