An Interactive, User-Driven Physics Simulator

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Abstract

Physics simulations are often of single concepts or immune to user control. My project aims to change that by allowing users to create a situation and then simulating the behavior of objects in that situation. Users will create objects either by freehand drawing or shape tools, then the program will convert them to polymorphic objects and run the simulation. Objects varying from the simple to complex will be modeled: single shapes or multiple shapes connected statically or with axles.

Background

ASSIST, the program that inspired my project, was made by a team at MIT. In ASSIST, the user uses a "sketchpad" system to draw a situation, which is then interpreted and fed into a commercial physics simulator. It was designed to help engineers in the beginning stages of planning a project, when precision matters less than ideas. My project is similar to ASSIST but focuses more on the physics of the user's situations.

Procedure and Methodology

I will begin by creating a projectile motion simulator as early as possible and then add collisions, friction, rotation, and object interactions. Then a better method of user input, drawing, will be developed. Finally I will add complex objects. Testing will consist of viewing the simulation to see if it appears accurate and process modeling over short periods of time.

Expected Results

I hope to create a program that can accurately simulate any random situation drawn by a user.

Sample Output

```
Color: java.awt.Color[r=193,g=22,b=23]
X: 574.0
Y: 474.53
Vx: -20.0
Vy: -122.1
```

Sample Screenshot