Super Karel Bros.

Submission Date: 6th of October 11:59 PM

Contents

1 Introduction

In this project, you will play a game similar to "Super Mario Bros." using Karel.

1.1 Submission

The file you're expected to submit is SuperKarelBros.java

Submit a folder that is only containing this Java source file (*.java) at your problem session location in BlackBoard.

Please use the following naming convention for the submitted folders:

YourPSLetter_CourseCode_Surname_Name_HWNumber_Semester

Example folder names:

- **PSA_COMP130_Surname_Name_HW1_F19**

- **PSB_COMP131_Surname_Name_HW1_F19**

Additional notes:

- Decomposition is very important. You should use helper methods for each one of the 8 parts of the problem. **Failing** to use helper methods may be **penalized**.

- You are **not allowed** to use variables (e.g. counter) to store data in the code.

- Using the naming convention properly is important, **failing** to do so may be **penalized**.

- **Do not** use Turkish characters when naming files or folders.

- Submissions without the naming convention will be **disregarded** completely. (ex. "homework1", "project" etc.)

- Please **write your name** into the Java source file where it is asked for. **Failing** to do so may be **penalized**.

1.2 Academic Honesty

Koç University's *Statement on Academic Honesty* holds for all the homework given in this course. Failing to comply with the statement will be penalized accordingly. If you are unsure whether your action violates the code of conduct, please consult with your instructor.

1.3   Aim of the Project

The aim of this project is to make you practise essential programming skills of well-designed decomposition into helper methods, ensuring intelligibility of your methods (by writing comments if needed), and creative expression through your code. Doing "Stepwise Refinement" which means breaking the problem apart elegantly will result in a bunch number of easy-to-read methods, each of which performs just one small task. **So, make sure you decompose the problem into smaller and more manageable pieces**. Please remember that even if your program functions well according to the project requirements, **you may not be able to get full credit if the style of your code has problems.**

1.4   Given Materials

This part is optional. **Do not** change anything in the code if it is indicated to you by a comment. Below are the methods given to you in the code with their explanation.

1.4.1   Given Methods

The following method for you to use is already implemented. Please do not remove or change this method.

- void playThemeSong(String fileLocation)

  Plays the original "*Overworld Theme*" song of Nintendo's *Super Mario Bros.* game.

- void playVictorySong(String fileLocation)

  Plays the original "*Victory Theme*" song of Nintendo's *Super Mario Bros.* game.

1.4.2   Given Constants

In the code, you will see two constants which are used in given methods. (i.e THEME_SONG and VICTORY_SONG are given at the bottom of the java file). Since you did not learn methods in detail yet, necessary code is provided in the corresponding sections of the project. **Please do not remove or edit these constants.**

1.4.3   Video

You're provided with a video clip for a clear perception. Please refer to this whenever you are confused. It explains what you will need to do.

1.4.4 Given Worlds

We have provided you 2 different worlds. Your code should work for all of these worlds as shown in Figure 1 and 2.
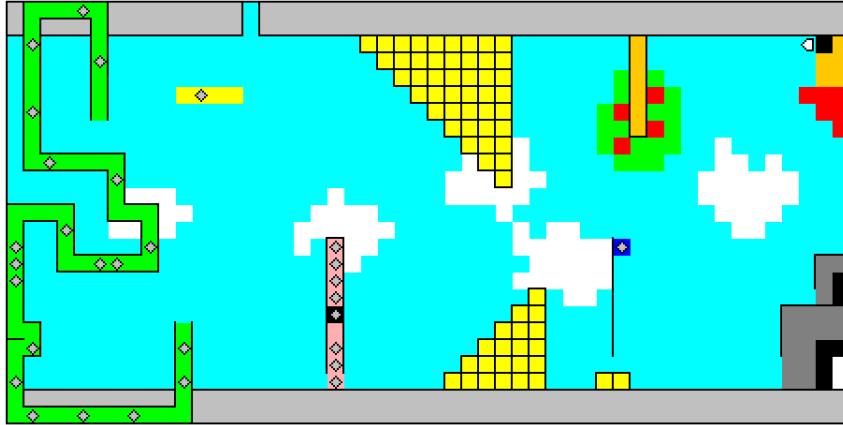

Figure 1: First world for Karel the Alien
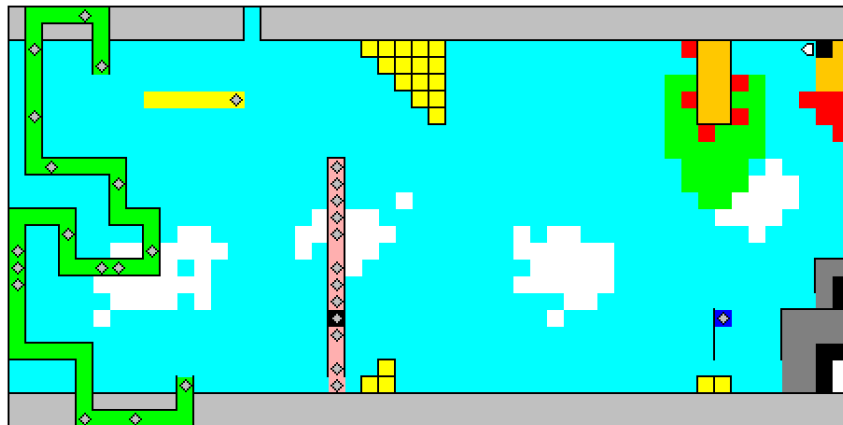

Figure 2: Second world for Karel the Alien

Note 1: In large worlds, the number inside the beepers may not be shown.

Note 2: In large worlds, Karel might look a bit differently as seen down below.

Figure 3: A Karel in a large world.

2 Project

2.1 The Story

Nintendo decided to publish a new Mario game in the Karel world. In the game, there are 8 tasks that should be completed, as described in the next section. Your goal is to play and test 2 worlds of the game by writing a code that completes all the tasks successfully.

2.2 Project Tasks

Your code needs to be general enough to work for all the possible worlds there can be. If you like, you can create your own worlds and test your code.

Important Note: If you get stuck in one of the tasks, do not worry. You can continue with the next tasks and test it by changing Karel's location from "Edit World" button.

Optional: playThemeSong(THEME_SONG) is already implemented in the run part to play the main theme, if you do not want to use, you can delete it.

2.2.1 Task 1 - Trimming The Tree (10 points)

In our first task, Mario, or in our case Karel, is expected to scale and trim a rectangular tree with unspecified height and width. There are RED apples attached to the trunk of the tree and GREEN leaves around them. Karel should trim the tree according to this rule:

If the tile is RED, Karel should paint it to CYAN.

2.2.2 Task 2 - Reverse Downstairs (10 Points)

In this part, Karel will need to climb to the top of a descending stairway. According to the following rules:

1. Karel will first have to climb downwards on top of the stairs.

2. Then follow the staircase **one by one** while still maintaining correct direction.

3. The staircase can come in any size but is guaranteed to have steps that decrease in height one by one when going from right to left.

2.2.3 Task 3 - Coin Bricks (10 Points)

In this level, Karel should simulate hitting the bricks by moving into them and painting them to the background color CYAN, until it reaches a beeper. After it reaches a beeper Karel should pick that beeper and go to the next task. Below are the specific rules:

1. Coin bricks always start just one tile after where the cliff (the gap on the ground) starts.

2. There can be any number of bricks next to each other, parallel to the ground and the beeper can be in any of them.

3. Karel should break the bricks (turn YELLOW corners into CYAN corners) one by one and after it breaks one tile it should fall back on the ground first and then it should move to the next tile to demonstrate a jump move. Once Karel breaks a block with a beeper in it, it should pick the beeper and fall back on the ground and continue on to the next part without breaking any more bricks.

4. If you're in doubt exactly what to do in this part, please refer to the video.

2.2.4 Task 4 - The Long Pipe (20 points)

Of course, a Mario game could not exist without a green pipe. This level has a single but a very important pipe. The pipe connects the upper ground to the lower ground. Once Karel passes the Coin Bricks, it will encounter a vertical pipe. Karel needs to climb into the pipe, collect all the beepers inside and traverse through it with these rules:

1. The pipe can have a varying height, it is always one tile wide, it may curve around leftwards or rightwards and it does not branch off.

2. The number of beepers and their locations may differ.

3. The entrance and the exit of the long pipe are above and perpendicular to the ground. After Karel exits the pipe, Karel needs to go back to the ground.

Warning: Karel unfortunately cannot fly, so be sure to keep it on the ground.

2.2.5 Task 5 - The Pink Tower (20 points)

In this task, Karel needs to carry all the beepers into the black tile. Rules are as such:

1. Inside of the tower is PINK and the tower has some beepers in it. The width is always a single unit.

2. The height of the tower and the number of beepers and their locations may differ.

3. Karel needs to carry all the beepers into the black tile.

4. Once Karel is done carrying all the beepers into the black tile, it should exit the tower at the bottom using the right door.

Warning: After you're done, black tile must have the total number of beepers as many as the number of beepers initially the tower has. Remember that Karel has infinite amount of beepers on her backpack from the pipe.

2.2.6   Task 6 - Downstairs (10 points)

After Karel leaves the Pink Tower, it should ascend some stairs. Similar to the Task Reverse Downstairs:

1. It should ascend the stairs one by one.

2. The number of steps the stairs has can be different, but the steps are one block thick.

2.2.7   Task 7 - Flagpole (10 Points)

Traditionally a lot of Mario levels end with flags. In this part, Karel needs to ascend to the BLUE flag, and then lower it step by step. You have to animate this by picking/putting beepers and painting corners considering these rules:

1. The flagpole is located in the middle of two bricks and it starts from one tile above the bricks.

2. The flagpole can have any length.

3. You need to demonstrate the lowering down the flag motion.
   (Refer to the video for this.)

4. At the end of the flagpole, Karel removes the flag completely.

2.2.8   Task 8 - Into the Fortress! (10 Points)

Almost there! You are just a few steps away from victory. Karel needs to find the castle's door and go inside. After Karel arrived to door, i.e. finished the level, you can play the Victory Theme by using the given optional method playVictorySong(VICTORY_SONG). Again, it is already implemented in the run, if you do not want to use it, you can delete.

Hint: The door has the color WHITE.

3   End of Project

Your project ends here. You may continue to tinker with the code to implement any desired features and discuss them with your section leader.

Final Warning: Do not include anything beyond this point to your submission. Points may be deducted from your grade.

3.1   Further Questions

For further questions **about the project** you may send an email to SLCs and Ayça Tüzmen Yıldırım. Note that it may take up to 24 hours before you receive a response so please ask your questions **before** it is too late. No questions will be answered when there is **less than two days** left for the submission.