

Enhancing Firefighter Glove Fit and Performance: Design and Implementation of a Comprehensive Sizing and Analysis Tool Utilizing AI-Assisted Hand Measurements and Anthropometric Data

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The project aims to enhance firefighter performance, safety, and health by improving glove fit through AI assistance. It involves developing a hand anthropometric measurement tool, a hand-glove size matching system, and an anthropometric database. This is crucial due to the high rate of firefighter injuries in the US, with hands and fingers commonly affected. Ill-fitting gloves lead to decreased dexterity, hand fatigue, and burn injuries, impacting performance and increasing risk. The lack of hand dimensional data, especially for female firefighters, exacerbates this issue. Methods include a mobile app capturing 2D hand images for AI-driven dimension extraction and creating 3D hand models for analysis. The app will integrate market glove data and user feedback to optimize glove sizing recommendations. Statistical analyses will identify hand anthropometry trends. Outcomes will include a gender-specific firefighter hand dimension database, an improved glove sizing system, and a mobile app for personalized glove recommendations. These advancements will result in user-centered glove designs, reduced hand injuries, and enhanced firefighter performance. The AI-SAFEHAND app will provide firefighters with well-fitting gloves, benefiting their safety and firefighting efficiency.

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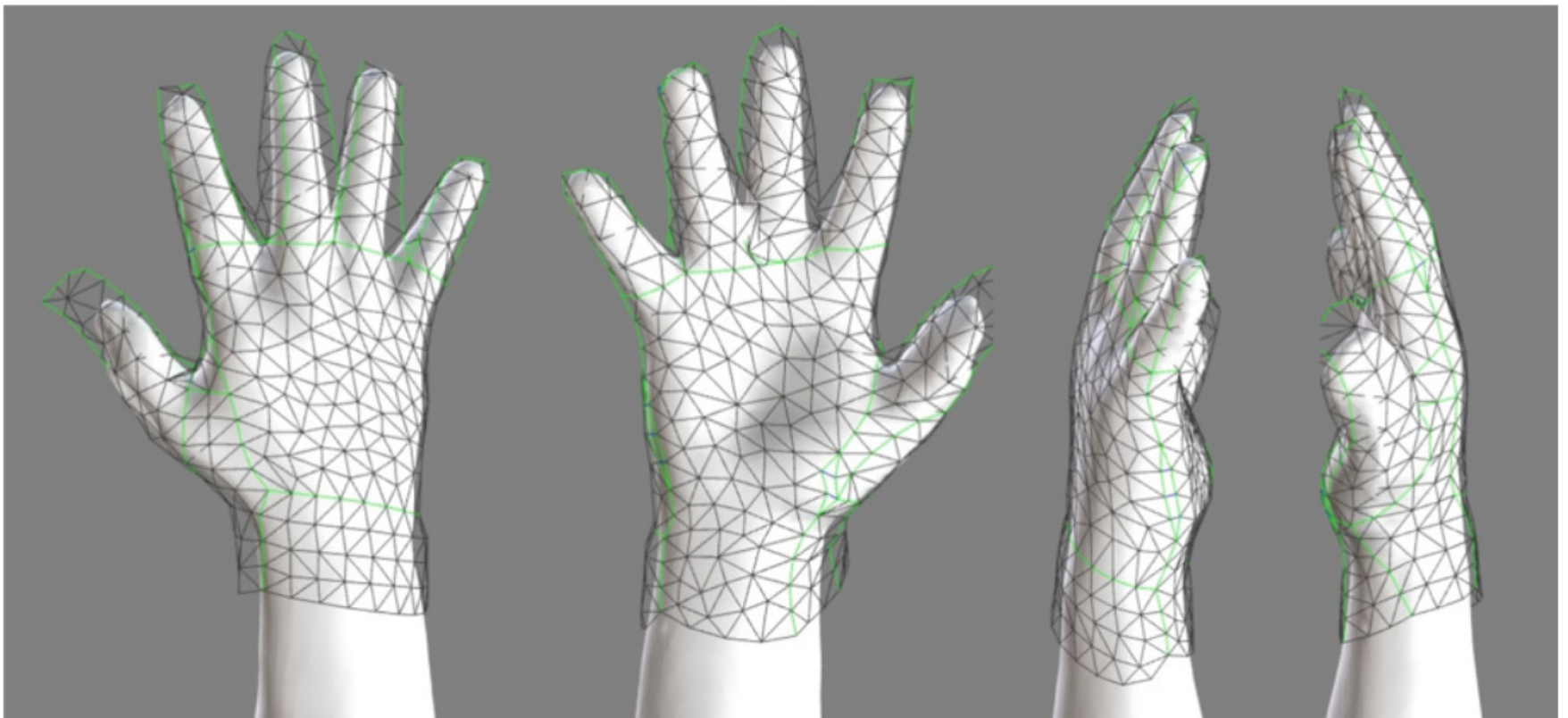
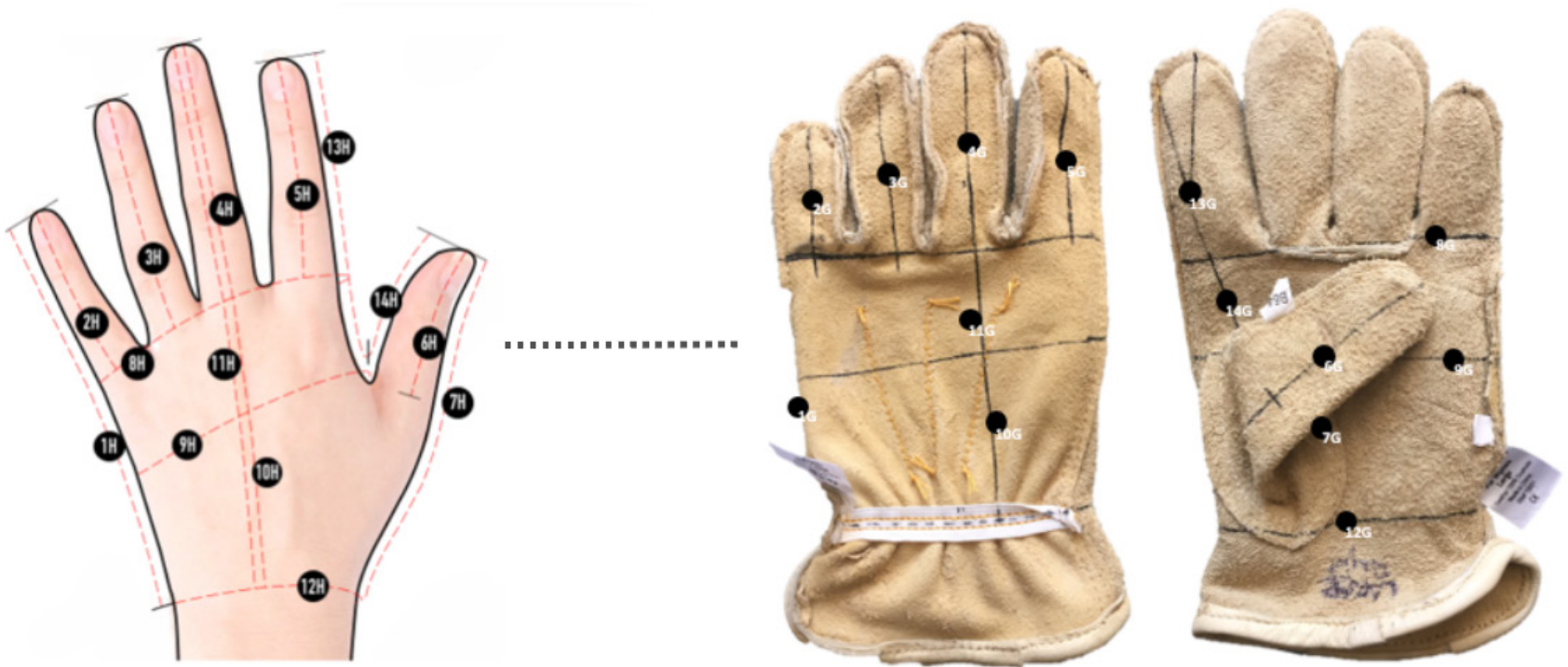


Image 1. Hand-Glove Relationship.

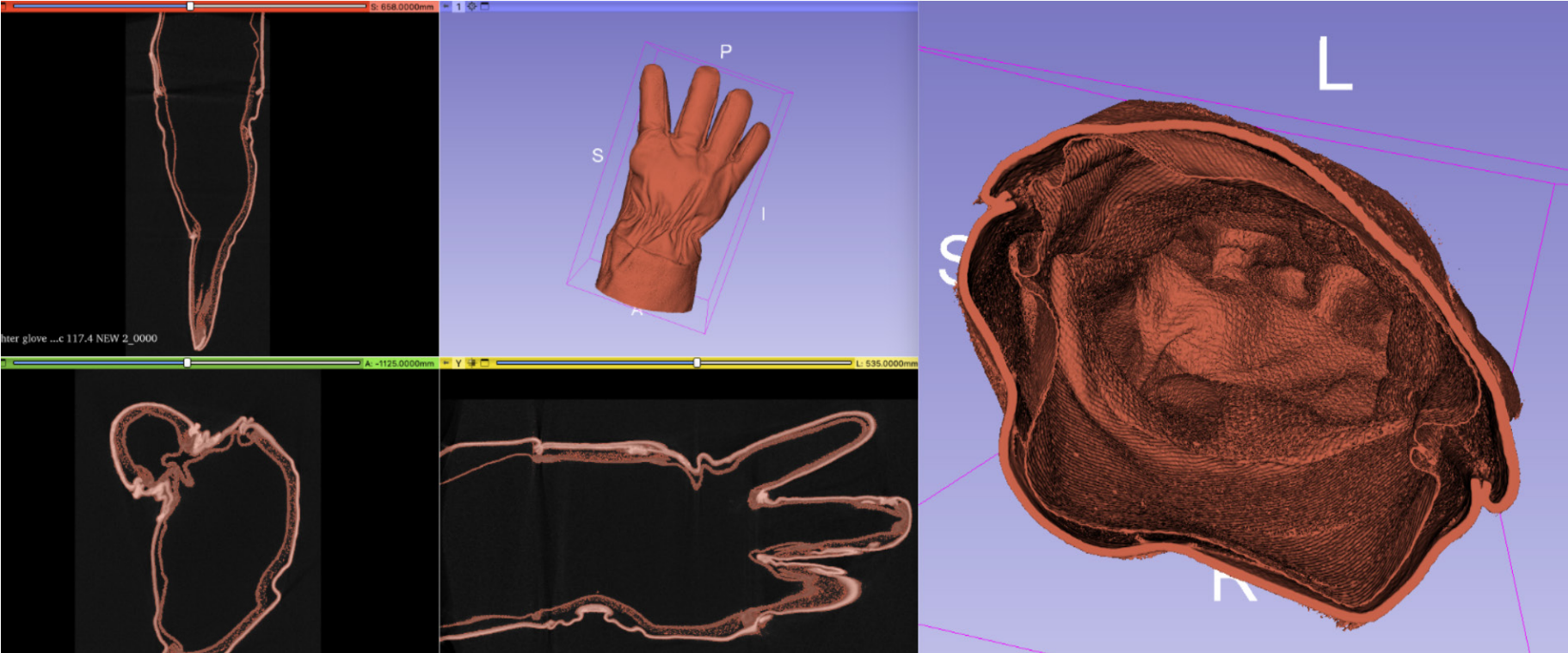


Image 2. Glove CT Scanning.



Image 3. Glove Interior-Hand Comparison; Using CT Scanning, glove interior can be captured with high dimensional accuracy. 3D hand scans are aligned with the cross-sections of CT scan data to understand the differences between glove webspace and hand crotch slope.

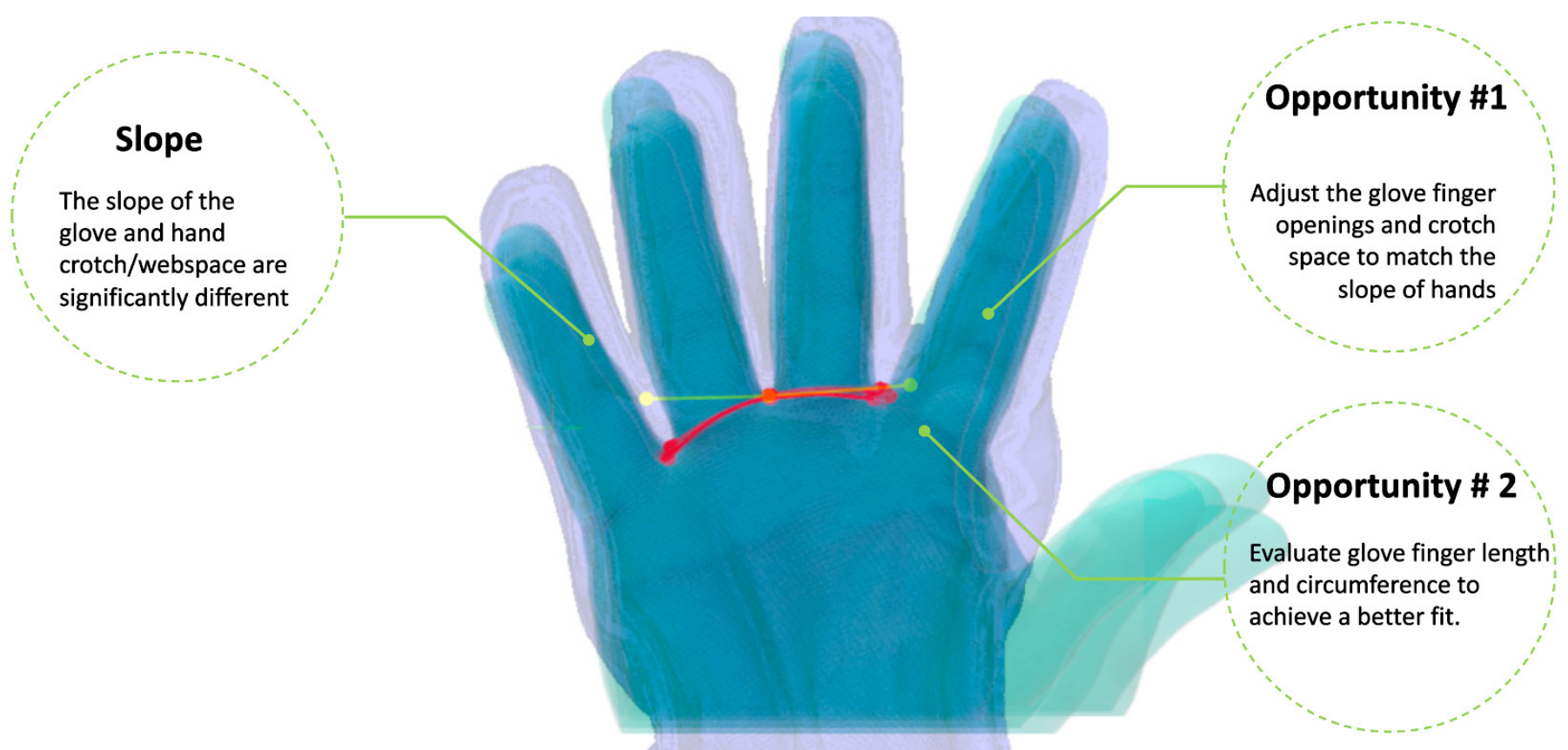


Image 4. Opportunity to Improve Glove Functional Fit; Comparing interior shape of gloves with hands enhances the understanding of the glove-hand relationship and demonstrates how a relatively small change in finger crotch slope could drastically improve fit of gloves.