LAB-2 checkoffs

GROUP-17
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PRE-LAB

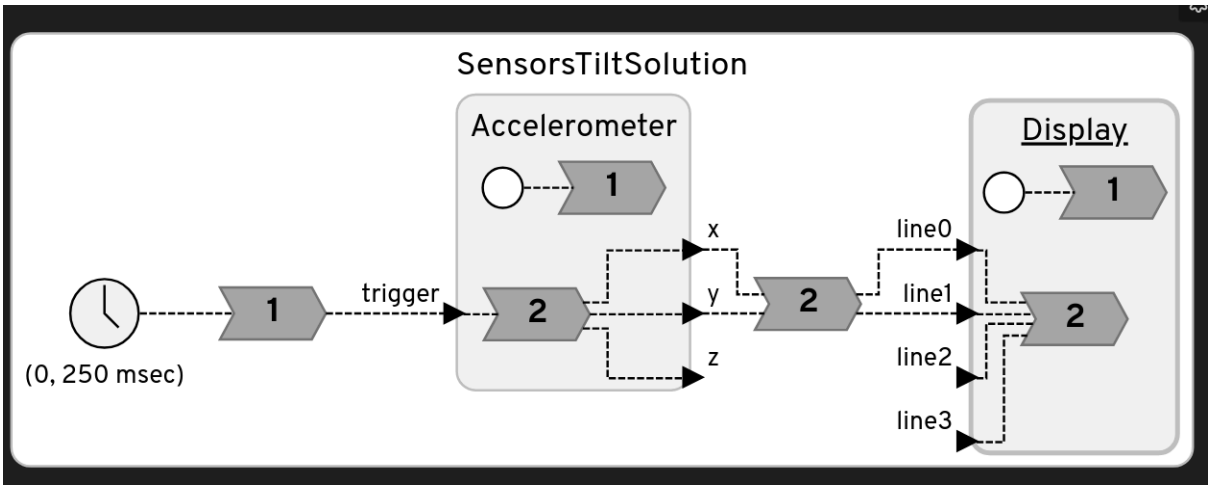
1.
    a. CTRL1_XL register is set to 0b00110000.
    ODR_XL3 = 0, ODR_XL2 = 0, ODR_XL1 = 1, ODR_XL0 = 1
    From the register settings, the accelerometer register is set to 52 Hz.
    b. The ranges supported by the accelerometer on the IMU chip are 2g, 16g, 4g, and 8g.
    c. 2g
    d. 0b00110010
2.
    a. The accelerometer range is ±2g, which means a full-scale range of 4000 mg (from -2000 mg to +2000 mg).
    4000/(2^16) = 0.061
    b. The sensitivity of the accelerometer can change by ±0.01% per °C.
    The bias (zero-g level) changes at ±0.1 mg/°C.
    For the temperature range from -40°C to +85°C, the bias is
    0.1mg/°C × 125°C = 12.5mg

CHECKOFFS

1. A. The X and Y axes are parallel to the ground since the robot is on a flat surface. Gravity acts vertically downward (along the Z axis), so there's no significant force or acceleration along the X and Y axes.

   B. In the Z axis, gravity pulls the robot down by an acceleration of -1g. However, the accelerometer reads +1g because of the robot's normal force on the Z-axis. This force keeps the robot stationary.

2. A.



A)The first reaction enables the Accelerometer. It sends a value true to the Accelerometer trigger and enables the accelerometer.

Reaction 1: B): It is an initialization reaction where the accelerometer, along with the imu sensors, are initialized

Reaction 2 C) This reaction is in the library file Tilt.lf and if the value of the trigger is True. It sends the accelerometer's x,y, and z-axis using the lf_set function to the main code.

Reaction 2 : D) It enables the roll and pitch value and sends it to line 0 and line 1 of the display.

B. By specifying single-threaded: true, you allow only one operation or task to be executed simultaneously. It ensures that no concurrency issues occur.

POST-LAB

1. range -32768 to 32767

   sensor reading =sensor reading value/sensitivity 1.0/0.000122 =8196.721

   8292=> 0x2000(hex)

   Binary => 0010000000000000

2. Measuring bias would require an ideal measurement. That means you measure the tilt where the value is universally accepted. You keep it as a reference and measure multiple angles.

   To compensate Desired reading =Current reading - Bias (based on ideal values)

3. The pitch should be aligned with the angle of steepness of the hill and the roll should be zero.
4. Helped us gain better understanding of how roll and pitch can be measured and why yaw cannot be measured . Also helped us understand sensor readings .