

# **GENG8030-Computational Methods and Modeling for Engineering Applications**

## **Course Project – Summer 2024**

### **Adaptive Cruise Control**

#### **Objective**

Develop and implement an adaptive cruise control system for vehicles that automatically adjusts the vehicle speed to maintain a safe distance from vehicles ahead.

#### **Hardware**

Arduino uno x 1, button x 5, distance sensor x 1, LCD display x 1

#### **Description**

Implement an adaptive cruise control system with five buttons of (1) Set\_speed, (2) Adaptive\_speed, (3) Cancel, (4) Increase\_speed, and (5) Decrease\_speed. When the system is initialized, the display shows the initial speed of 0.

1. When the Increase\_speed button is pressed, the speed increases and when the Decrease\_speed button is pressed the speed decreases however without pressing the Set\_speed button the speed will not remain constant and it changes slowly over time.
2. When the Set\_speed button is pressed the system enters the cruise control mode where the speed is held constant. In this mode, the Increase\_speed button and the Decrease\_speed button are still functional and can be used to change the Set\_speed. If the Cancel button is pressed, the system quits the cruise control mode where the speed decreases slowly.
3. If the Adaptive\_speed button is pressed, the speed is set and held constant until a vehicle shows up at the front or an object is detected where the speed automatically decreases. When the road becomes clear, the speed increases to reach the set speed again. In the adaptive cruise control mode, the display has to blink to differentiate this mode from the cruise mode. In this mode, the Increase\_speed button and the Decrease\_speed button do not function but the Cancel button can still be used to quit the adaptive cruise mode. If the Cancel button is pressed, the display stops blinking and the vehicle speed begins to slow down.

#### **Test procedure**

The implemented project will be fully tested to ensure that the project objectives are met. A sample test may include the following steps.

1. When the system is initialized, the display system shows: 0
2. Press the Increase\_speed button to increase the speed to over 40 and then release the button, the speed has to slow down.
3. Press the Decrease\_speed button to decrease the speed until the speed reaches 0.
4. Press the Increase\_speed button to increase the speed to about 20, press the Set\_speed button, and then press the Increase\_speed button and the Decrease\_speed button to change the speed. Press the Cancel button to quit the cruise control mode.
5. Press the Increase\_speed button to increase the speed to about 30 and then press the Set\_speed button to lock the speed. Press the Adaptive\_speed button; use a model car to trigger the distance sensor and watch that the speed decreases. Remove the model car and watch that the speed increases. Press the Increase\_speed, the Decrease\_speed, and the Cancel buttons to verify that they function according to the project description.