

## CS3237: Introduction to Internet of Things

### Lab Assignment: Application Development on Sensor Tag with RTOS

In this assignment, you will develop an application directly on the TI SensorTag IoT device using RTOS. Please read the RTOS tutorial (Week 8) before you start working.

**This is a graded lab assignment. It will contribute towards 10% of your final grade.**

**This is strictly an individual assignment. We will look at the source code and report.**

**At most 1-page Lab Report + Source code Submission via LumiNUS RTOS-Lab. You can optionally include a link to a very short video that demonstrates a working application.**

**Deadline: Friday 12 November 11:59PM**

The CC2650 SensorTag board has a Motion Sensor MPU9250 and a light sensor OPT 3001. Your task is to read the light and MPU sensors (accelerometer only) at different rates based on the environment, and change the LED brightness according to the light sensor and the accelerometer values. In particular, you should adjust the brightness of the LED depending on how fast the sensor node is moving and/or the strength of the light shining on the sensor node. As increasing the brightness of the LED contributes towards the light shining on the light sensor, you need to adjust the thresholds of the light sensor values appropriately.

You can see a demo of the task from the video in the lab zip file.

#### Skeleton Code

We provide a skeleton code in LumiNUS → Labs to show how to read the sensors through I2C. You may build on this code to finish the task.

Please use the Code Composer Studio to import the template project:

1. Open File, and select Import.
2. Select Code Composer Studio, then select CCS projects. Go to NEXT.
3. Click Browse and select the folder. Then Click Finish.
4. Build and use it like other projects.

The *main.c* file has the main functions. Other source code files are the library files for various sensors. In the *main.c* file, we have three functions to introduce:

- `readOPT3001()`: This function is to read the light sensor.
- `readMpu9250()`: This function is to read the sensor values from the MPU9250 Motion Processing Unit.
- `PWMLED()`: This function controls the brightness of the LED. You need to use PWM (Pulse Width Modulation; review lecture from Week 7) to control the brightness of the LED. The PWM RTOS example code is available.

You need to create tasks that wake up periodically to perform sensing and controlling the brightness of the LED.

The lab report should explain the high-level structure of the application, the task(s) being used and their periods.