**Jacobs University Bremen**

Introduction to Robotics and Intelligent Systems Lab (Spring 2020)

CH-220-B\_s2020

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Lab Rotation II B lab 2

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**Introduction:**

**In this lab session, we are using Processing as a tool to work with Arduino in order to make use of the data from the environment. Then, Simulink is introduced to create a RL circuit model and understand the processes during work, so that we can do further tasks about a RC circuit model.**

**Task 3.1**

rotateX and rotateY are two functions to rotate the planes in radian angle respectively. Coordinates are being rotated around the origin, positive angle for clockwise and negative anticlockwise. Also, when these two functions are used within draw(), the transformation is reset when the loop begins again.

**Task 3.2**

**1)** No, the directions of XYZ accelerations are opposite, but parallel to the directions on the breakout board.

**2)**

**Left front right front**

**电脑屏幕的照片上有文字

描述已自动生成 电脑屏幕的照片上有文字

描述已自动生成**

**Down front up front**

**电脑屏幕的照片

描述已自动生成电脑屏幕的照片上有文字

描述已自动生成**

**Up back left back**

**电脑屏幕的照片上有文字

描述已自动生成电脑屏幕的照片上有文字

描述已自动生成**

**Right back down back**

**电脑屏幕的照片上有文字

描述已自动生成电脑屏幕的照片上有文字

描述已自动生成**

**3)**

It is not really m/s^2. Because this is only a representation of acceleration, since no matter what our range is, this unit does not change. Depending on the range, the unit can be different from meters and seconds, but it certainly is a unit of acceleration.

**Task 3.3**

Skip

**Task 3.4**

**图片包含 游戏机, 钟表

描述已自动生成**

According to the Lab Manual, the RL circuit can be written as H(S)= .

Therefore, by having L and R as constant and S as input, the circuit can be represented in Simulink like the above, where we use integrator as 1/S and add and divide blocks to show the complete process in the formula.

**Task 3.5**

**图片包含 游戏机, 窗户, 烤箱, 微波炉

描述已自动生成**

In the scope after the model being ran for 10 discrete times, the outputs are increasing in a curve-like manner and there is a upper bound. There is nothing happening in between the beginning and the first step.

This is a stable function because the pole of the transform function is negative, as shown below.

L+R/S = 0 L>0 and R>0

S = -L/R

S is negative because L and R are both positive.

**Task 3.6**

**电脑萤幕的截图

描述已自动生成**

Transform function = R =1e6 C=1e-6

RC = 1

Rewrite transform function as , which approaches to 1

Then, let us prove that the function is stable system. We need the pole of transform function to be negative.

RC+1/S = 0

S = -1/RC as R>0 and C>0 our S < 0, so pole is negative and our function is a stable system.

Overall, we can say that our function is similar to the previous function, both in shape and its properties.

**Conclusion:**

In this lab session we managed to complete the tasks of lab 3 in the Lab manual. Understanding how Processing works with Arduino is a good start for the orientation sensor, especially functions like rotateX and rotateY. After that we can better analyze the orientation outcomes and their meanings behind.

By analyzing an RL circuit and creating the model of it, we understand more about the relationship between the resistor and the inductor. Also, by learning how to draw a RL circuit model and explaining the output of that model, we have less barriers doing the RC circuit model task.

There was a time that error occurs about the accelerometer, we had to change a new unit of that for the program to run and show the expected results.

**Reference:**

Lab Manual