Triangle Mesh Optimization

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Outline

* Background
* Distributing Meshpoints
* Projection Method
* k Nearest Neighbors
* Exterior Domain
* Outer Boundary Force
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Meshes are commonly used in computer graphics and simulations.
Distributing Meshpoints

Coulomb’s Law: \[ F(r) = k_e q \sum_{i=1}^{N} q_i \frac{r - r_i}{|r - r_i|^3} \]
Projection Method
k Nearest Neighbors

\[ k = 5 \]
3-D Case
Exterior Domain
Outer Boundary Force

\[ F_b(\phi) = k_e q^2 \frac{\nabla \phi (\phi + 1)}{\phi^2} e^{-\phi} \]
Signed Distance Function

circle: \[ \phi = C - \sqrt{x^2 + y^2} \]

center of circle

\( C = 1 \)
Comparison

All Points

15 Nearest Neighbors
Comparison

All Points

15 Nearest Neighbors
Meshpoints were distributed across a given domain by giving the points properties that of electric charges.

Mesh quality was improved through the projection and k nearest neighbors methods.

Future work includes decreasing computation time (ex: writing C code) and exploring further into using a second domain to improve mesh quality.
Questions?