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### iRobot Create 2 Project 4 Report

The fourth project with the iRobot Create 2 involved designing and implementing a graphical user interface, or GUI, that communicates with the robot in real time. The functionalities we were required to have displayed and operational included directional movement keys to move the robot, buttons to change the central LED color of the robot, a four-digit ASCII LED input field for numbers to be displayed onto the robot, and a button to play a song with the robot. The movement keys also had to be connected to the WASD and arrow keys of our computers, and had to rotate an image of the Roomba on the GUI. At the end of implementation, we were then to race our Roombas through the hallway and an obstacle course.

Triny and I followed our typical procedure we used for the past projects, working through a planning stage, a designing stage, a testing stage, and a reviewing stage. Given this GUI was a much larger project than any others thus far, we immediately got to work on splitting up the work and planning with each other to ensure we stayed on the same page. Before everything else, we had to figure out how to design the base of the UI itself, one onto which we could place our various buttons and Roomba image. To do so, we used Python's Tkinter library to create a window, a canvas, and various frames to hold their respective buttons. After the base of the UI was done, we knew the movement of the robot—both including the on-screen and keyboard-based keys—would be the absolute largest of the tasks. A lot of our time went into thinking how we would handle that, making it our top priority. The other functionalities were smaller and were easily handled along the way, typically when we reached goals with the movement. Throughout our implementation, we only came across three small challenges: input delay for the movement keys, displaying digits with the ASCII LEDs, and getting everything to work simultaneously. The new class we made for this project was tied closely to the Robot class from before, all of the functionalities calling upon its methods.

Designing and implementing the GUI only led to two issues, both of which were handled: input delay for the movement and simultaneous commands. Though we did have those two small roadblocks, we ended up winning first place in the obstacle race and walking away with added knowledge and experience of Python (specifically designing a UI using it) and the Create 2.