BME Symposium eBooklet Abstract

Team 9

OsteoSurface Solutions

Team members:

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Mentors:

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Title:

3D Bone Reconstruction and Segmentation

Abstract:

The accurate diagnosis and effective treatment planning for orthopedic conditions rely heavily on the precise visualization of bone structures from medical imaging data. Current imaging modalities, such as CT and MRI scans, provide detailed cross-sectional images but require extensive manual interpretation. Our project, 3D Bone Reconstruction and Segmentation project addresses this gap by developing an intuitive software solution that transforms 2D medical imaging data into high-resolution 3D bone models.

Orthopedic surgeries are driving demand for advanced imaging technologies. As the aging population increases, the need for precision in surgeries and bones is growing rapidly. Our system addresses this clinical need with high compatibility across imaging formats, ease of use, and rapid processing speeds. The global orthopedic market is projected to reach $65 billion by 2027, with imaging technology playing a key role in diagnostics and pre-surgical planning. The

projected growth rate for 3D Bone reconstruction is $2.8 billion by 2032. North America accounts for 35% of the global medical imaging market. Which is valued at $14.3 billion, driven by advancements in imaging and AI.

The key design specifications include a modular architecture featuring both client-side and server-side components: a web interface built with React JS for intuitive interaction, a Three.js interface for 3D viewing, and a Django-based segmentation server that executes thresholding and neural network-based algorithms for enhanced accuracy.

The cost-effectiveness and scalability are central to our design approach. The use of cloud-based processing minimizes local hardware requirements, making it a feasible option for various healthcare settings. Furthermore, the modularity of our software allows for seamless updates and customization, reducing manufacturing and maintenance costs.