Introduction

• One in 323 children are born with cerebral palsy in the US and 2 in 3 could walk if given proper orthosis. Fusiform has designed a method to streamline the process of creating custom orthosis. However, the orthosis design still takes about 10 hours.

• Goal: To develop a browser-based constructive solid geometry application for the efficient creation of a 3D modular orthosis and reduce the current Fusiform design process by ten fold.

The Problem

• 1 in 323 children are born with cerebral palsy in the US
• 2 in 3 could walk if given proper orthosis
• Ankle foot orthotic devices – correct gait and prevent deformities
• Custom orthoses take 3-4 weeks to complete
• Fusiform creates orthotic devices using leg scan
• Problem: Fusiform process takes up to ten hours in SolidWorks and expertise in SolidWorks needed

The Solution

• Browser-based constructive solid geometry application
• Browser-based application is capable of:
  • Adding basic shapes (cube, sphere, plane)
  • Performing CSG operations (union, intersection, subtraction)
  • Performing mesh modification (cutting, smoothing, simplification, scaling)
  • Importing local STL files
  • Exporting creations as OBJ files
  • Removing objects from the scene

Outcomes and Results

• Browser-based platform to help further streamline orthosis design by removing many often unnecessary (for this task) features in standard 3D CSG software
• We are now able to provide software to clinicians that is more scalable and user-friendly than other 3D CSG software

Future Work

• Vikram will continue to work with Fusiform to finish any unmet deliverables and further improve the usability of the application
• Next steps: implement water tight algorithm, removal of extra points inside the mesh, and improve usability

Lessons Learned

• Learn new programming language – Javascript
• Translating C++ code to Javascript
• Integration of open source packages
• The importance of documentation in software design

Credits

• CSG Integration – Vikram Chandrashekhar
• Mesh modification– Nicole Ortega

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