

Accelerometer Tutorial

Step 1: Start LabVIEW(LV) Robotics 2011, and then create a new robotics project. The project explorer window will then pop up. Save this project as LabAccelerometer. Once the project has been created it will automatically build and open the Roaming VI from lab 1. You may close this VI.

Step 2: Right click on *Starter Kit 2.0 sbRIO(some ip Address)* in the project explorer window, and create a new VI; name this VI Accelerometer. In the block diagram of the VI, create the following: **While loop, Initialize, Close.** (See figure 4.1)



Figure 4.1

Step 3: Now add a **Read AI** statement in the while loop and connect it to the Initialize reference. Right click on the AI line of the Read AI statement, then add constant. Select which ever pin the X-Axis of the accelerometer you are using is connected to.

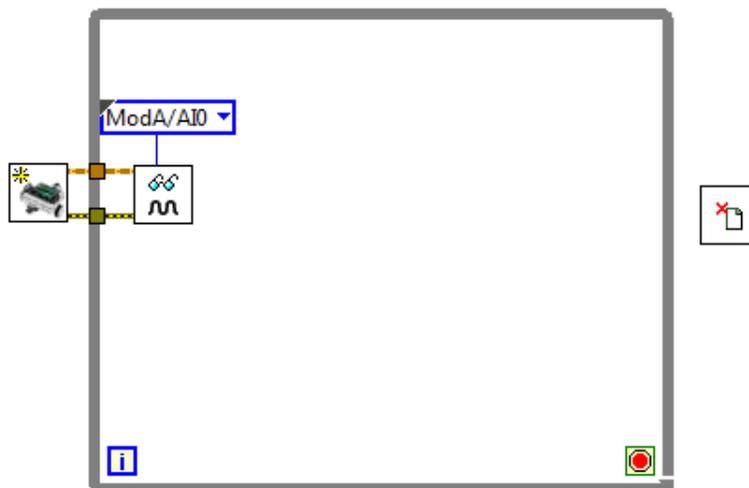


Figure 4.2

Step 4: Next we will create the logic for the accelerometer this tutorial assumes you are using the ADXL320. The Read AI statement will read an analog voltage from the sensor. If the sensor is at rest and laying on a flat surface, the voltage should read 2.5 volts. It will read 2.5 volts, because that is half of the voltage we are using. To convert this voltage to acceleration, the following equation must be used.

$$Acceleration = \left(\frac{Analog\ Voltage\ Value - \frac{1}{2}V_{cc}}{0.312} \right) * 9.8$$

When coding this equation in LabVIEW, it will look like figure 4.3.

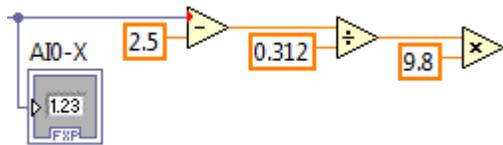


Figure 4.3

Now three conditions must be created based on the readings from the sensors. Only one axis will be used, and the axis will depend on the orientation of the sensor mounted on the robot. For the purposes of this tutorial, we will use the X-Axis. The three conditions are: Acceleration < -1, -1 < Acceleration < 1.5, and Acceleration > 1.5. Create the code from figure 4.4 make sure to include indicators at the end of the equations. This will allow the acceleration and voltage to be viewed for testing purposes.

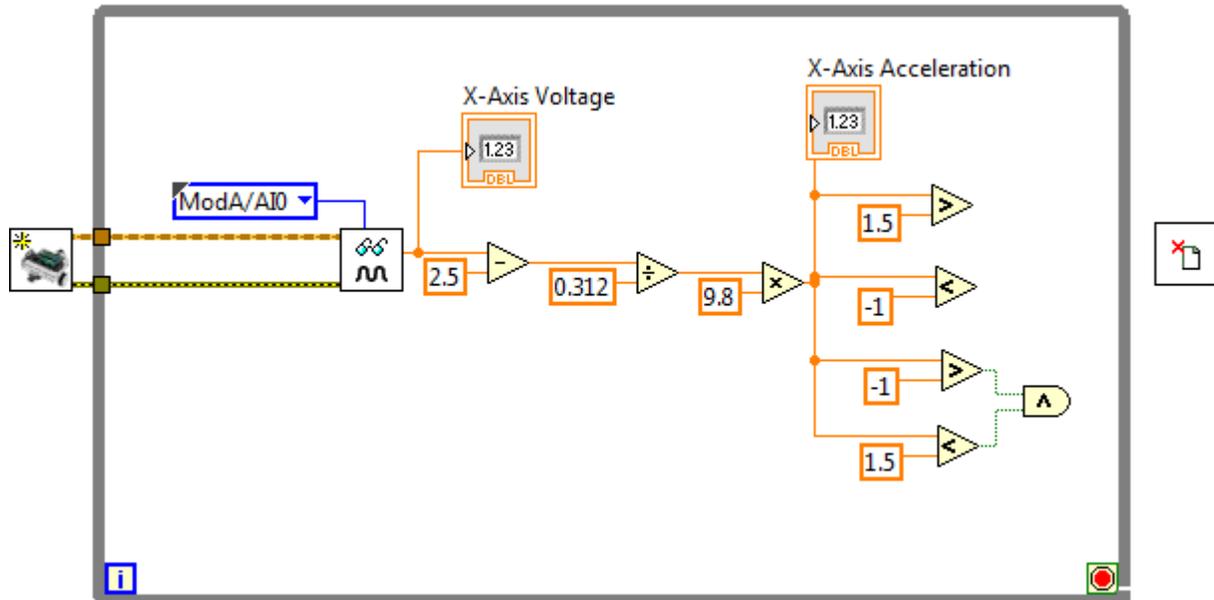


Figure 4.4

Figure 4.6

Step 5: Now Three Cases must be set up for the three different sensor scenarios. If the sensor is reading between -1 and 1.5, this means that the robot is level. If the robot is level then the code from figure 4.5 should run (For the purpose of this tutorial sub vi's have been used to decrease the size of code so that it may be easily viewed. Sub vi's may be referenced in the figure following where they are used.) Otherwise the robot will be tilted (In the case of this lab it will be half off of the ramp). For this case either the code from figures 4.6 or 4.7 should run.

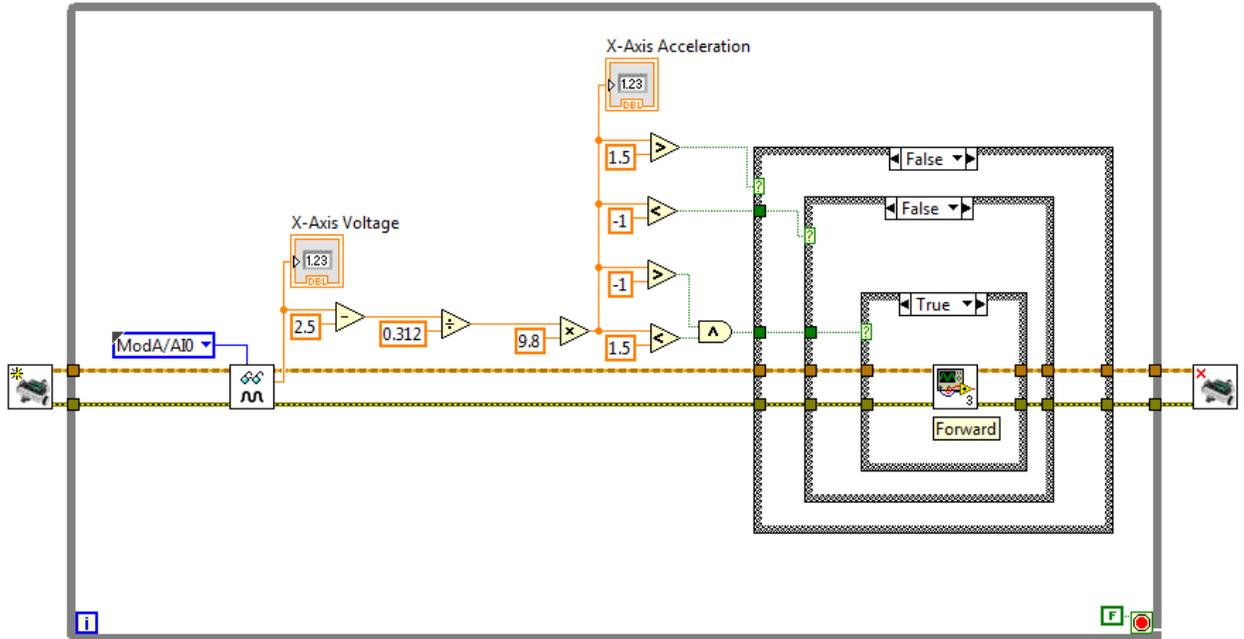


Figure 4.5a: Forward Case

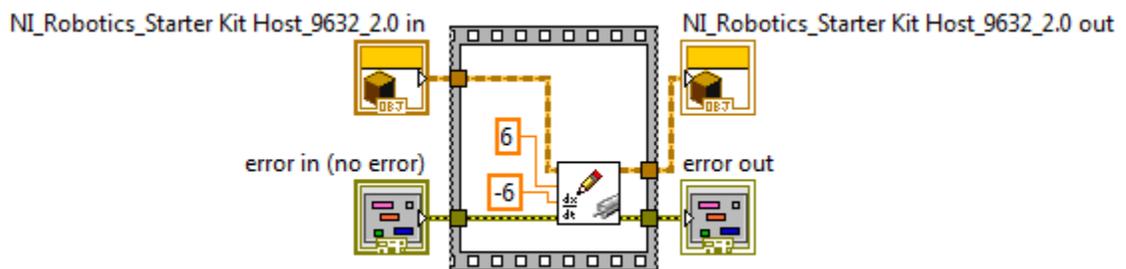


Figure 4.5b: Forward Sub VI

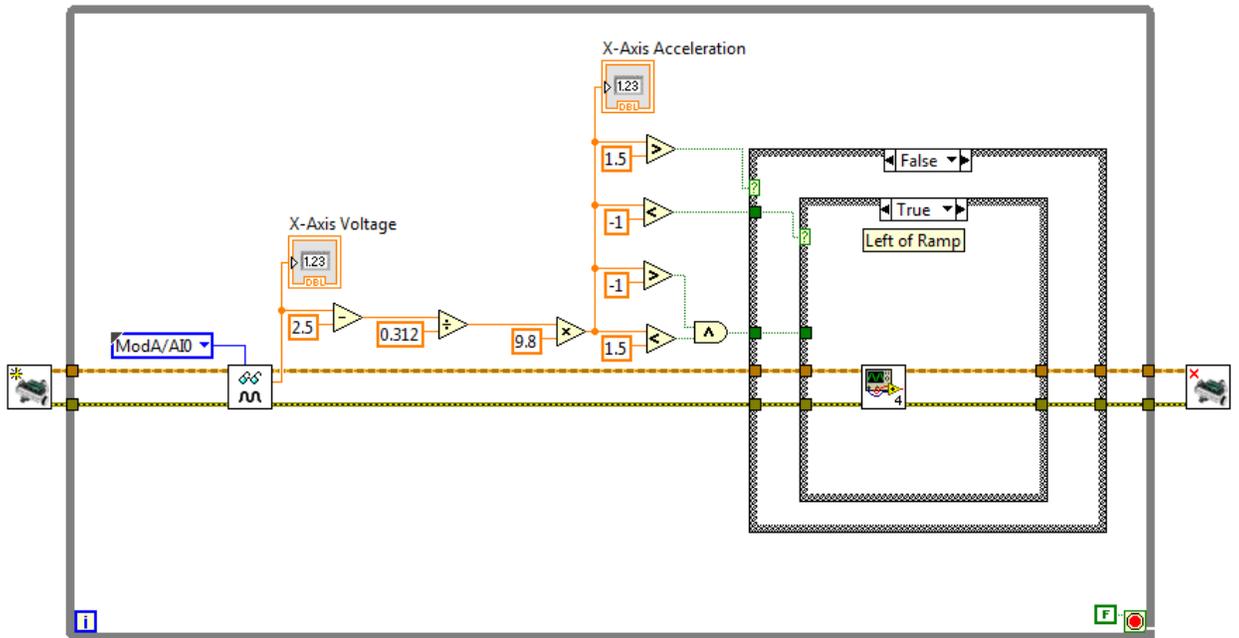


Figure 4.6a: Left of Ramp

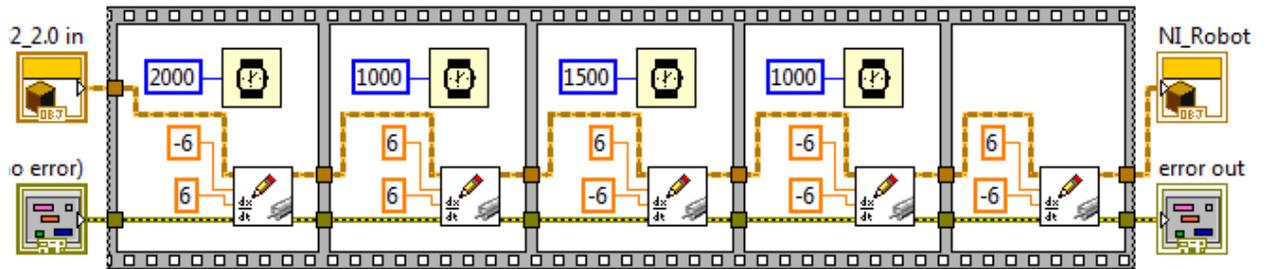


Figure 4.6b: Left of Ramp Sub VI

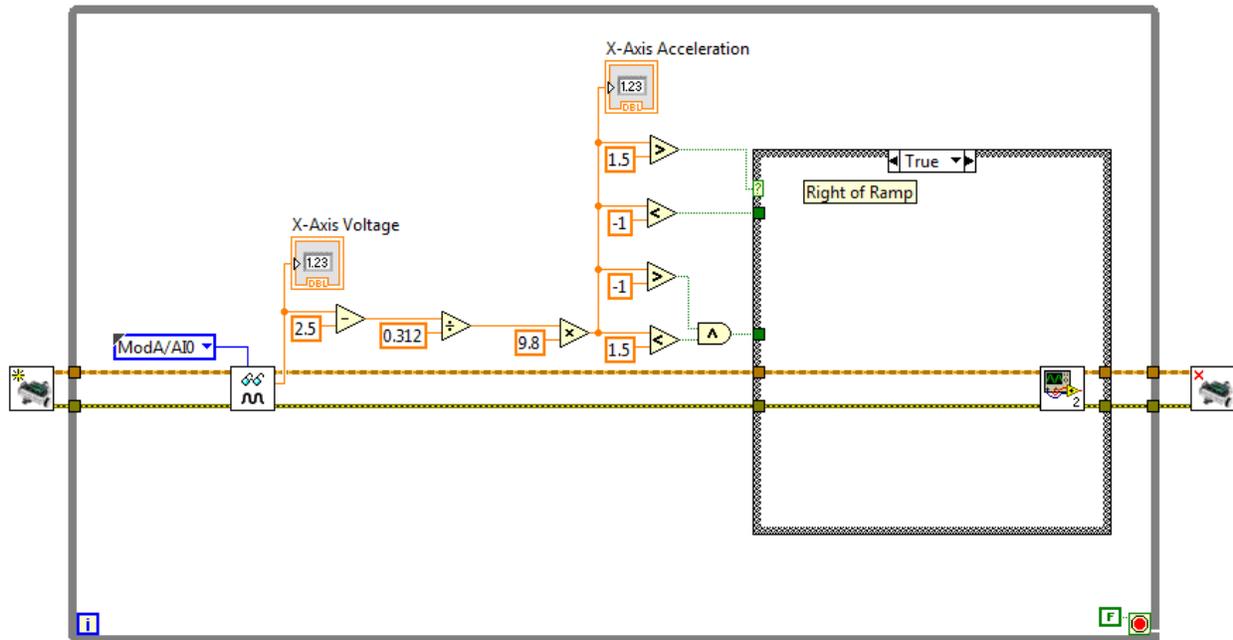


Figure 4.7a: Right of Ramp

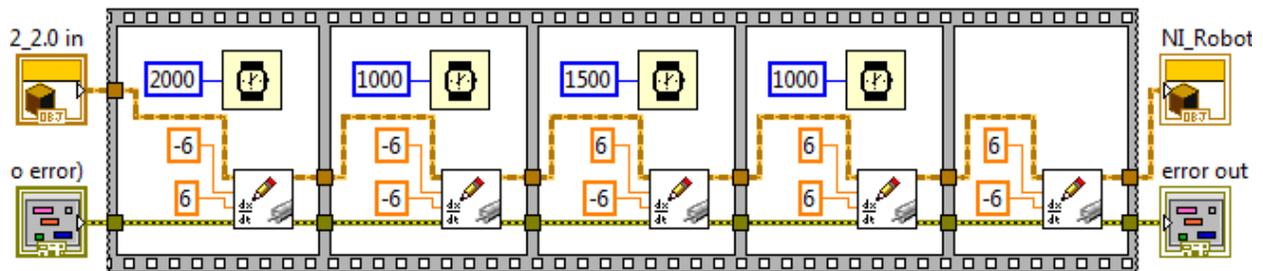


Figure 4.7b: Right of Ramp SubVI