CPS 499/592 — *Intro to Robotics*
Spring 2023 — *Lab* 02

Assigned: 2023-02-20
Due: 2023-03-01

Overview

The purpose of this assignment is two-fold:

1. To ensure that you are comfortable with interfacing with the iRobot Create2
   i.e. *sending commands* **AND** *receiving data*
2. To gain an understanding how you could incorporate threads into your program.

Task 1: Transmit/Receive (Tx/Rx)

Modify your program from Lab01 to monitor some of the robot's sensor values. Specifically,

1. Read the robots wall signal and its four cliff sensor signal values. (Each of these should be an unsigned 16-bit integer.)
2. Read all of the sensor in **Group Packet ID # 3** (Packets 21-26).
3. Display those sensor values in a human-readable format, identified with English text strings that contain
   - what the packet corresponds to,
   - the value returned by the robot,
   - any applicable units.

   in the Tkinter window.

   Example: `Battery Charge:  60531 mAh`

Task 2: LEDs

Modify your program by adding the following functionality:

1. We are going to toggle the robots LEDS. Specifically, we are going to create a periodic timer that will toggle the robot's LEDs such that **When activated** . . . which also means this functionality can be paused . . ., the robot will **alternate/toggle** between:
   - Turning on the spot/dock LEDs **and** turning off the power led, check robot, debris LEDs
   - Turning off the spot/dock LEDs and turning the power led "RED" at full intensity and turning the check robot and debris LEDs on.

Disclaimer:
You might notice that our Roomba's do not match what is on the box and may be missing some elements.

Specifically, we are lacking some of the digital display elements and may/may not be missing some of the above LEDs 😎.

Test your code on your robots with the available LEDs ... then when you think you have working code, try to use the "Black" Darth Vader looking Robot provided by Dr. Stiffler.

CPS 499/592 – DELIVERABLE – LAB 02

I will be accepting one document for the deliverable. Below are the details regarding this document.

Filetype: pdf if it is not a pdf ... 5 points will be deducted
Filename: Lab 02.pdf
The header of the document should look like the following example:

> Team Members: Nicholas Stiffler, Student1 (YYYY), Student2 (ZZZZ)
> Course: CPS 499/592
> Assignment: Lab 02

There are 2 major components to the deliverable:

1. **Python Code**
   All of the code that you used needs to be included in the submission in a folder called "code".
2. **Report**
   This component requires you do the following:
   - Provide the table described in **Task 1**
   - Write a brief 1-page report about the project describing the steps your team took to accomplish the task.
     - What challenges did you face?
     - What did not work as you had anticipated?
     - What did your team do to overcome these challenges?
     - What LEDs does "your" robot have? Is it missing any?
     - If you had more time what would you do differently to improve the code?
     - etc.

Below is the grading rubric I will use when evaluating your submission.

- The deliverable should be an archive (.zip, .tgz., etc) that contains the following
  - A pdf file for the report.
  - A "code" directory that contains all of the code you used for the assignment.
- The demo requires a time, scheduled either outside of class or on a designated lab day where you will show Dr. Stiffler that your project works, and he will ask questions about your design decisions, etc.
- **Your submission will not be graded without demoing the project**

CPS 499/592 – Cover Sheet – Lab 02

Team number: _____
Names:
_____
_____
_____
_____

Task 1 functionality (30):

- □ Request sensor values from robot.
- □ Assemble returned bytes into 16-bit integer.
- □ Request sensor values from group packet #3.
- □ Display strings on workstation.
- □ Display integers on workstation.

Task 2 functionality (30):

- □ Setup thread/timer.
- □ Toggle lights first configuration.
- □ Toggle lights second configuration.
- □ Ability to Pause/Stop the lights.
- □ Ability to Start/Resume the lights.

Style (20):
The following refers to your code, which should be submitted **as part of your Team's deliverable document**.

- □ One function per command?
- □ No duplication of executable code?
- □ No magic numbers?
- □ Names match functionality?
- □ Adequate comments?
- □ Comments match code?
- □ Consistent formatting?

Documentation (20):

- □ Report is complete and clear?
- □ Required sections exist? (report and code)

Other comments:

Total: