OBJ PHYSICS MODELER

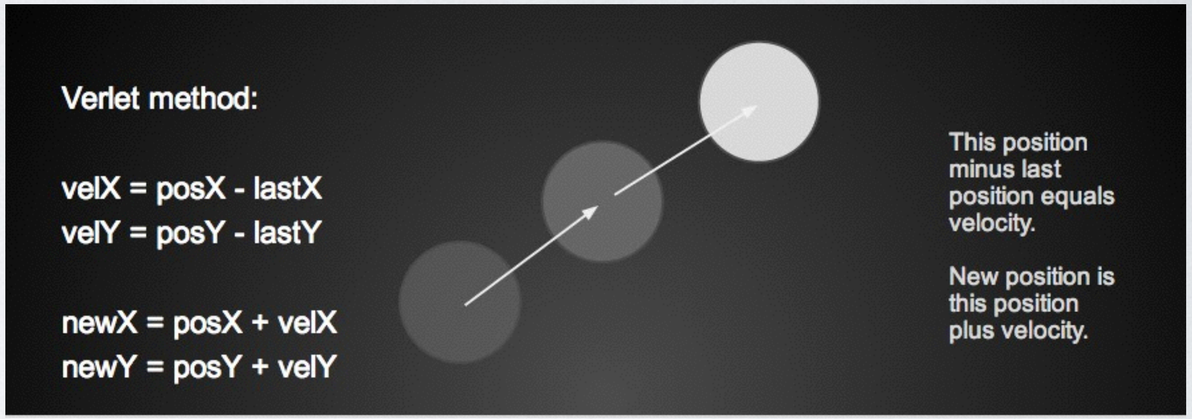
Benjamin Laws

OVERVIEW

- Object models are static; is there a way to dynamically simulate them?
- Goal: add physics to meshes without requiring extra stored data.

MODELING SCHEME

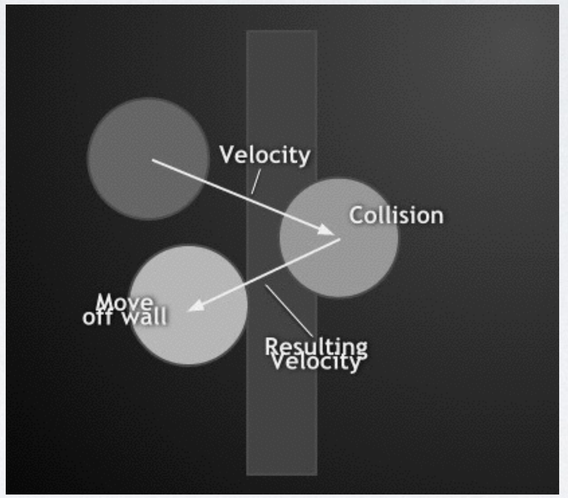
- Verlet Integration



http://blog.2and2.com.au/?p=883

MODELING SCHEME

- Verlet Integration



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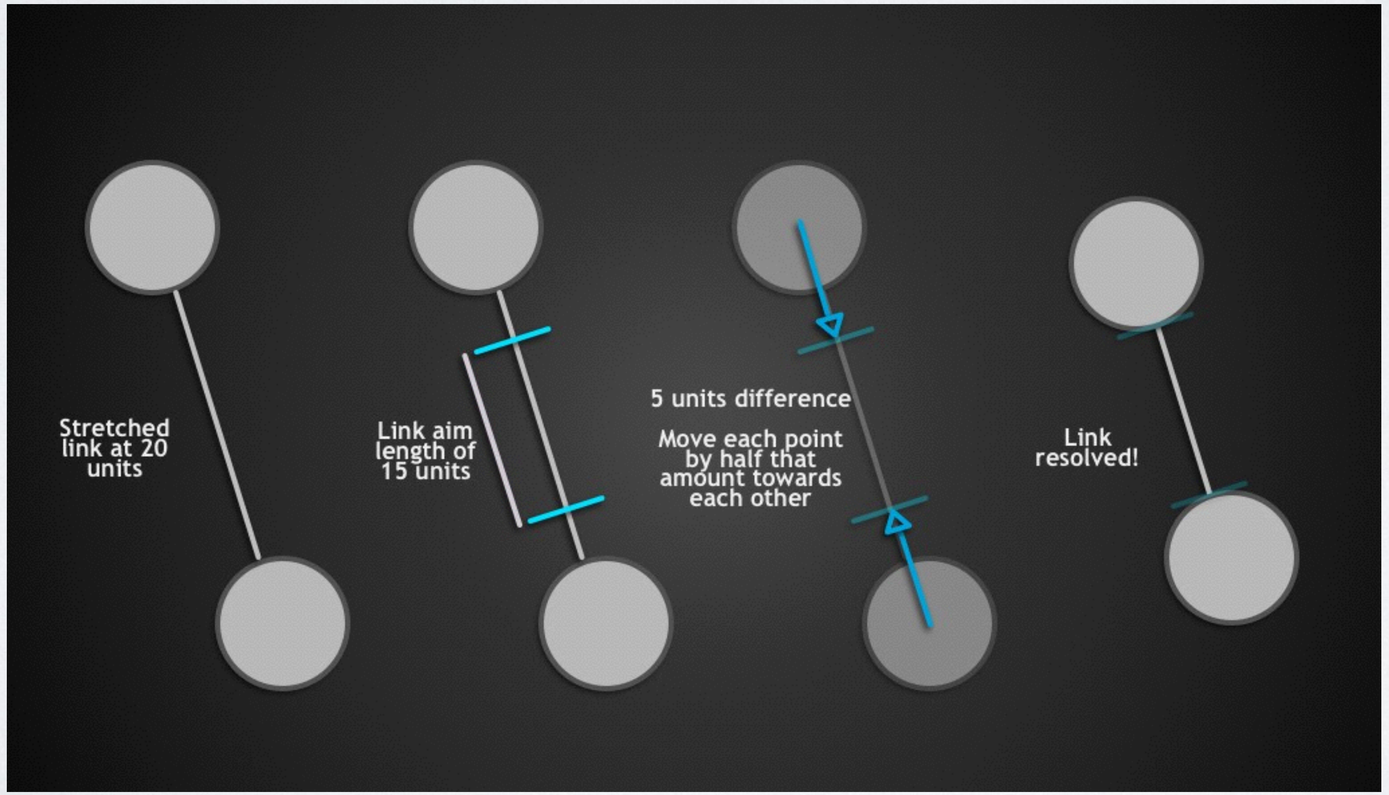
MODELING SCHEME

- Verlet Integration



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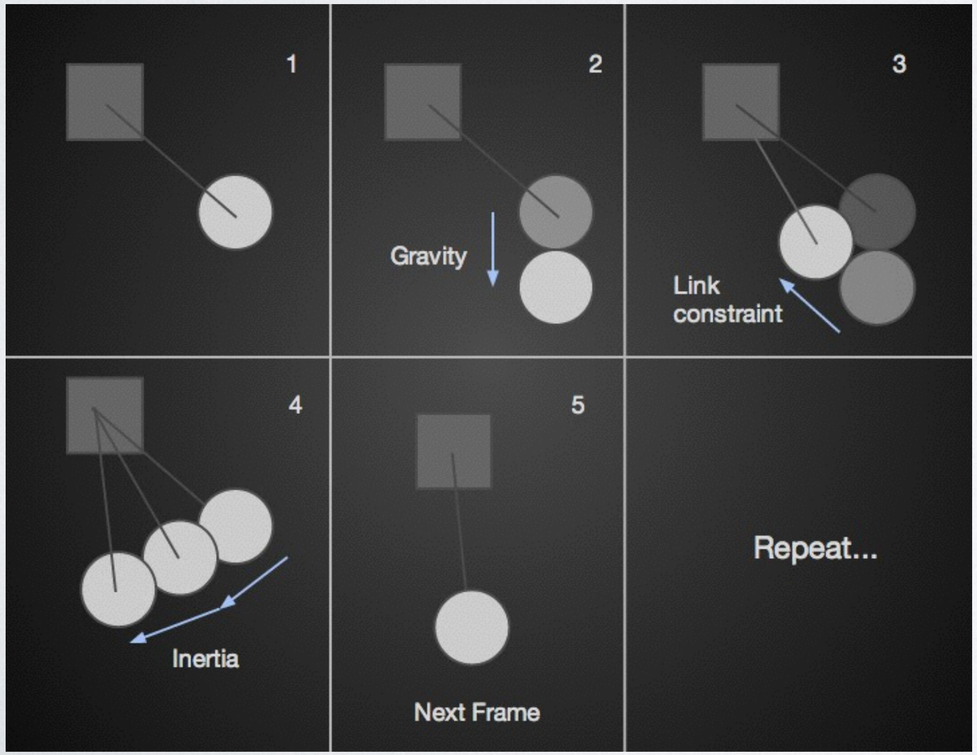
- Verlet Integration



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FORCES AND CONSTRAINTS

- Gravity
- Wind
- Friction
- User "pokes"
- Mesh connections (three levels)
- The bounding volume
- Pinned vertices

TYPES OF MESH CONNECTIONS

- Level 0: no connections.
- Level 1: only vertices connected by triangle edges are connected.
- Level 2: vertices are connected to their neighbors and to their neighbors' connections.
- Level 3: all vertices are connected to all other vertices.

TYPES OF MESH CONNECTIONS

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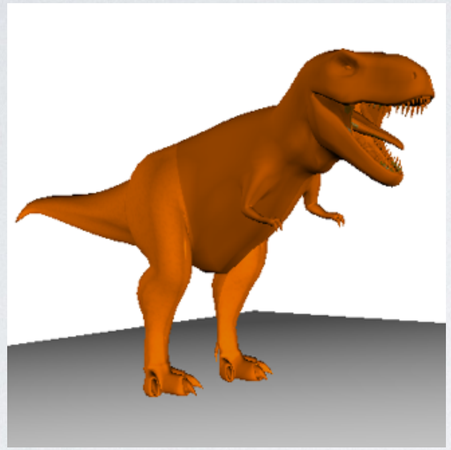
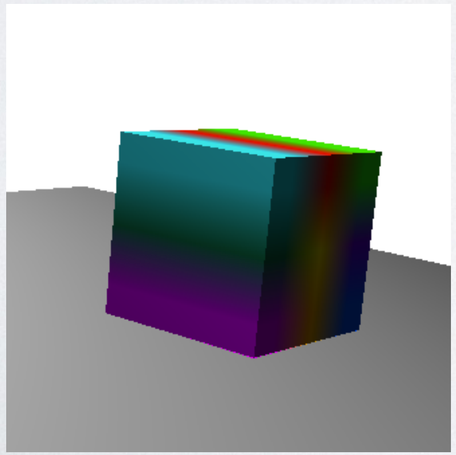


Level 3



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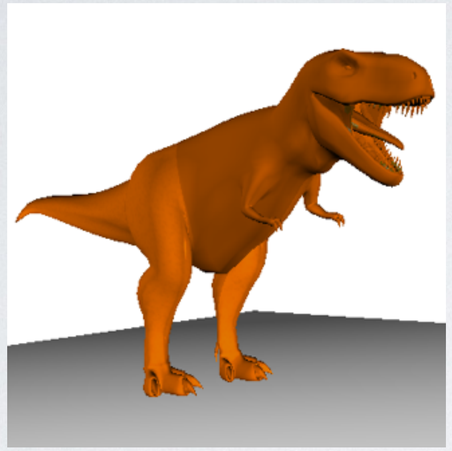
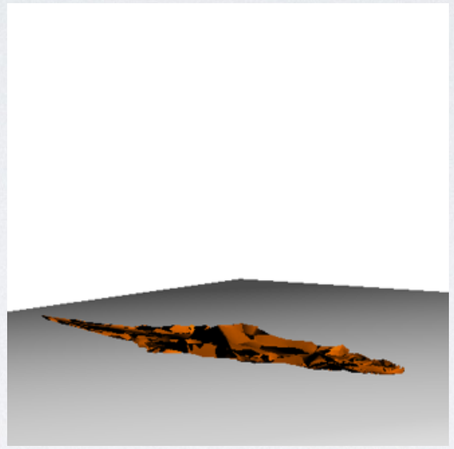
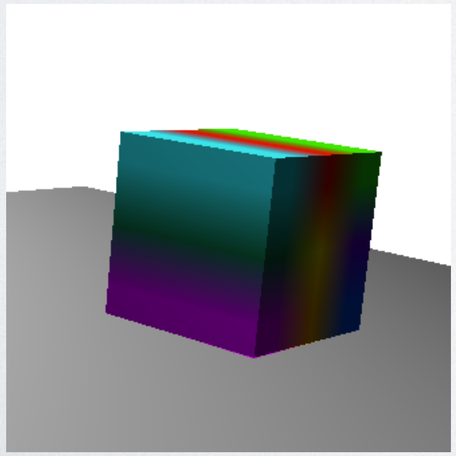
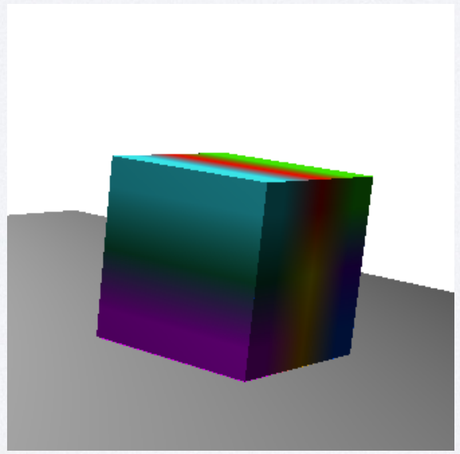


Level 3



Level 1





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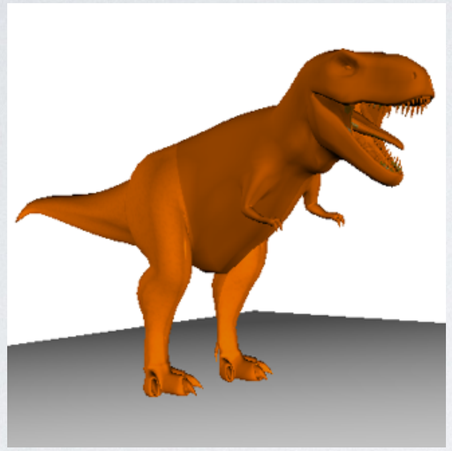
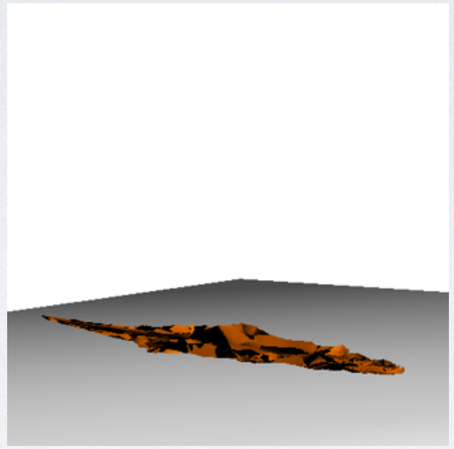
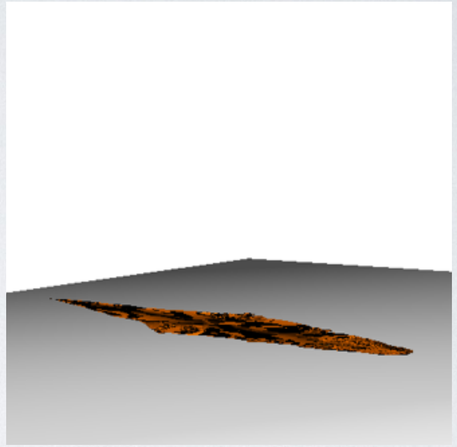


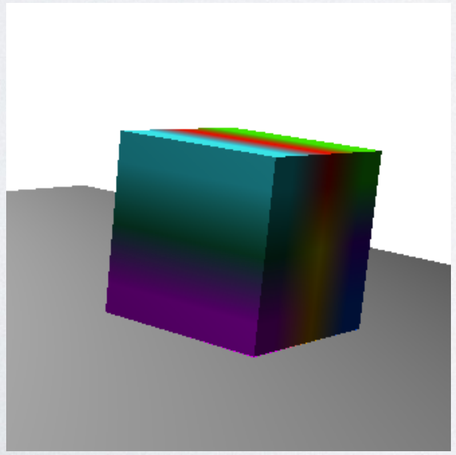
Level 3

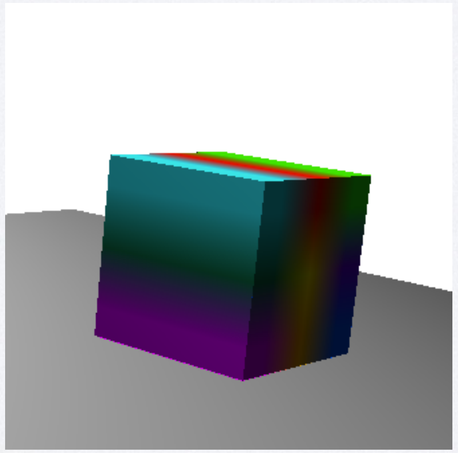


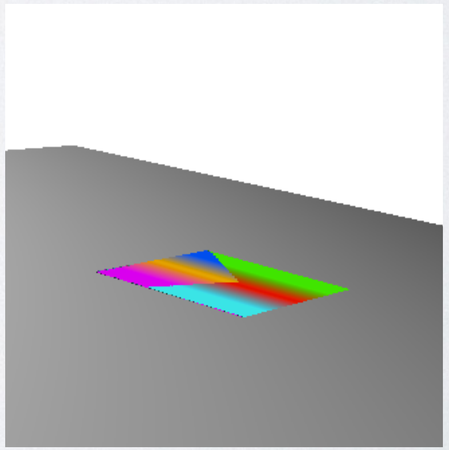
Level 1



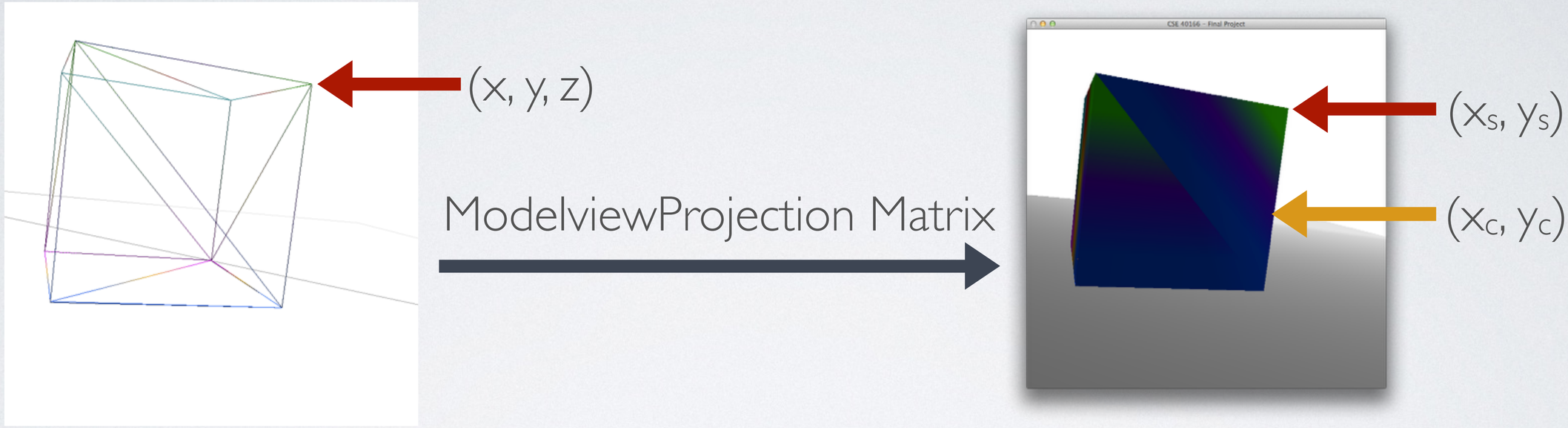
Level 0





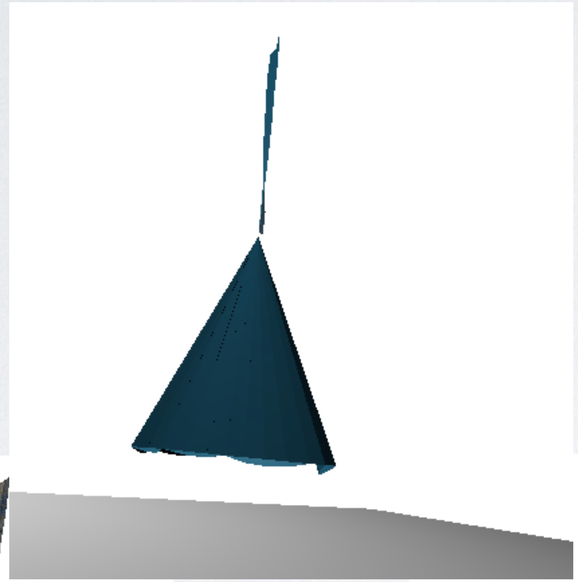


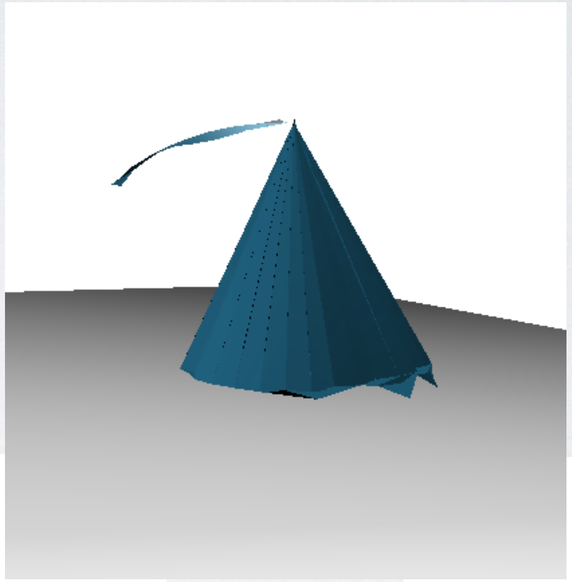
FINDING CLICKED VERTICES

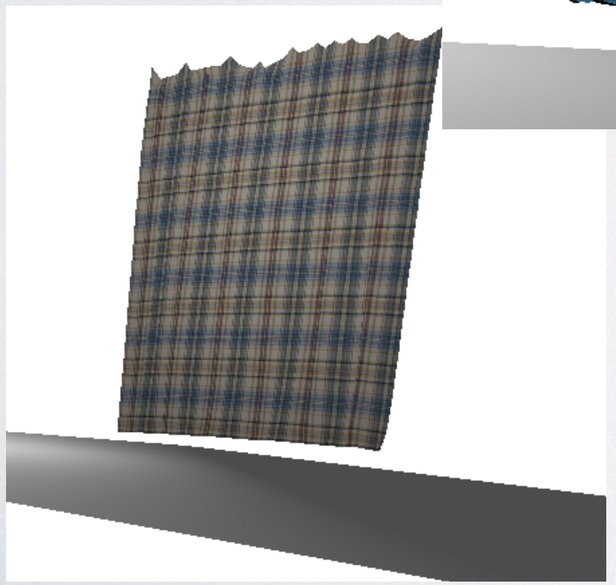


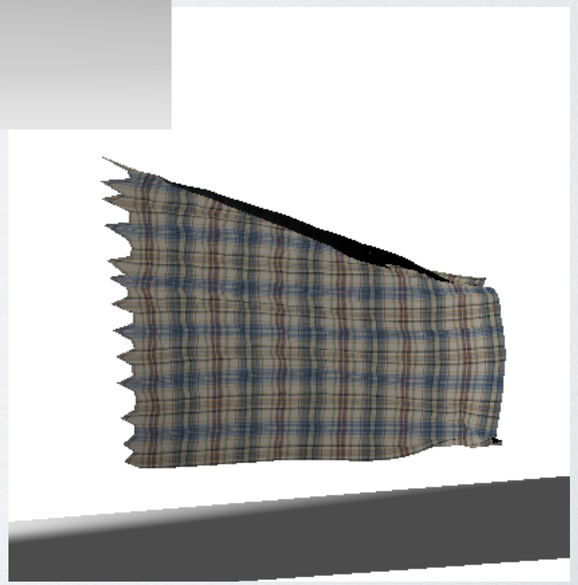
- Each vertex (x, y, z) is transformed to a screen position (x_s, y_s) that can be compared to the location (x_c, y_c) of the user's click.

PINNING AND WIND









VERTEX DELETION

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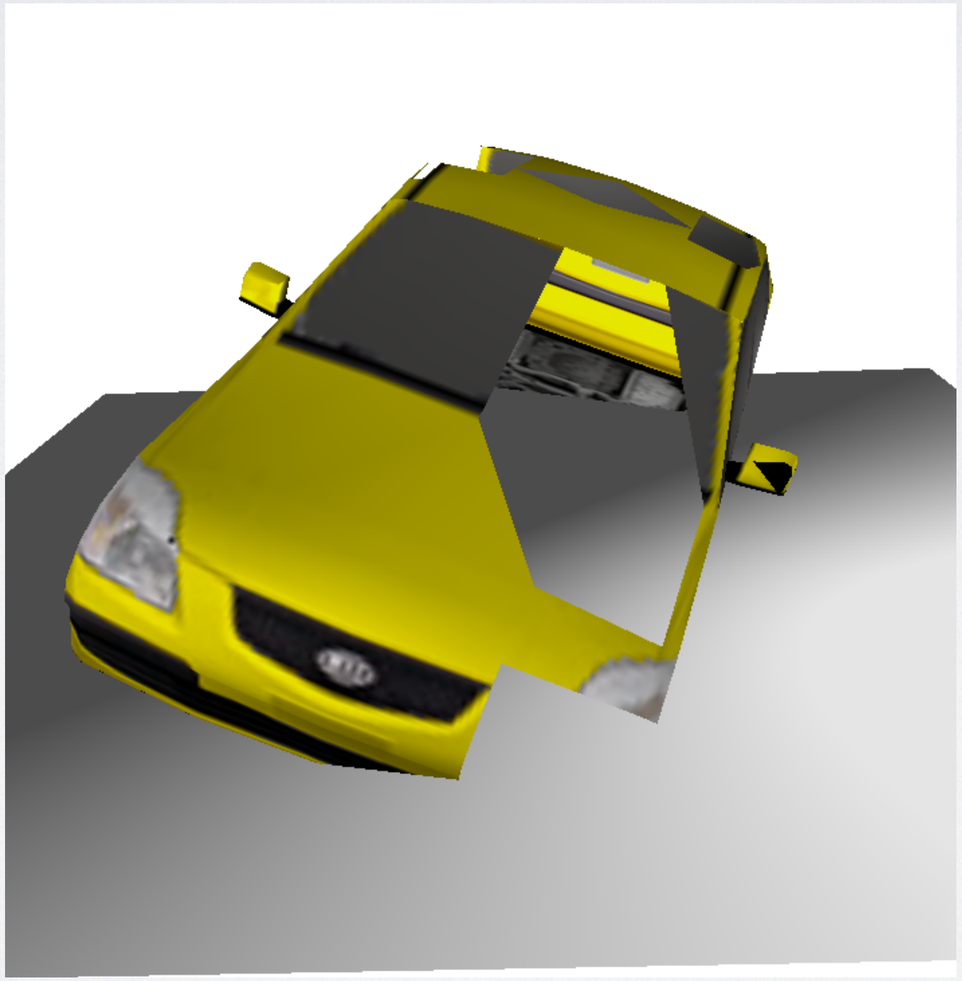

POTENTIAL ADDITIONS

- Optimize connection levels 2 and 3 to run in real-time for models with many vertices.
- Make lighting more realistic by recalculating mesh normals each frame.
- Create calculations to allow separate parts of models to interact with each other.

THANKS

- Verlet Integration: http://web.archive.org/web/20080410171619/http://www.teknikus.dk/tj/gdc2001.htm
- Verlet images: http://blog.2and2.com.au/?p=883
- tinyobjloader: https://github.com/syoyo/tinyobjloader
- SOIL Image Library: http://www.lonesock.net/soil.html