Introduction

Short introduction explaining the reasoning for FEM. A short explanation of the utility of FEM

Mesh Construction

Why we need to construct the mesh

Delaunay Triangulation

Explanation of what delaunay triangulation is, and why it is useful.

Construction of Triangulation

Overview of the major methods sof the construciton of delaunay triangulation, and the merits of each one.

Divide and Conqure

Short explanation of the divide and conqure algorithm develped by chew.

Sweep Line

This is one of the faster methods for constructing the delaunay triangulation.

Edge Flipping

Explanation of the edge flipping algorithm, with psudocode of the algorithms utilized in the process.

BinSort

TriLoc(Walking mesh)

EdgeFlip

In Circumcircle

Construction of Constrained Triangulation

Comment on the importance and use of the constrained alternative of dalaunay triangulations

Divide and Conqure

There is a modification that construces the constrained triangulation at the same time.

Sweep Line

There is a implementation that construces the constrained triangulation during the implementation of the unconstrained sweep line algorithm. This is extreamly fast, but was too difficult for me to implement.

Edge Flipping

This just uses the same stuff from triloc and edge flipping, but it adds one or two new algorithms.

Intersecting edges

Find All intersections

System Of Equations

Sparse Matrix

Most of the elements in the matricies will be zero, so we want to implement optimizations for sparce matricies. Explain more as to why this is important, from the memory issues.

Krylov Subspaces

This is a really cool thing. It is a subspace of the solution of the system of linear equations. Check with paul on the proof of this.

Iterative Methods

These are a methods for approximating the solution to systems of linear equation of the form $Ax = b$. They convere to the actual soultion at different rates. And we require a tolerance that we stop at.

Stationary Methods

These methods are very simple to implement and understand, but they converge very slowly, and are not great. They should be avoided.

- Jacobi
- Gauss-Seidel
- SOR
- SSOR

Guass-Seidel

We present an implementation of this method??

Nonstationary Methods

These methods are much faster, but they are much more complicated and take a lot more work to implement. Most of these use sequences of orthogonal vecotrs, which can be constructed by the basis if Krylov subspace.

- Conjugate Gradient
- Minimum Residual
- Conjugate Gradient on the Normal Equations
- Generalized Minimal Residual
- BiConjugate Gradient
- Quasi-Minimal Residual
- Conjugate Gradient Squared
- Biconjugate Gradient Stabilized
- Chebyshev Iteration

GMRES

We examine further an implementation of gmres, and provide psudocode.