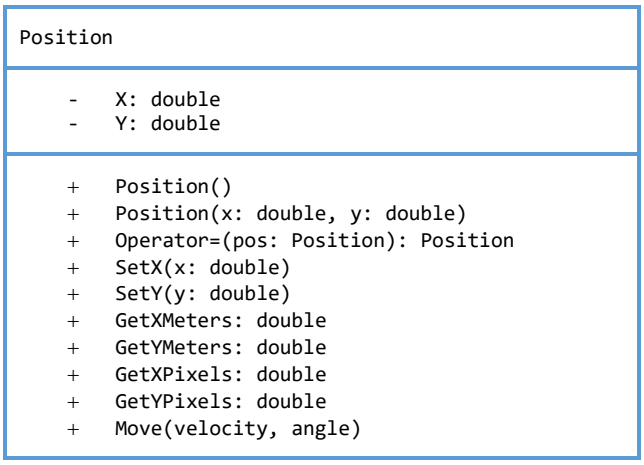
# CSE 230 Problem Set 12

## Problem 28.1: Position Attributes

Consider the following problem definition:

> An orbital simulator has a notion of a position. This represents the 2-dimensional location of an orbital body in the simulation. A position is stored, can be copied from one position to another, and can be moved according to a velocity. Note that you can represent the position in meters or in pixels.

Using appropriate metaphors, create a class diagram describing a class to satisfy this problem.

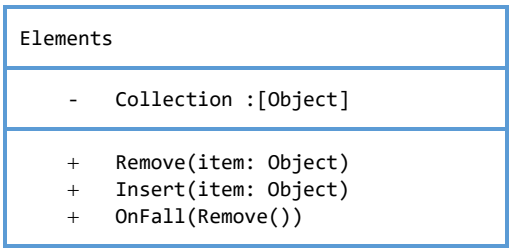


## Problem 28.2: Orbital Element Collection

Consider the following problem definition:

> An orbital simulator keeps track of many elements (such as satellites, planets, etc), each of which responds to the force of gravity. This collection is reduced as elements fall to earth or increase when new items are added to the simulation.

Using appropriate metaphors, create a class diagram to satisfy this problem:

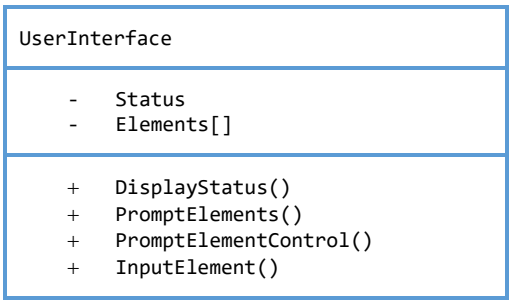


## Problem 28.3: User Interface

Consider the following problem definition:

> An orbital simulator allows the user to control various elements in the simulation. A satellite, for example, can thrust to a higher orbit. Also, the user can add new elements to the simulation. All the while, the simulator displays the current status to the user.

Using appropriate metaphors, create a class diagram to satisfy this problem:

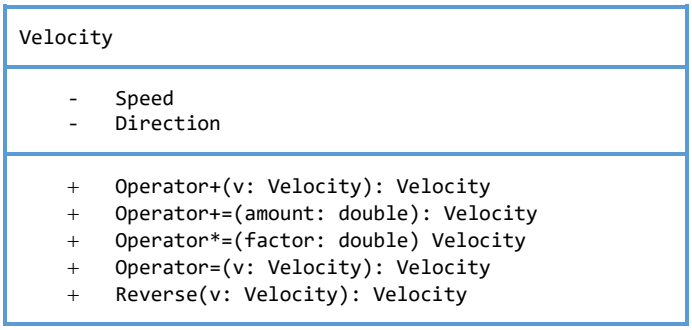


## Problem 28.4: Velocity Operations

Consider the following problem definition:

> An orbital simulator has a notion of velocity. A velocity the speed and direction (from Example 28.3) of movement. It is possible to increase velocity by a fixed amount (such as add 5 m/s to the speed), increase velocity by a factor (such as double the speed), reverse velocity (move the opposite direction), and copy a velocity object. It is also possible to combine two velocities, equivalent to a nudge given to a marble rolling down a slope.

Using appropriate metaphors, create a class diagram to satisfy this problem:



## Problem 28.5: Orbital Element

Consider the following problem definition:

> An orbital simulator models the interactions of various orbital elements. These elements are part of a larger collection of elements (described in Problem 28.2). Each individual element has a position (Problem 28.1), velocity (Problem 28.4), and has a variety of status attributes (such as whether it is dead and needs to be removed from the simulation), and can handle a collection of events (when two elements collide, when it is time to draw, when it is time to move). Using appropriate metaphors, describe a function to handle such events.

Using appropriate metaphors, create a class diagram to satisfy this problem: