Assignment 6

Level Meter Features

1 Goal

In previous assignments, we have practiced state machine design and implementation through example projects such as LED patterns and traffic lights. In this assignment, we will apply similar techniques in building a more realistic application – a level meter.

The **LevelMeter** active object currently acquires accelerometer data from the **SensorAccelGyro** HSM. It first averages measured data in each sample period and converts the raw x, y, z acceleration into pitch and roll angles which are updated periodically on the LCD via the **Ili9341** HSM.

In this assignment we are going to add a couple more features to the level meter:

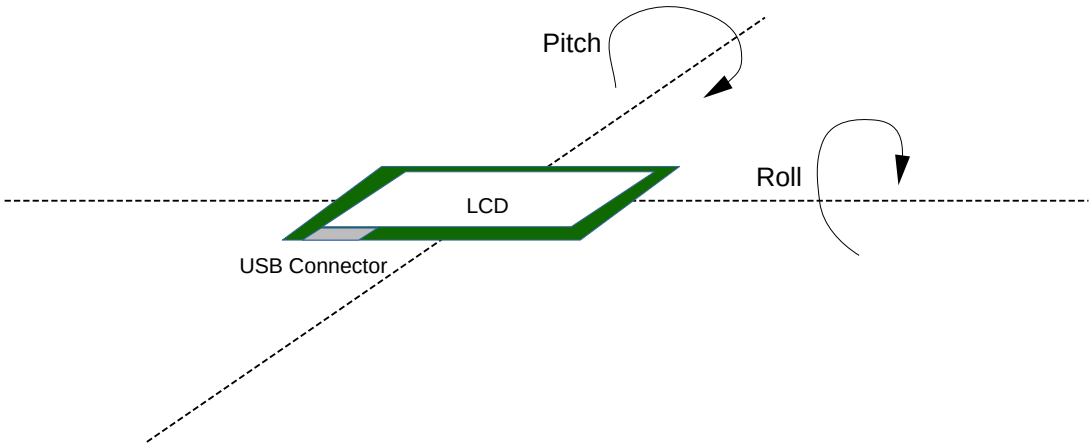
1. Detects when the absolute value of the pitch or roll angle exceeds the threshold and alerts the user by changing the corresponding text colors (foreground/background). You may decide which colors to use.

   Currently the pitch and roll thresholds are default to 45 degree. You may change them to other values in the entry action of the *LevelMeter::Started* state.

   Note – The pitch and roll angles range from -90 to +90 degree, with a precision of 2 decimal places (e.g. -45.12 degree, or 67.89 degree).

2. Measures humidity and temperature periodically and displays the measurements on the LCD. You may decide the sampling rate, display format and location on the LCD.

   The humidity and temperature sensor is controlled by the **SensorHumidTemp** HSM. We have provided a skeleton implementation in the assignment code base. Please follow the similar patterns in **SensorAccelGyro** and **LevelMeter** HSMs to complete the feature.



2 Setup

2.1 Project Setup

1. Download the compressed project file (platform-stm32l475-disco-assignment6.zip).
2. Backup your existing project folder. Decompress the downloaded project file to a local folder.
3. Launch STM32CubeIDE. Hit F5 to refresh the project content.

   Or you can right-click on the project in Project Explorer and click "Refresh".
4. Clean and rebuild the project. Download it to the board and make sure it runs.

   On the LCD, you should see the following text:

   ```
   P= 000.00
   R= 000.00
   PT= 45.00
   RT= 45.00
   ```

   The meaning of the above readings are:

   - P – Pitch in degree
   - R – Roll in degree
   - PT – Pitch Threshold beyond which an end user shall be alerted.
   - RT – Roll Threshold beyond which an end user shall be alerted.

3 Tasks

1. Implement the two new features as stated in the Goal Section. You would need to modify the **LevelMeter** and **SensorHumidTemp** HSMs.

   Note – Events and data members required by the new features have been added to the source code for reference. You may use them as is or create new ones.
2. Verify an alert pattern is shown on the LCD when either the pitch or roll threshold is exceeded.
3. Verify meaningful humidity and temperature measurements are displayed on the LCD. Note the sensor is located on-chip and may be warmer than room temperature.