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Review of *Towards Animating Virtual Humans in Flooded Environments*

Summary

Towards Animating Virtual Humans in Flooded Environments is a research paper written by 4 students from the Pontifical Catholic University of Rio Grande do Sul in Brazil on the context of the MIG (Motion in Games) 2020 virtual event. It tackles the concept of creating a realistic simulation of human (or "agents") movement and behavior within flooded environments, mostly for games. For instance, walking normally, walking with an effort, and getting dragged by a fluid are all behaviors expected out of it. Their main contribution is achieving this simulation by combining 2 physics simulation model: BioCrowds for human motion and collision detection, and SPlisHSPlasH for implementing smooth particle hydrodynamics solvers. Using Newton's law of momentum conservation, they derived a new function that returns a resulting velocity vector of an "agent" and introduced a parameter τ that affects the fluid particles' overall momenta upon collision.

Strengths and Weaknesses

Overall, the authors successfully substantiated their claim by performing enough thorough experiments. In fact, with 50 agents, they managed to demonstrate the expected behaviors with different τ values and different fluid velocities after 12 different tries and provided visual proofs to support their experiment. In other words, their claim holds itself theoretically, with different test cases and metrics. However, there is a limitation that may hinder their experimentation results: the number of agents in the simulation. In fact, tests were only conducted for roughly 50 agents, but there aren't any results for a higher number of agents, which can drastically change the overall result evaluation. There isn't any confirmation if the number can affect the claim itself at hundreds, thousands or near infinity. Moreover, another experiment has been conducted with a single obstacle to show that a fixed object could create a safe zone for agents who can be unaffected by the fluid, but it isn't thorough enough since it hasn't been tested with different kinds of obstacles (different length or size).

Presentation

This paper was well presented overall. In fact, the authors employed concise vocabulary that helped them present and support their claims effectively. They also used clear visuals and diagrams to further explain their experiment to help the reader to understand and visualize better their research. However, although well detailed, the mathematical explanation in the paper seemed too convoluted as there wasn't any clear way to help the reader understand what a certain formula consists of and its purpose. This section needs better structuring and maybe visuals to explain the importance of their math formulas.

Decision

All in all, ignoring small presentation flaws and concerns regarding experiments, I accept this paper. In fact, its strengths outweigh its flaws as the paper well presented thorough experimental data by putting mathematical formulas to practice to further support and prove their research. They succeeded in providing a model that can simulate objects in flooded environment that can prove to be useful for

crowd control simulations. I believe, despite its weaknesses, this paper has potential to further develop the research in question given more time and resources.