COMP 438 - Winter 2025

Project Proposal

Marie Giacomel 40321702

Motivation

My main motivation for this project is my passion for game development and my goal of working in the industry in the future. For my final-year project, my team and I are building a game engine from scratch in C++, so I wanted to choose a project that bridges geometric modeling and processing with game development.

Most game engines rely on rigid body physics to simulate solid objects that don't deform, but soft-body physics, like simulating jelly, requires additional techniques to model elasticity and deformation. This project will give me hands-on experience with soft-body dynamics, necessary for creating realistic physics-based interactions in games. Additionally, I wanted a highly visual project that would be easy to showcase and serve as a portfolio piece, while keeping in mind that I've never used libigl before and that it's also a bit of a challenge for me..

Description

The project is developed in C++ using libigl and focuses on simulating various geometric primitives behaving like jelly-like soft bodies. The simulation will be based on the mass-spring system method to model elasticity and deformation realistically. A simple user interface will allow users to adjust key parameters, making the simulation more interactive and engaging. The goal is to create a visually compelling and physically accurate soft-body simulation while exploring real-time soft-body dynamics.

Objectives

Generate Primitive Meshes – Create and render basic geometric primitives (cube, sphere, pyramid, cone, cylinder…) that will serve as the foundation for the soft-body simulation.

Implement a Mass-Spring System – Develop a physics-based deformation using a mass-spring system, allowing objects to behave like jelly-like bodies.

Implement a User Interface – Design a simple and intuitive interface that enables users to control the simulation (change model, height, pause / play, …)

Support Custom Model Importation – Allow users to import their own 3D models (.obj, .off).