MeJ Makers 26’ Spring School

Multi-agent crowd simulation - Learning week in Pertuis activity
Pertuis, 30 March - 1st April 2026

Yves Papegay - yap@informathiques.fr
Laure Vallet - laure@informathiques.fr

Funded by
the European Union

This document is the course material for the activity 10 (Multi-agent crowd simulation - Learning week in Pertuis) in the framework of the Erasmus+ KA210 Small-scale partnerships in school education project ***MeJ Makers****. 2023-2-FR01-KA210-SCH-000176068*

The electronic version is an interactive document delivered under the Wolfram Notebook format. Read it or interact with it can be done with the help of the freely available Wolfram Player.

Introduction

Bases of simulation : Vectors, Position, Velocity, Acceleration

Adding a bit of Physics to simulation

Forces and Newton Laws

Mass

Mass is a measure of the amount of matter in an object (measured in grams).

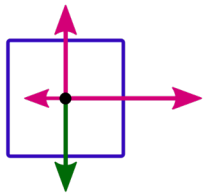
Force

A force is a vector that causes an object with a mass to accelerate (measured in Newton, an example is gravity).

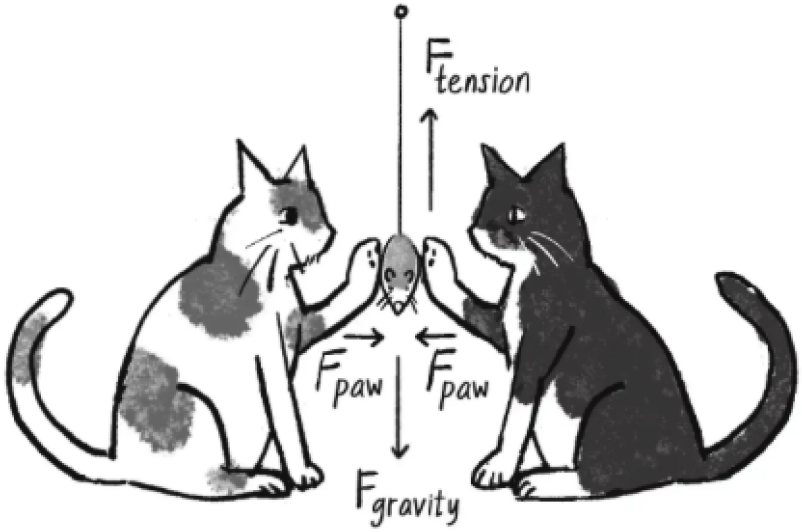
Newton Laws

1. An object at rest stays at rest, and an object in motion stays in motion, at a constant speed and direction unless acted upon by an unbalanced force.
2. Force equals mass times acceleration.

$$\sum \vec{F} = m\,\vec{a}$$



3. For every action, there is an equal and opposite reaction.



Do It Yourself

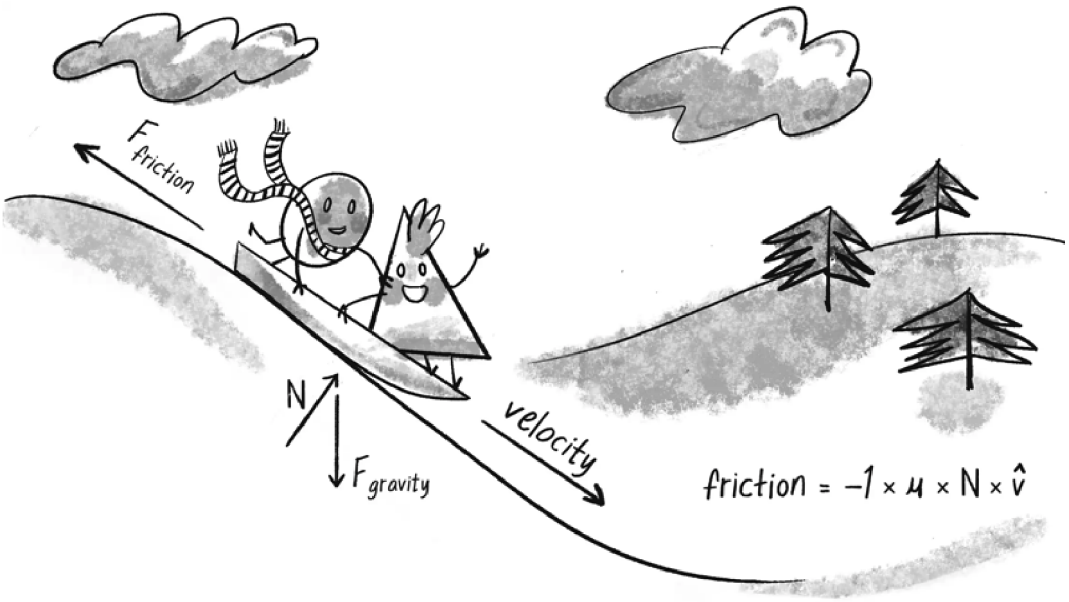
Go to the collection of today's course : https://editor.p5js.org/ypapegay/collections/P1DWM8pBR

Implement forces

1. Based on the "Wind acting on one Ball" sketch, add a second ball of different size and mass and look at the effect of the wind. (solution is sketch "Wind acting on two Balls")
2. Based on the previous sketch, change the gravity force to be scaled by mass. (solution is sketch "Wind acting on two Balls with correct Gravity")

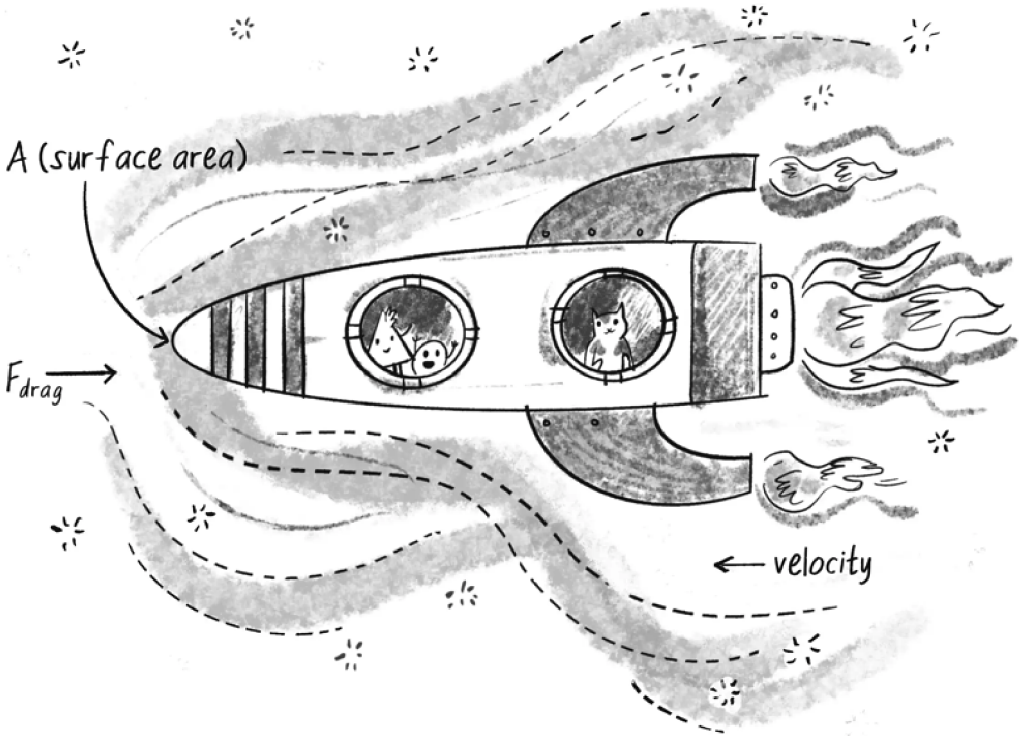
Examples of Forces

Friction

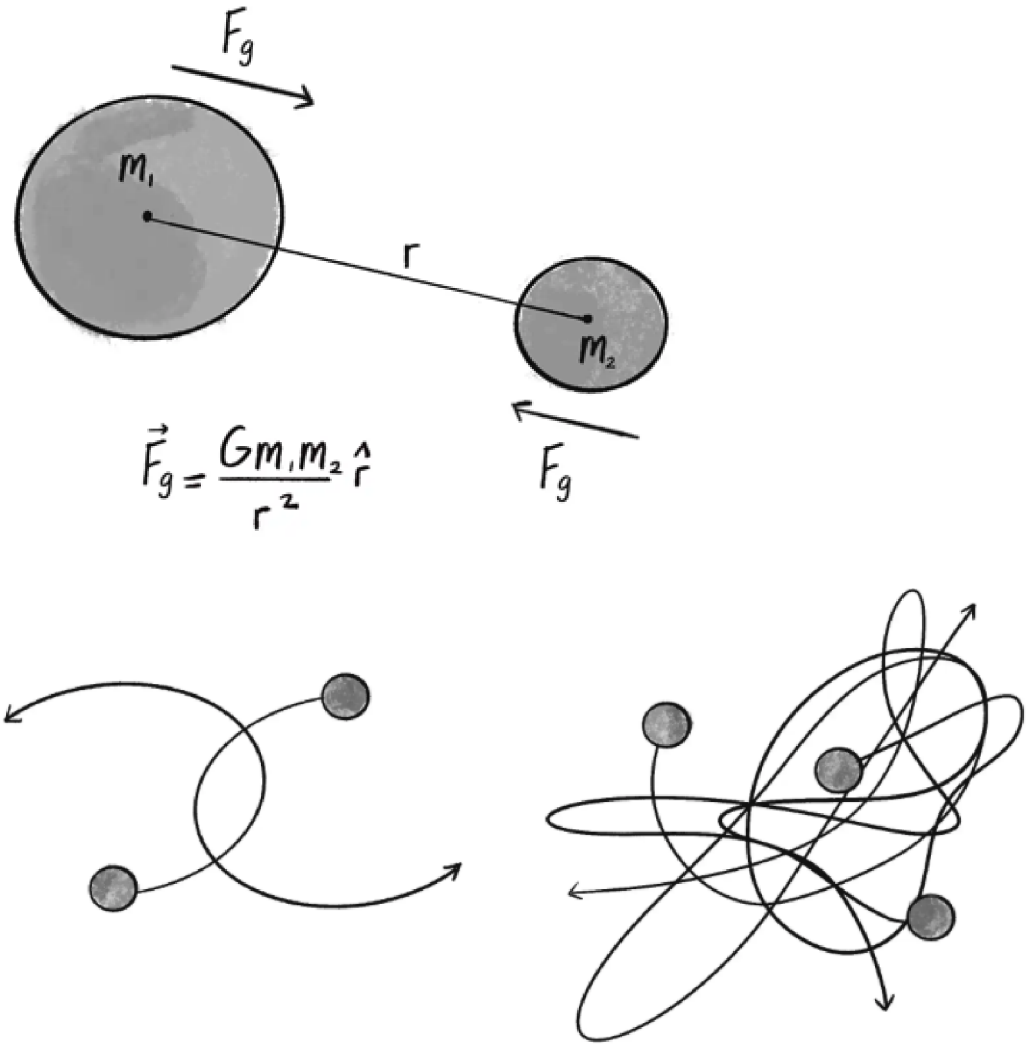


Drag Force (air/fluid resistance)

$$\vec{F}_d = -\frac{1}{2}\rho v^2 A C_d \hat{v}$$



Gravitational Attraction



Do It Yourself

Drag Force Effect

Explore the sketch “Drag Force Effect” where the bottom part of the canvas is supposed to be a liquid.

Gravitational Attraction

1. Based on the sketch “Gravitational Attraction”, extend it to have several agents attracted (solution is sketch “Gravitational Attraction of several agents”).
2. Based on the sketch “Two Bodies Attraction”, extend it to have several agents interacting together (solution is sketch “N Bodies Attraction”).

Reaching a target, Following a Path

Flocking : Separation, Alignment, Cohesion