Jacobs University Bremen

Introduction to Robotics and Intelligent Systems Lab

(Spring 2020)

Lab 3

Group Members :

- Hamza Bouhelal

- Mohamed Reda Arsalane

-Badr Essefiany

Salah Eddine Naouassih

1-Introduction:

In this final lab, we are perfecting our skills and experiences with the Arduino, working with different codes and equipment to solve the tasks we are given. This report is mainly constituted of pictures and explanations of what we did, the problems we faced, and how we solved them.

2-Lab Tasks:

Task 3.1:

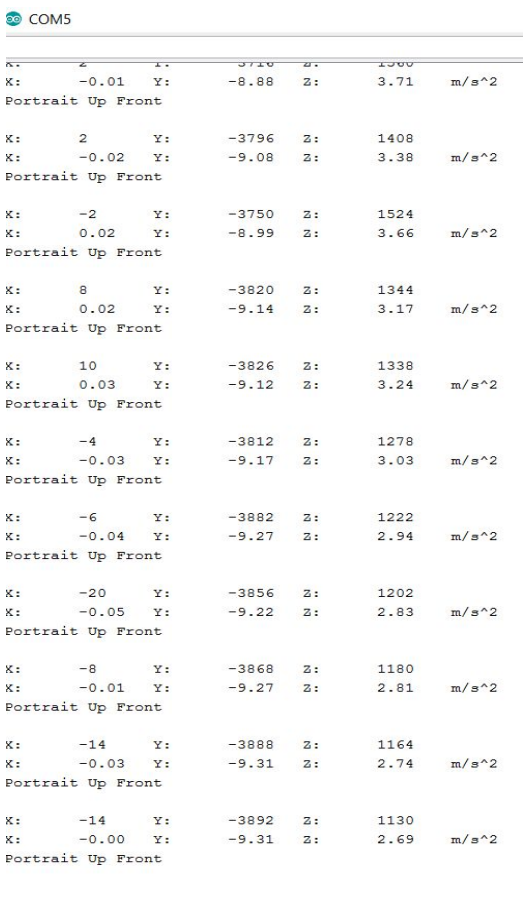
The command rotateX() makes a rotation around the x-axis with the argument the angle of rotation, for rotateY(), it does the same except the rotation occurs on the y-axis.

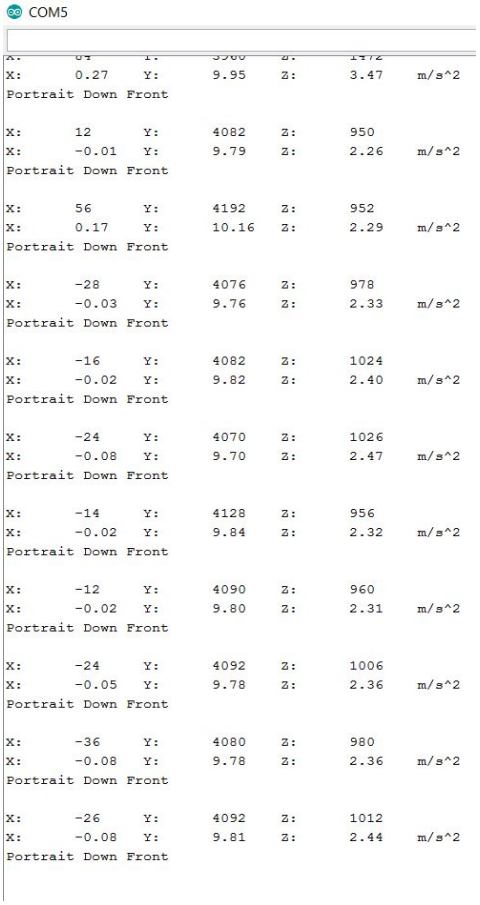
Task 3.2:

3.2.1:

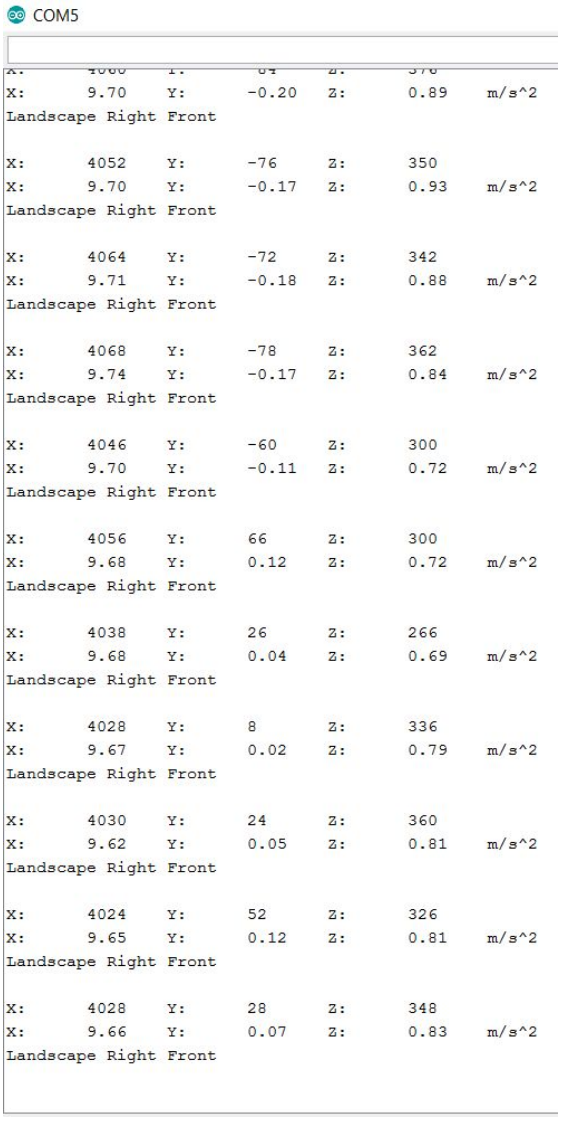
The signs of XYZ are negative or positive depending on their axis respectively (the ones printed on the accelerometer), so Yes, the values are as we expected.

3.2.2:

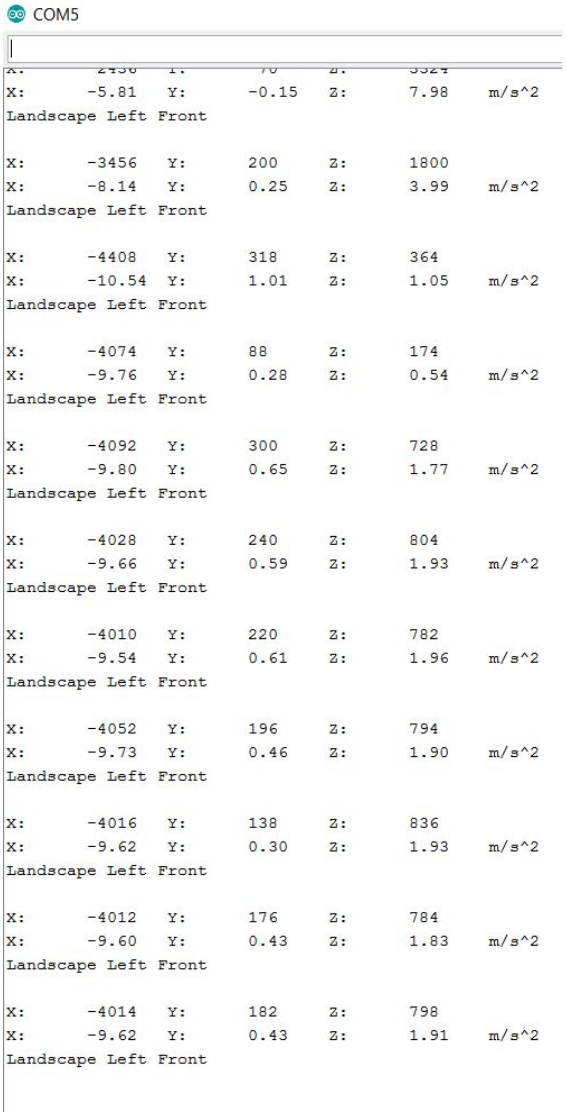




Portrait Up Front **Portrait Down Front**



Landscape Right Front



Landscape Left Front

COM5

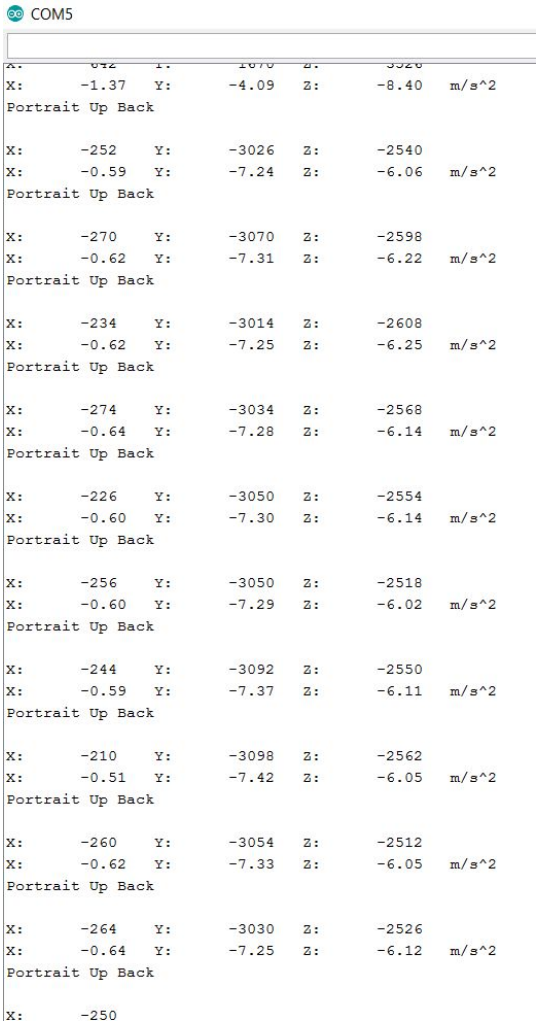
```
X:      0.29    Y:      -2.40   Z:      -8.16   m/s^2
Portrait Up Back

X:      562     Y:      206     Z:      -3724
X:      1.43    Y:      0.34    Z:      -8.87   m/s^2
Portrait Up Back

X:      2212    Y:      244     Z:      -3504
X:      5.37    Y:      0.66    Z:      -8.44   m/s^2
Landscape Right Back

X:      2142    Y:      -12     Z:      -3680
X:      5.17    Y:      -0.01   Z:      -8.78   m/s^2
Landscape Right Back

X:      2158    Y:      260     Z:      -3404
X:      5.15    Y:      0.69    Z:      -8.15   m/s^2
Landscape Right Back

X:      2328    Y:      332     Z:      -3386
X:      5.57    Y:      0.83    Z:      -8.08   m/s^2
Landscape Right Back

X:      2352    Y:      284     Z:      -3416
X:      5.62    Y:      0.65    Z:      -8.15   m/s^2
Landscape Right Back

X:      2258    Y:      474     Z:      -3240
X:      5.32    Y:      1.09    Z:      -7.73   m/s^2
Landscape Right Back

X:      2428    Y:      424     Z:      -3282
X:      5.78    Y:      1.01    Z:      -7.85   m/s^2
Landscape Right Back

X:      2384    Y:      442     Z:      -3220
X:      5.71    Y:      1.04    Z:      -7.78   m/s^2
Landscape Right Back

X:      2430    Y:      362     Z:      -3276
X:      5.78    Y:      0.91    Z:      -7.92   m/s^2
Landscape Right Back
```

Landscape Right Back

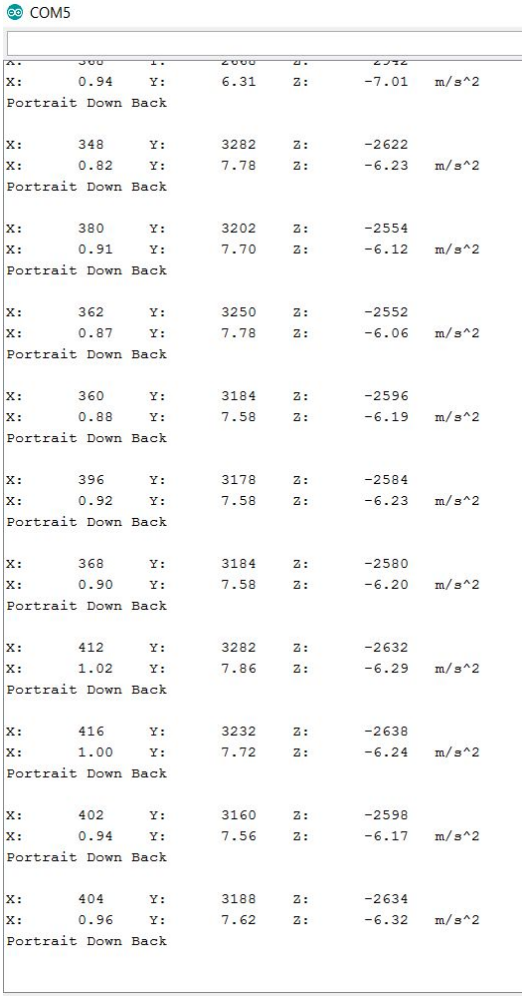
COM5

```
X:      -4.06   Y:      -0.90   Z:      -8.35   m/s^2
Landscape Left Back

X:      -1944   Y:      -258    Z:      -3426
X:      -4.67   Y:      -0.63   Z:      -8.17   m/s^2
Landscape Left Back

X:      -1950   Y:      -258    Z:      -3502
X:      -4.67   Y:      -0.67   Z:      -8.41   m/s^2
Landscape Left Back

X:      -2028   Y:      -252    Z:      -3436
X:      -4.79   Y:      -0.60   Z:      -8.19   m/s^2
Landscape Left Back

X:      -2044   Y:      -246    Z:      -3562
X:      -4.87   Y:      -0.60   Z:      -8.56   m/s^2
Landscape Left Back

X:      -1992   Y:      -170    Z:      -3452
X:      -4.81   Y:      -0.44   Z:      -8.30   m/s^2
Landscape Left Back

X:      -2018   Y:      -214    Z:      -3474
X:      -4.77   Y:      -0.51   Z:      -8.32   m/s^2
Landscape Left Back

X:      -1972   Y:      -176    Z:      -3486
X:      -4.71   Y:      -0.46   Z:      -8.29   m/s^2
Landscape Left Back

X:      -1998   Y:      -206    Z:      -3498
X:      -4.75   Y:      -0.48   Z:      -8.32   m/s^2
Landscape Left Back

X:      -1976   Y:      -186    Z:      -3484
X:      -4.72   Y:      -0.43   Z:      -8.38   m/s^2
Landscape Left Back

X:      -2040   Y:      -228    Z:      -3500
X:      -4.84   Y:      -0.56   Z:      -8.34   m/s^2
Landscape Left Back
```

Landscape Left Back



Portrait Up Back



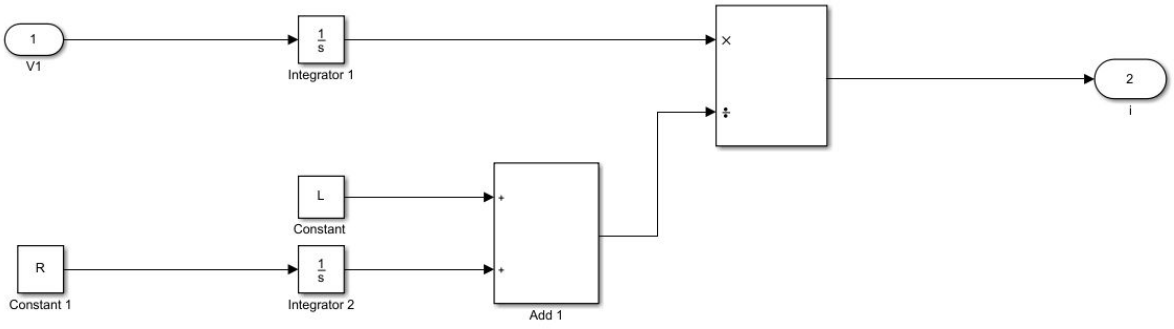
Portrait Down Back

3.2.3:

The unit of the Acceleration is m/s^2, so yes it is really in m/s^2 (we are working on the accelerometer).

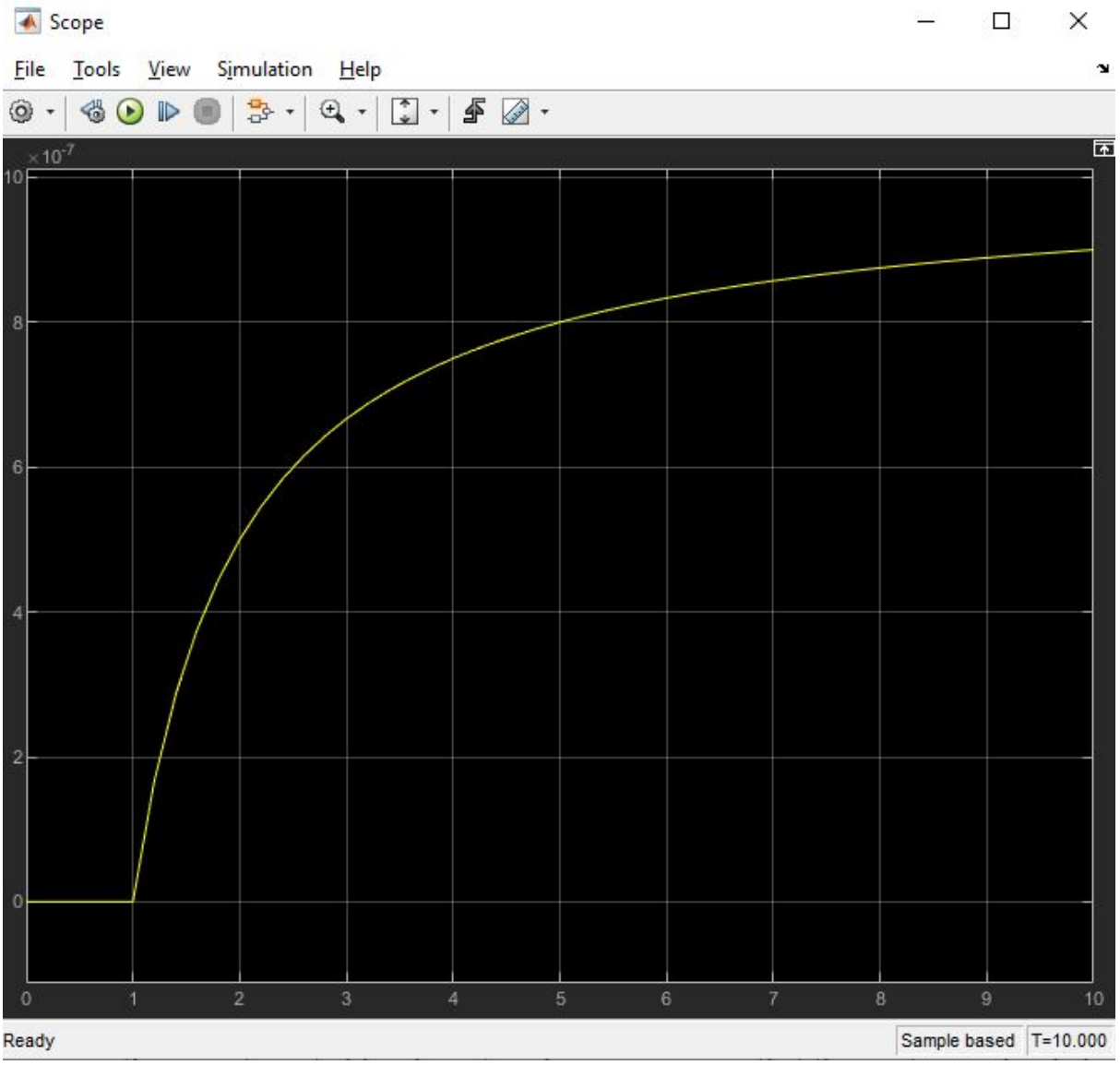
Task 3.4:

We know that **i(t)R = V1(t) − (Ldi/dt)**, using the Laplace transform we find **I(S)R = V1(S) − SLI(S)** so the transform function is **H(S) =1/(SL + R)** or **H(S) =(1/S)/(L + R/S')** this function helps us design the circuit in Matlab and it's equivalent to our RL circuit after the transform function.



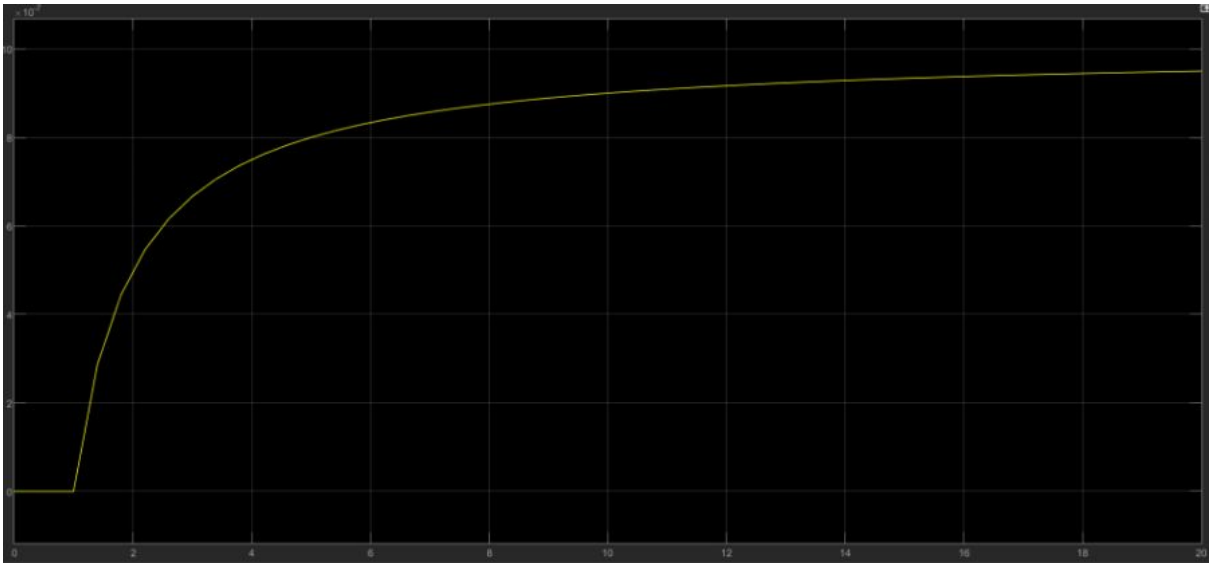
the circuit that we created in Matlab Simulink

Task 3.5:



After running the program for 10 discrete time, we obtain the preceding graph, in which we can observe the graph being stagnant then gradually increasing from an initial value which starts at 0 to a more stable state at a final value of 9*10^(-7).

Task 3.6



Similarly to the first graph, we can observe the same phenomenon occurring once again, as the graph is stable for the first few values and then starts to gradually increase to a final value in which the graph becomes more stable.