Interactive simulation of the composition of forces.

OOP – GROUP 07 – DS & AI

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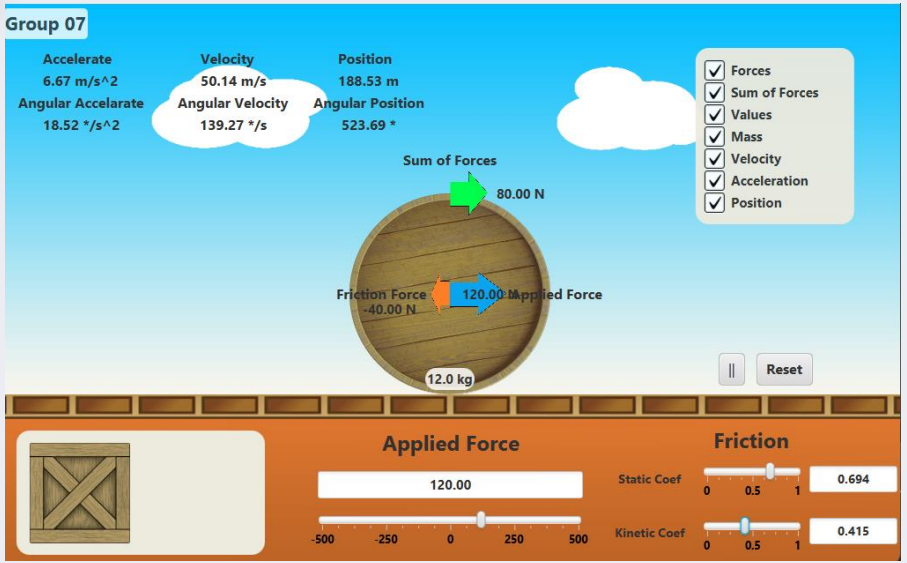


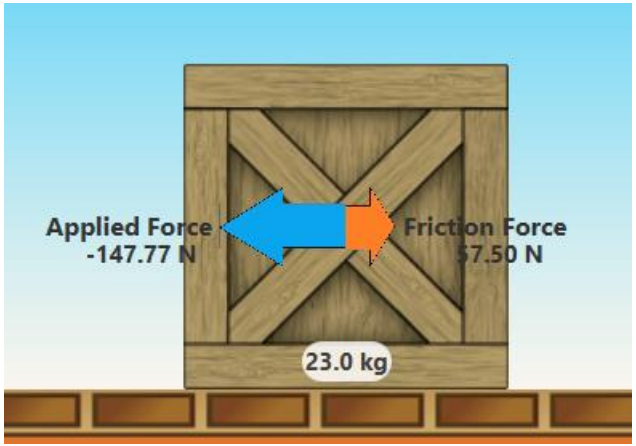
Problem statement

Overview:

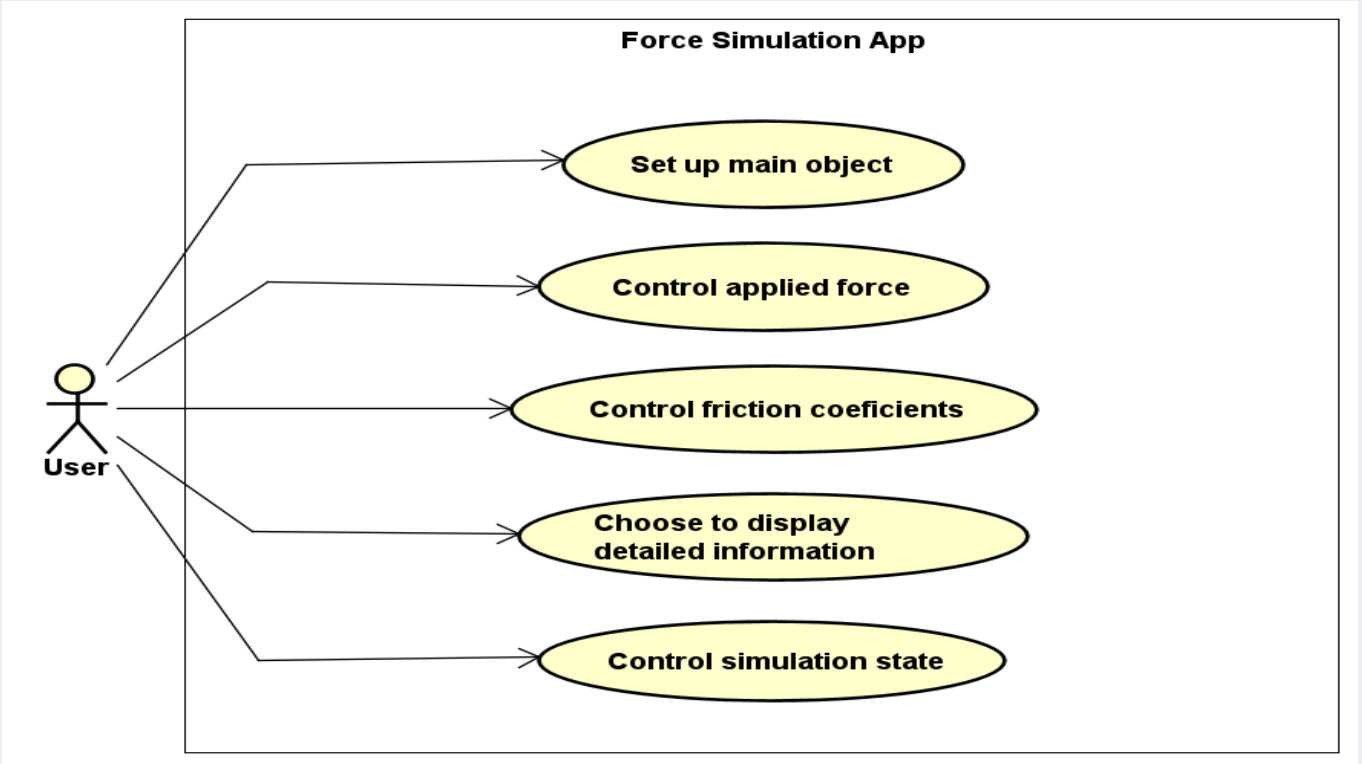
- Simple interactive simulation:
  -> Newton’s laws of motion.

User:

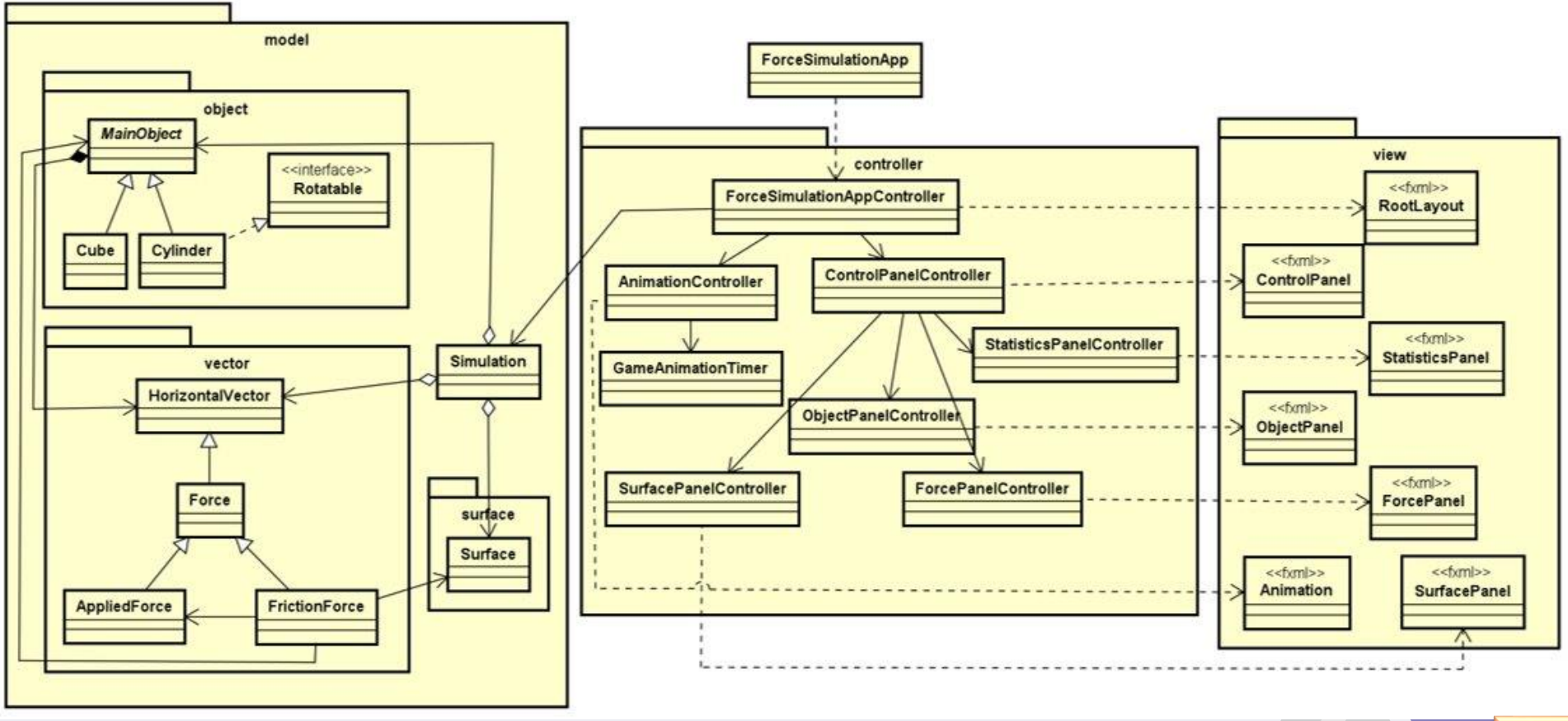
- Control all components
- Observe motion of the main object.
- Forces, speed, acceleration, mass, …



Use case diagram

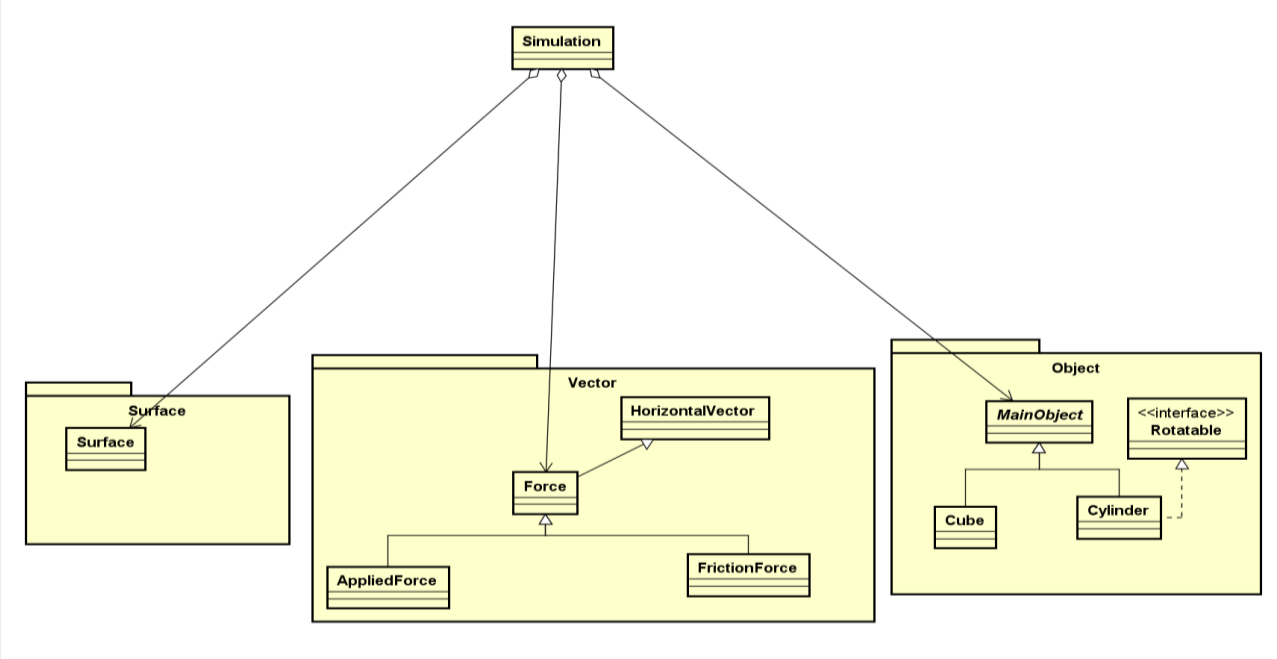


General class diagram

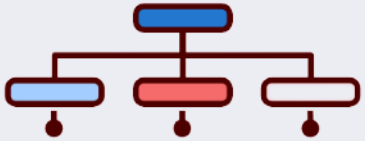


Class diagrams for model package

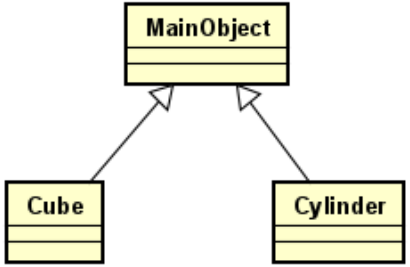
Simulation
Logic about object, surface, and the forces.



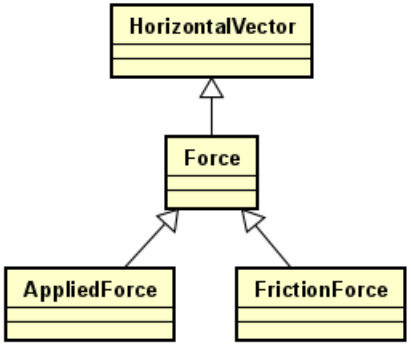
Inheritance



Cube, Cylinder inherits from MainObject



All Forces inherits from HorizontalVector



Polymorphism

Different behaviors for applyForceInTime method

In Cylinder class:

```
public void applyForceInTime(..) {
          super.applyForceInTime(..);
          this.applyForceInTimeRotate(..);
}
```

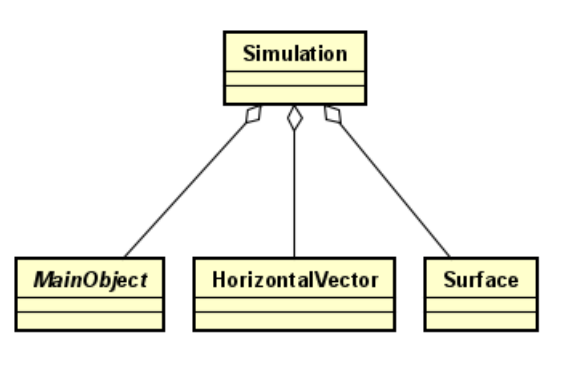
In Cube class:

```
public void applyForceInTime(..) {
          super.applyForceInTime(netforce, fForce, t);
}
```

In Simulation class:

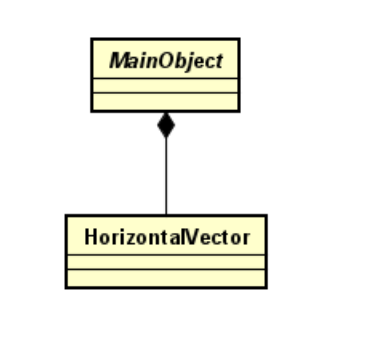
```
public void applyForceInTime(double t)
{
    this.getObj().applyForceInTime(…);
}
```

Aggregation



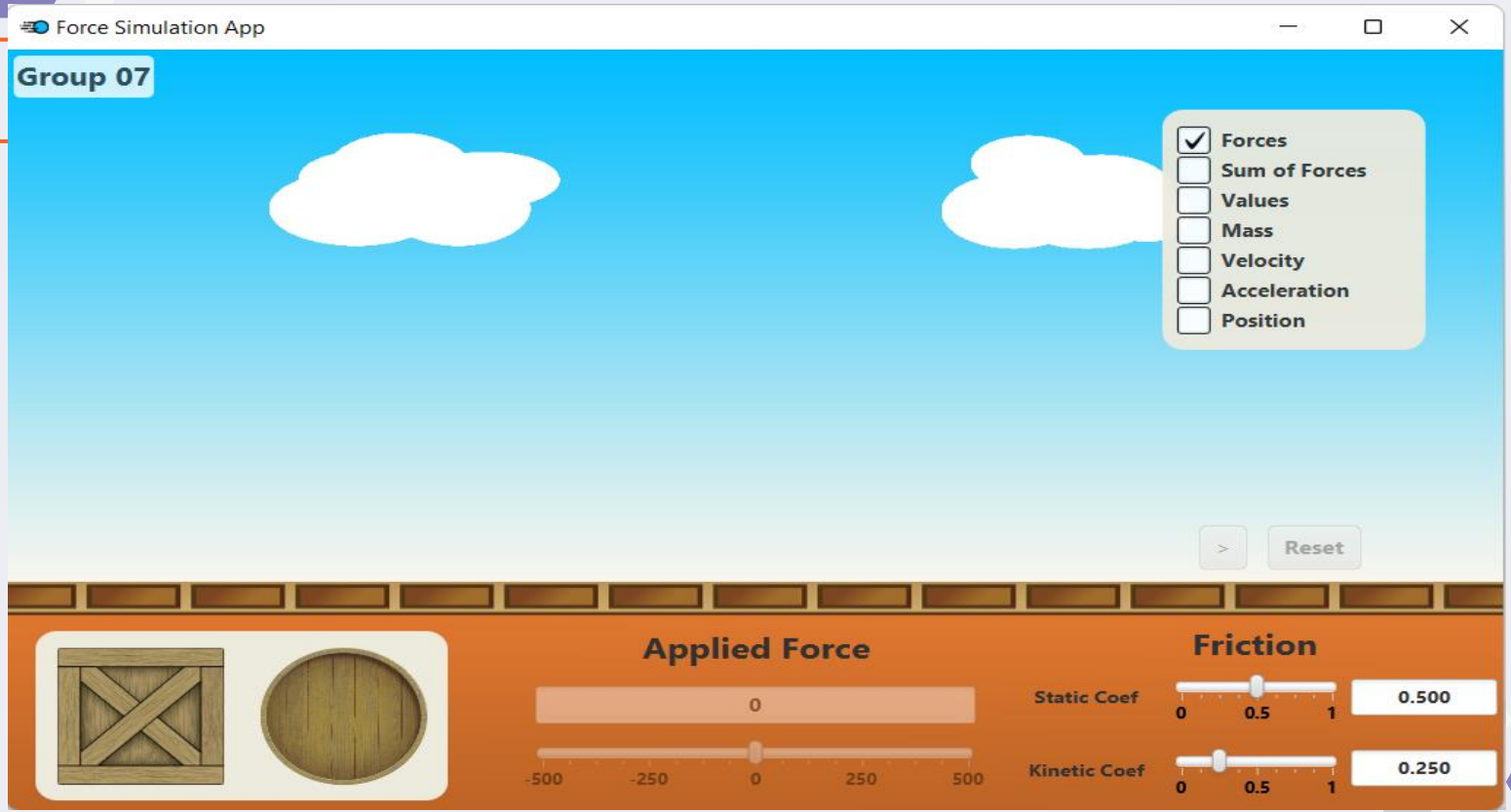
Simulation aggregates MainObject, HorizontalVector , and Surface

Composition



MainObject composites HorizontalVector (such as velocity, ..)

Demo



https://youtu.be/NiNDOvTOK9c