

Animating hair using SPH and LCP

Master Thesis Proposal

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Background

Realistic hair simulation is a challenging task due to the natural fluid motion of hair and the great number of strands[1]. Simulating human hair becomes a balance game between realism and performance[2]. The realism of computer graphics animated hair in movies is really good and might at times be indistinguishable from real hair. However, rendering such realistic hair in real-time is much more complicated.

Problem

Investigate hair simulation with smoothed particle hydrodynamics(SPH) and loosely connected particles(LCP) at an interactive frame rate [3]. Evaluate the balance between performance and perceived realism. What aspects of hair movement are the most important for the perception of virtual characters.

Implementation

The 3D games engine Unity will be used for creating a scenario where the hair can be visualized. It will help with the loading of models, rendering etc. In Unity scripts will be used to implement SPH, LCP and all other things needed such as shaders etc. SPH is a fluid simulation method that is based on a mesh-free Lagrangian method [3]. It is suitable for giving a fluid motion to collections of particles and can thus be used in simulations of water, cloth, hair etc. LCP is a particle system method where the particles are unordered and only loosely connected to their neighbours, which means they can be separated unlike ordered connected particles, and can be used to separate hair wisps[3]. The 3D-modeling tool Blender will be used for creating models and applying anchor points for the hair on models[4].

Evaluation

The project will focus on evaluating the performance of the method and will also use the method to test the human perception of virtual characters. It

would be interesting to look at what aspects of hair simulation that are the most important for the perceived realism so that simulations can focus on these aspects and this way improve upon the performance.

References

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