

Project #1: A Graphics Satellite Rescue Simulation

Deadline: Friday, October 11

Overview:

NASA has a tentative contract with your software company, Consulting Services Operating for Needed Expertise (CSONE) to create a space station refueling simulation that will be used by NASA personnel as a training tool. Your company has promised to deliver a prototype of the simulation by **October 11**. If the prototype is successful, your company will receive the full contract worth 25.5 million dollars.

The simulation requires a space shuttle to launch a fuel cell, which will dock with an orbiting space station. Due to a low fuel supply, the space station has entered a state of unplanned orbital descent and will eventually crash to the earth, if it does not receive a new supply of fuel soon.

Prototype specification:

Choosing level of difficulty: The simulation will provide an option for user selection of a level of difficulty, beginner (B), intermediate (I), or advanced (A). The level determines the speed at which the space station is orbiting.

The Space Station: The space station is a Diamond object. It has a fueling port, namely the lowest vertex of the diamond. Space station movement begins at a random horizontal location and a vertical location of 0. To simulate orbiting, the space station will move left-to-right on a downward sloping line across the window, disappearing on the right side of the window and reappearing on the left side. Each new orbit will begin at a slightly lower level than the previous orbit. The color of the space station changes from green to yellow after one orbit, indicating a low fuel supply. After two orbits it turns to red, and stays red until it is refueled or crashes.

The Space Shuttle: The space shuttle will be a Triangle object, located in the middle of the left side of the window with its base always on the left window boundary and its nose pointing to the right.

The position of the shuttle can be adjusted slightly up or down each time the 'J' or the 'K' key on the keyboard is pressed. 'J' will cause the shuttle to move up, and the 'K' key will move the shuttle down. Up and down distance movements will be the same for each key press.

Pressing the space bar will launch a fuel cell, a blue ball (Circle object), from the space shuttle. The shuttle generates a new fuel cell each time the space bar is pressed. However, only one fuel cell can be moving toward the space station at a

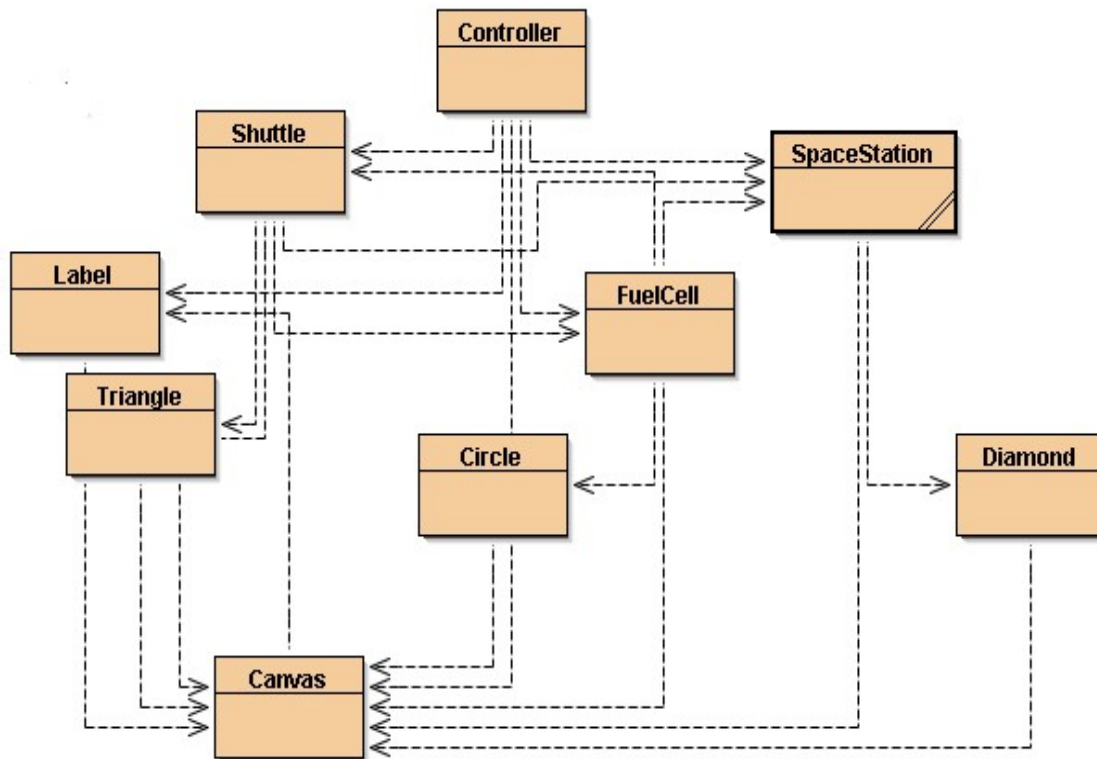
time. That is, pressing the space bar when a fuel cell is in motion does not cause a new fuel cell to be launched. The fuel cell will appear at the nose of the shuttle and travel at a reasonable rate of speed from the shuttle to the right side of the window on the horizontal line passing through the shuttle's nose. The shuttle will be able to launch 5 fuel cells only and will keep track of how many fuel cells remain. After all 5 have been launched, the shuttle simply watches as the space station continues its descent toward earth and eventually crashes by reaching the bottom of the window during one of its orbits. When the space station is refueled or crashes, the simulation ends.

The Fuel Cell: The fuel cell is a Circle object. **It needs access to the space station's location** to determine if it is close enough for a docking operation.

The fueling process: If the fuel cell makes contact with the fuel port of the space station by being close enough to dock (some point on the fuel cell's perimeter that is very close to the lowest vertex of the space station), fueling will occur automatically. After a three second wait (for fueling to terminate), the fuel cell will become invisible. Then the shuttle will travel toward the space station on the same path as the fuel cell (a while loop), dock with the space station (its nose will touch the fuel port, as the fuel cell did), wait 3 seconds and then travel back (in reverse) to the left side of the window. The space station will turn green again, and, after another three second wait, the simulation ends. If the fuel cell misses the space station, it simply disappears, after reaching the right boundary of the window.

Starting and stopping the simulation: Pressing the 'S' key will start the simulation and pressing the 'X' key will stop it.

Project class diagram:



Getting started:

Copy your Project1 from the Moodle site for this course. Make sure that the project will compile and run before beginning to work on it. (Note: All you will see is a blank window with a label at the top.). The Controller, Shuttle, SpaceStation and FuelCell classes are documented for you. You need to supply or modify method bodies and comments for one Controller class method, keyTyped(), and the methods and comments in the Shuttle and SpaceStation classes as indicated in the documentation. **The words *TO DO* are used in the documentation for these classes to mark the methods you are to write or modify. Do not modify any of the other classes. Remove the TO DO comments, as you finish each section and test it.**

Grading:

Controller class: 10 points

Shuttle class: 25 points

SpaceStation class: 25 points

Style: 10 points

Submitting your work: Leave work in your I: account. Let me know in class whose folder contains the work, if you work in your "regular" pairs or triples.