

User Interface and System Design

16-311: Introduction to Robotics

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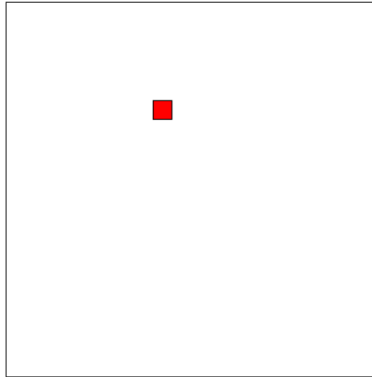
Learning Objectives

1. Recognize the effect of user experience decisions in every day life.
2. Evaluate user interfaces.
3. Improve a simple simulation through user interface and graphic display.

1 User Interface

Download the following Python code: https://drive.google.com/file/d/1TFygYoiHN_ZDXQPDmTlnar877dQiBQ5A/view?usp=sharing. When you run this code, a “car” will appear on the screen and move up. You can make the car turn left by pressing the “l” key and make the car turn right by pressing the “r” key. The “f” key will increase speed, the “s” key will reduce the speed, and the “d” key will toggle between dark and light mode. The car will stop when its “battery” has been depleted.

This code uses Tkinter, so you shouldn’t have to download any additional packages. You are welcome to modify the code as much as you want. If you use some package other than pygame, provide a readme so the TAs know how to run your code.



Your task is to improve the user experience of this car simulation. Choose three of the following features to add to the system:

1. Map the “l”, “r”, “f”, and “s” functions to new keys that are easier for a user (lines 151-154). Additionally, add a button on the canvas for changing between dark and light modes instead of a key press (line 155). Information about buttons can be found here: <https://effbot.org/tkinterbook/button.htm>.
2. Change the car graphic so that you can tell which direction it is facing. These may be helpful: <https://effbot.org/tkinterbook/canvas.htm>.
3. Add a battery level indicator so you can tell how much battery the car has left. These may be helpful: <https://effbot.org/tkinterbook/canvas.htm>.
4. Add a speed indicator so you can see your current speed. These may be helpful: <https://effbot.org/tkinterbook/canvas.htm>.

Deliverables:

1. Take a screen recording of you interacting with your updated simulation. Include a link to the video in your submission. [12 points for adding each update in a minimalist manner, 15 points for adding each update in a clear, easy-to-use manner]
2. Explain your decision making process for each of the three updates. If you weren't able to get a functionality working, explain what you would have done. [25 points]

2 System Design



1. What are three challenges that a vehicle must overcome in a mine setting? [10 points]
2. When would you want to use the agile method instead of the v method? [10 points]
3. What are two methods of validating your requirements? When would you use each? [10 points]

What To Submit

Submissions are due on Gradescope by the date specified in the Syllabus.

1. Create a .pdf file with the written answers **ALL THE SECTIONS**.
2. Ensure that your .pdf contains the video and explanation for Part 1 and the answers to all the questions for Part 2.