# CS102 – Algorithms and Programming II
## Programming Assignment 4
## Spring 2023

**ATTENTION:**
- Compress all of the Java program source files (.java) files into a single zip file.
- The name of the zip file should follow the below convention:
  **CS102_Sec1_Asgn4_YourSurname_YourName.zip**
- Replace the variables "Sec1", "YourSurname" and "YourName" with your actual section, surname and name.
- You may ask questions on Moodle and during the scheduled Zoom meeting.
- Upload the above zip file to Moodle by the deadline (if not significant points will be taken off). You will get a chance to update and improve your solution by consulting to the TAs and tutors during the scheduled Zoom meeting.

**GRADING WARNING:**
- Please read the grading criteria provided on Moodle. The work must be done individually. Code sharing is strictly forbidden. We are using sophisticated tools to check the code similarities. The Honor Code specifies what you can and cannot do. Breaking the rules will result in disciplinary action.

**Animated School Bus**

In this assignment, you are going to implement a Java program with a Graphical User Interface to animate a parametric school bus. The pixel length of the bus in and the number of wheels (as seen from 2D side view) should be defined by the user. Try to capture the likeness of a bus by adding windows of appropriate size, based on the length of the bus (i.e., windows should have equal size, and the gap between each consecutive window should be equal; also make sure that no window goes out of the bus).

*Sample School Bus*
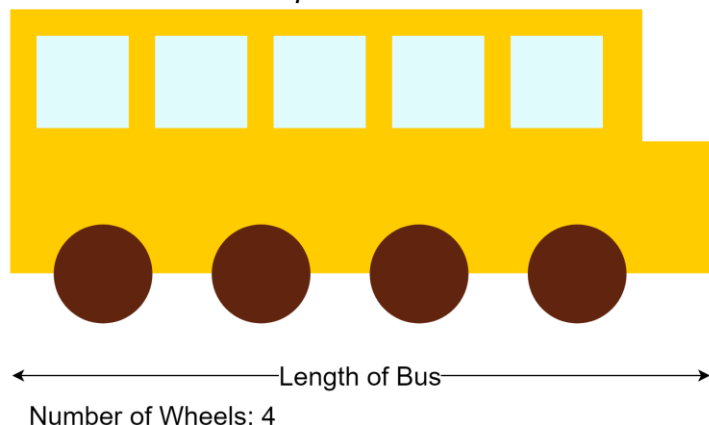


Number of Wheels: 4

Determine the wheel radius based on the length of the bus and the number of wheels so that wheels can be positioned without overlaps. Similar to how windows behave, no wheel should go out of the bus. Here you can have assumptions on the given bus length and the number of wheels.
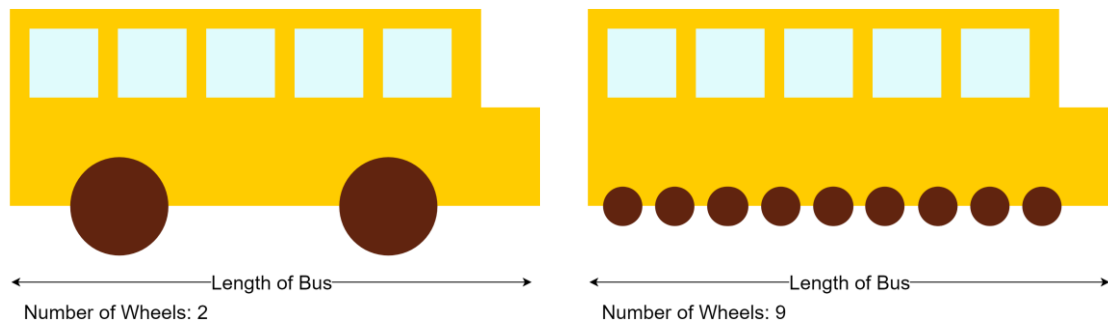


Include a Graphical User Interface for the user to change the bus length and number of wheels. When we click on the update button, the bus should change accordingly. Also include "Play" and "Pause" buttons to start and stop the animation of your bus.
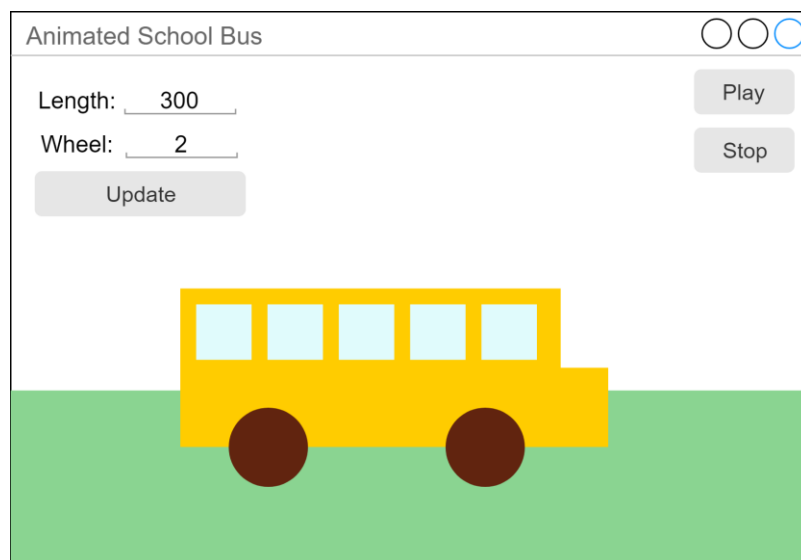


For animating the bus, you should keep the current horizontal position of the bus in some variable. Painting of the bus should operate based on this variable. Then, using a Timer object, update the position of the bus and repaint it; consecutive rendering of the different positions of the bus will result in an animation. Note that there are multiple Timer classes in Java, and javax.swing.Timer is more suitable for our task (for ActionListener you need to import java.awt.event.ActionListener).

During animation, when the bus touches one side of the window of your frame, it should start moving towards the opposite direction. In other words, the bus will move back and forth between the left and right boundaries of the frame. When we click on the "Stop" button the animation should stop, and when we click on the "Play" button it should resume from the current position of the bus.

You are free about how you design the user interface layout. Try to experiment with different layout options and organize your interface elements using panels. For example, if you want to position Play and Stop buttons together, you may include them in a panel with grid layout, and position this panel in your main frame. Grouping the user interface elements in a hierarchical manner could ease the design process.

**Preliminary Submission:** You will submit an early version of your solution before the final submission. This version should at least include the following:

- Include the required functionality to draw the parametric bus on screen.

You will have time to complete your solution after you submit your preliminary solution. You can consult the TAs and tutors during the scheduled Zoom meeting. Do not forget to make your final submission at the end. Even if you finish the assignment in the preliminary submission, you should submit for the final submission on Moodle.

**Not completing the preliminary submission on time results in 50% reduction of this assignment's final grade.**