

Review of

*Multi-resolution Clustering for Enhanced Elastic Behavior in Clustered Shape Matching***Summary**

Multi-resolution Clustering for Enhanced Elastic Behavior in Clustered Shape Matching is a research paper written by 2 students from the University of Maryland within the context of the MIG (Motion in Games) 2020 virtual event. It tackles the concept simulating deformable objects animation through physics. The authors contributed in the attempt to study and recreate deformation with both stiff and flexible objects by proposing a method as suggested in the title of their paper that derives from Newtonian physics. With shape matching, an explicit Euler scheme was used to find the position and the velocity of a set particles to compare and match the rest shape to the deformed shape of the set. Then, using clustered shape matching, the set of particles is divided into multiple clusters, where each individual particle is associated to a cluster. They stated that a higher cluster number leads to a more deformable behavior. The final position and velocity are then computed with the weighted average of said metrics from each cluster. This algorithm is applied for 4 different resolutions that each use different weight functions that affects any internal forces associated to a particle.

Strengths and Weaknesses

This paper's strengths lie in its thorough experiments, which obviously prove to be successful to support the authors' theoretical claim. In fact, they conducted different experiments for 7 different cases and objects, with different number of particles, clusters, and weight values (from the different resolutions) to visualize the objects' behavior and see if they match their expected behavior. Overall, the results respected the expected behaviors and therefore shows that their method to enhance stiff and flexible object deformation is legitimate and can be used by computer animators. However, the authors' used the explicit Euler scheme, although efficient at small timesteps for predicting a particle's next position and velocity, can lead to errors at larger timesteps, which can hinder an object's overall deformation behavior.

Presentation

The paper is presented rather well with clear and concise vocabulary to further support its claim in an efficient manner with clear visuals. Speaking of visuals, the paper perfectly describes each experiment and their respective figures to help the reader understand the overall research. The table of parameters helped a lot the reader to understand how each parameter is used and its purpose, and how it affects the object's behavior. Moreover, the mathematical formulas were well presented as each term was well defined and were well explained in a sequential manner.

Decision

I accept this paper. In fact, the paper presents an enhanced model for representing the deformation of both stiff and flexible objects, with variable parameters. Their experiments are thorough enough to

prove the legitimacy of this method. However, further experiments could be conducted just in case to test the limits of their integration scheme in order to see if the deformation motion is still respected.