Project 3: Speed Control

In this project you will develop a program for the **FRDM-KL46z board** and your robot car to precisely control the speed and position of the robot under varying conditions. The goals of this project are both accuracy and precision.

Your robot will be tested for consistent speed on 2 straight line courses that are exactly 10 meters long (measured from front wheels of robot):

1. Flat, concrete terrain.
2. Varied terrain (May include portions of concrete, grass, small hills or ramps).

Testing process:

1. Place front wheel contact point on starting line.
2. Press FRDM-KL46Z User Button 1 and simultaneously start a stopwatch timer.
3. Robot should drive forward, and stop after exactly 10 meters.
4. Stopwatch timer stops when the robot reaches a complete stop.
5. Measure distance between robot front wheel contact point and 10 meter line.

This process will be repeated three times for each course. Your grade will be influenced by the precision in time and distance (larger variance means lower grade) and accuracy across all trials.

The precision score will be calculated using the following equations, given measurements **m₁** through **m₆**. Measurement units can be either time or distance.

$$\mu = \frac{1}{6} \sum_{i=1}^{6} m_i \text{ (Mean)}$$

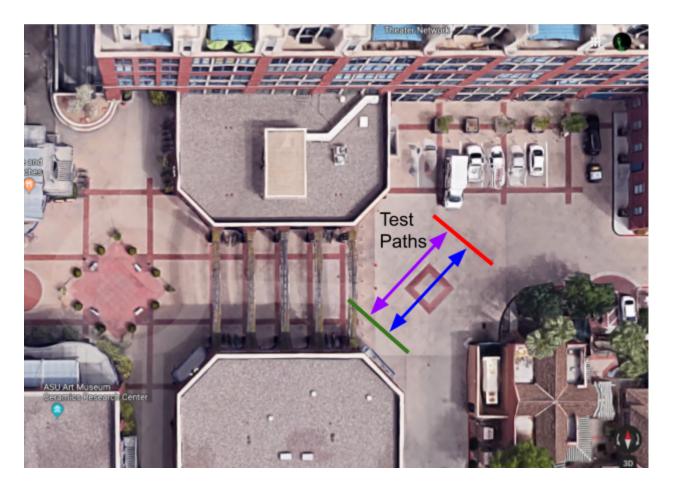$$\sigma = \sqrt{\frac{1}{5} \sum_{i=1}^{6} (m_i - \mu)^2} \text{ (Std. Deviation)}$$

$$Precision\ Score\ =\ 20\left(1 - \frac{\sigma}{\mu}\right)$$

$$Distance\ Accuracy\ Score\ =\ 20\left(1 - \frac{|\mu_d - 10|}{10}\right)$$

Your program must utilize:
1. Interrupts
2. At least 1 control scheme as you see fit. (P, PI, or PID).

Testing will occur in the area next to Brickyard Artisan Court:

Submission

Once you have completed the development challenge, export your project file by clicking

File -> Export, then choose Archive File. Click "Browse" to save your project as "CSE325_Project_3_*yourlastname*.zip"

Submit the following to canvas:
- **Zipped project file**
- Completed **Integrity.txt**

Demonstration

You must submit your code and complete a demonstration with a TA by the due date set on blackboard. The TA will read your code, and you must demonstrate that it works. The TA may ask you questions about your code, and you must be prepared to answer.

Grading

Rubric:

Criteria	Points
Program is well structured, well commented, variables and methods are named clearly.	10
The program utilizes interrupts.	10
Program utilizes control loops	10
Timing Precision Score	20
Distance Precision Score	20
Distance Accuracy Score	20
The student can answer questions about the program correctly.	10
Total	**100**

If you do not upload your code before the assignment deadline, you will receive a grade of 0.