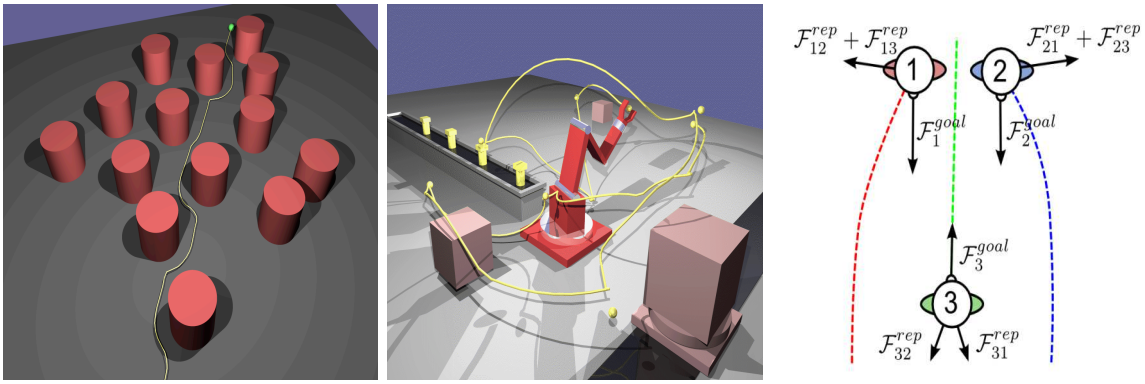
Goal-Oriented Graphics Animation



(a) (b) (c)

Figure 1: Goal-oriented animation. (a) and (b): motion paths for particle and robot arm from David Breen's paper. (c) Simulation of Helbing's social-force model (Figure from [1]).

1 Submission details

- **Deliverables**:
  - A report (in pdf format) containing graphics, results, and your source code.
  - Short videos of the animations. Animated GIFs are fine too.

2 Problem description

The goals of this assignment are:

- To practice programming with the 3-D API environment of choice.
- To practice 3-D rigid transformations and coordinate-system transformation.
- To learn basic concepts of physics-based animation.

In this assignment, you will write a solution for the following problems:

1. Simulate the motion of an object on a plane. The object moves from an initial position to a goal position, while avoiding collisions with various obstacles. The method to be implemented is described in Example 1 of Breen's paper [2]. Figure 1.(a) shows an example output for this animation.

2. Simulate an articulated robot arm as it moves as it tries to reach a set of pre-selected points in sequence while avoiding collisions with obstacles. This is Example 2 in Breen's paper [2]. Figure 1.(b) shows an example image for this animation.

3. Simulate the motion of pedestrians using Helbing's social-force model [3]. See link below for example videos: `https://youtu.be/IeoDhZuAuM8`

References

[1] James Ferryman, David Hogg, Jan Sochman, Ardhendu Behera, Jose A. Rodriguez-Serrano, Simon Worgan, Longzhen Li, Valerie Leung, Murray Evans, Philippe Cornic, Stephane Herbin, Stefan Schlenger, and Michael Dose. Robust abandoned object detection integrating wide area visual surveillance and social context. *Pattern Recognition Letters*, 34(7):789 – 798, 2013.

[2] David E. Breen. Cost minimization for animated geometric models in computer graphics. *The Journal of Visualization and Computer Animation*, 8(4):201–220, 1997.

[3] Dirk Helbing and Péter Molnár. Social force model for pedestrian dynamics. *Phys. Rev. E*, 51:4282–4286, May 1995.