Project proposals

Collisions and Plasticity

Simon Wicky, Ludo Hoffstetter, Sébastien Gachoud

Summary

The general idea behind project is to showcase an explosion, which would happen close to a mesh and permanently damage it. To produce this effect we would need three component namely :

- Plasticity
- Collision
- Ponctual explosion

As it is more interesting to implement the first two components, the actual explosion will be moved to the extended goals.

Collisions

This part of the project is about implementing collision within the same mesh, e.g. the eight figure mesh provided will not be able to self intersect anymore, when dragged around.

Technical approach

To implement collision, we will need to :

- Detect collisions:
  For each point, determine whether it is inside or outside the mesh
- Determine what to do with a point inside the mesh
  We cannot just push it to the nearest edge, it could go through the model
- Resolve the collision by moving the point where it should be with the help of a constraint

We can already anticipate difficulties to determine where the problematic vertex should go. The collision constraint should have a strong weigth to look realistic.

The collision with the floor will be kept as is.

Plastic deformations

If an object is too strongly stretched or bent, its rest shape will change. We want our simulation to behave in this sense.

Technical approach

To implement plasticity we will need to :

- Compute per edges tensions (length difference)
  We need a way to tell whether an edge has been stretched too much
- Compute per vertices bending (curvature difference)
  We need a way to tell whether a part of the mesh (a vertex) has been bent too much
- Adapt the rest length and curvature if the diefference exceeds a given threshold

It is not sure that this approach is enough for the plasticity to look realistic.

Extended goals

As stated in the summary, we would like to add point explosion. We would be able to trigger an explosion at a given coordinates with a given force. It would then create a shockwave traversing the mesh, which will react accordingly. If we fix the mesh somewhere, it could for example wiggle around and deform itself if the explosion was too strong.