RESEARCH INTO THE SIMULATION OF SHOCK WAVES

Abstract

Authors:
Michael Jones, Tomasz Mackow, Robert McDonnell

Project Name Simulation Of Movement Of Shock Waves Within An Environment In Real Time
Names of Students Michael Jones, Liam Ireland, Tomasz Mackow, Gina Perera, Robert McDonnell
Supervised by: Dr Peter Kenny

Project description

The aim of the project was to explore different methods of simulating the movement and physical effects of shock waves in real time.

We aimed to create a plug-in for a video game engine, enabling realistic shock wave simulation in any environment created within the game engine.

We also aimed to create an interactive demonstration for the plug-in, which would allow the user to modify the environment, the origin of the shock wave and the physical parameters of the shock wave and the wave medium.

Results

Shock wave simulation software was implemented in *Unity3D*, an open-source video game engine. The system simulated interactions between shock waves and physics objects. The system was generalised so that physical parameters (such as the normal pressure of the wave medium and initial wave speed) could be adjusted.

Demonstration software was created, which provided a test scene and user controls for the parameters of the shock wave system and the viewport.

A number of wave models were considered including representation as a sphere, as a mesh, as particles and using smoothed-particle hydrodynamics. Several implementations of the system were developed and evaluated, including a simple sphere-based system and several different particle-based systems.

A simple physics engine was developed early in the project, which simulated collisions between rigid bodies with primitive shapes (spheres/boxes). This was not used in the final demonstration of the wave system due to robustness issues.