DGI17 project specification

Nils Lenart

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1 Background

Cloth modeling is subject to long standing efforts in computer graphics. One popular way to model cloth is by treating the cloth as made up of discrete particles which are connected together by springs [NMK+05]. The systems is evolved with Newton's mechanics and the forces are computed by Hooke's formula. This is a natural way to solving the problem. Merely treating the cloth as based on springs often lead to unnatural behavior, such as high springiness and a rubbery impression. [Provot95] use constraints on the springs to prevent them from extending too much, which is a solution to this problem. The idea in this project is inspired by [Müller06], where the dynamics is entirely based on constraints. This gives a robust framework for modeling and good extensibility with constraints of interest. For details of the process, please see the blog at https://dgiproject2017.wordpress.com/.

2 Scope and implementation

This project will focus on implementing a constraint based cloth model to see if it seems like a feasible alternative to spring-mass model and to see if it can be done in real-time.

The project will implement a cloth model based on the position based dynamics in [Müeller06]. It will be a simple version with the aim to see what cloth modeled only with constraints would look like and to see if it can be an alternative to spring-based models. Another aspect is to see the performance of such a model to see if it can be used in real-time

The simulation will be implemented in Java using the Processing graphics library. The algorithm will be similar to [Mller06] but will not include all details. Only distance based constraint will be used, all masses will be set to 1, no damping of velocities (but collision friction), only nearest-neighbor distance constraints will be used within the cloth, and only simple collision with a sphere which can easily be handled with distance constraints.

3 References

[Müller06] - MÜLLER M., HEIDELBERG B., HENNIX M., RATCLIFF J.: Position Based Dynamics. 3rd Workshop in Virtual Reality Interactions and Physical Simulation "VRIPHYS" (2006).

[Provot95] - PROVOT X.: Deformation Constraints in a Mass-Spring Model to Describe Rigid Cloth Behavior. Graphics Interface (1995).

[NMK+05] - NEALEN A., MÜLLER M., KEISER R., BOXERMAN E., CARLSON M.: Physically based deformable models in computer graphics. Eurographics 2005 state of the art report (2005).