WHILE TOLERANCE

LAB 6

SECTION C

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Problem

In this lab we were required to echo some values and make some calculations for magnitude while the program is running and then based on the magnitude's value print out Speeding Up, Slowing Down, or Constant Acceleration. We were also required to convert from ms to mm:ss.ms for easier reading.

Analysis

The program analyzes data from an Esplora unit and calculates the magnitude of the acceleration and then prints a statement based on it's relation to the average of the last 5 magnitudes.

Design

For the last section we were told to print various strings based on the relationship between our averaged previous 5 values and the current magnitude. We also had to design code to convert ms to mm:ss.ms format.

Testing

In order to test if my code worked I had to plug the Esplora into the computer to generate values for my program and use an Excel spreadsheet to confirm that the calculations work correctly. I also added a printf(); to print out values so I could try and use them to find problems.

Comments

The last part gave me difficulties as I'm not entirely sure how to do what the lab asked me to do. I did my best but the code still probably doesn't do what it should. "4"

Source Code

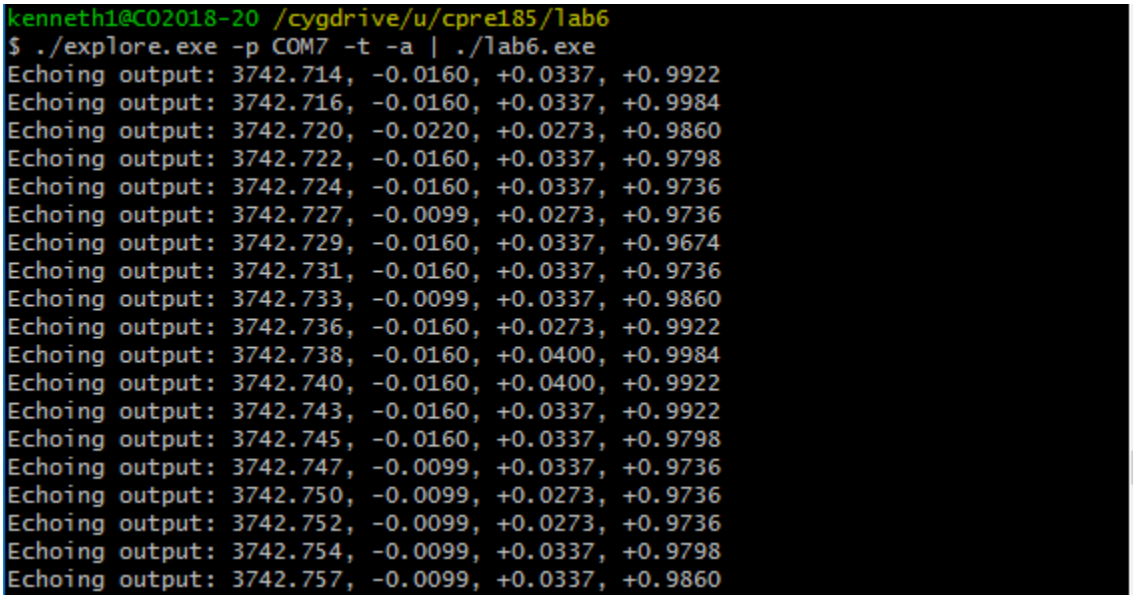
```
//Author: Kenneth A. Jacobson
//Description: Display magnitude of acceleration from Esplora unit
//Lab6
//13.10.2017

#include <stdio.h>
#include <math.h>

#define TRUE 1


int main(void) {
  /* DO NOT MODIFY THESE VARIABLE DECLARATIONS */
        int t;
        double  ax, ay, az;

        //Your other variable declarations below
        double time;                    double sample0= 0.0, sample1= 0.0;
        double accl;                    int minutes, seconds, millis;
        double tolerance = .02;     double avemag= .987, sampleSum;
        double sample2= 0.0;            double sample3= 0.0, sample4= 0.0;


        while (TRUE) {
                scanf("%d,%lf,%lf,%lf", &t, &ax, &ay, &az);

//CODE SECTION 0
// modify the printf below for appropriate formatted output

                time = (double) t/1000.0;
                printf("Echoing output: %8.3lf, %+7.4lf, %+7.4lf, %+7.4lf\n", time, ax, ay,
az);

//CODE SECTION 1
// declare appropriate variable type for accl
//write an expression to compute accl, see Lab handout
                accl = sqrt(pow(ax,2.0)+ pow(ay,2.0)+ pow(az,2.0));

                //printf("At %8d ms, the acceleration's magnitude was: %lf\n",
```

```
//       t, accl);

//CODE SECTION 2
// Convert the time expressed in milliseconds in variable t into
// three parts - minutes, seconds and milliseconds
// declare appropriate variables for each of the three parts - minutes, seconds, millis

        minutes = time/60.0;
        seconds = (int) time % 60;
        millis = t - (seconds*1000) - (minutes*60*1000);


        printf("At %d minutes, %d seconds, and %d milliseconds it was: %lf\n",
        minutes, seconds , millis, accl);

//CODE SECTION 3
//Interpret magnitude to return human-friendly strings
        //change sampled values and compute average magnitude

            sample4 = sample3;
            sample3 = sample2;
            sample2 = sample1;
            sample1 = sample0;
            sample0 = accl;
            sampleSum = sample0+ sample1+ sample2+ sample3+ sample4;
            avemag = sampleSum/5;


        /*test statement
        printf("s0: %.3lf, s1: %.3lf, s2: %.3lf, s3: %.3lf, s4: %.3lf\n", sample0,
sample1, sample2, sample3, sample4);
        printf("accl: %.3lf, avemag: %.3lf\n", accl, avemag);
        return 0;
        }*/

        if(fabs(accl-avemag) > tolerance && accl > avemag){
            printf("Speeding Up\n");

        }
        else if(fabs(accl-avemag) > tolerance && accl < avemag){
```

```
                printf("Slowing Down\n");

            }
            else{
                printf("Constant Acceleration\n");

            }

        }
return 0;
}
```

Screen Shots

1.)



2.)

```
kenneth1@CO2018-20 /cygdrive/u/cpre185/lab6
$ ./explore.exe -p COM7 -t -a | ./lab6.exe
Echoing output: 3842.433, -0.0160, +0.0337, +0.9798
At  3842433 ms, the acceleration's magnitude was: 0.980508
Echoing output: 3842.435, -0.0160, +0.0337, +0.9922
At  3842435 ms, the acceleration's magnitude was: 0.992892
Echoing output: 3842.437, -0.0220, +0.0337, +0.9984
At  3842437 ms, the acceleration's magnitude was: 0.999199
Echoing output: 3842.440, -0.0160, +0.0400, +0.9922
At  3842440 ms, the acceleration's magnitude was: 0.993126
Echoing output: 3842.442, -0.0220, +0.0337, +0.9860
At  3842442 ms, the acceleration's magnitude was: 0.986816
Echoing output: 3842.444, -0.0160, +0.0337, +0.9798
At  3842444 ms, the acceleration's magnitude was: 0.980508
Echoing output: 3842.446, -0.0160, +0.0337, +0.9798
At  3842446 ms, the acceleration's magnitude was: 0.980508
Echoing output: 3842.449, -0.0160, +0.0337, +0.9736
At  3842449 ms, the acceleration's magnitude was: 0.974316
Echoing output: 3842.451, -0.0099, +0.0400, +0.9736
At  3842451 ms, the acceleration's magnitude was: 0.974474
Echoing output: 3842.453, -0.0160, +0.0337, +0.9736
At  3842453 ms, the acceleration's magnitude was: 0.974316
```

3.)

```
kenneth1@CO2018-20 /cygdrive/u/cpre185/lab6
$ ./explore.exe -p COM7 -t -a | ./lab6.exe
Echoing output: 3950.982, -0.0160, +0.0337, +0.9798
At  3950982 ms, the acceleration's magnitude was: 0.980508
At 65 minutes, 50 seconds, and 982 milliseconds it was: 0.980508
Echoing output: 3950.985, -0.0160, +0.0337, +0.9736
At  3950985 ms, the acceleration's magnitude was: 0.974316
At 65 minutes, 50 seconds, and 985 milliseconds it was: 0.974316
Echoing output: 3950.987, -0.0160, +0.0337, +0.9798
At  3950987 ms, the acceleration's magnitude was: 0.980508
At 65 minutes, 50 seconds, and 987 milliseconds it was: 0.980508
Echoing output: 3950.989, -0.0160, +0.0337, +0.9736
At  3950989 ms, the acceleration's magnitude was: 0.974316
At 65 minutes, 50 seconds, and 989 milliseconds it was: 0.974316
Echoing output: 3950.992, -0.0160, +0.0337, +0.9860
At  3950992 ms, the acceleration's magnitude was: 0.986700
At 65 minutes, 50 seconds, and 992 milliseconds it was: 0.986700
Echoing output: 3950.994, -0.0160, +0.0337, +0.9860
At  3950994 ms, the acceleration's magnitude was: 0.986700
At 65 minutes, 50 seconds, and 994 milliseconds it was: 0.986700
Echoing output: 3950.996, -0.0160, +0.0337, +0.9922
```

4.)

```
kenneth1@CO2018-20 /cygdrive/u/cpre185/lab6
$ ./explore.exe -p COM7 -t -a | ./lab6.exe
Echoing output: 4745.150, -0.0039, +0.0273, +0.9922
At  4745150 ms, the acceleration's magnitude was: 0.030191
At 79 minutes, 5 seconds, and 150 milliseconds it was: 0.030191
Speeding Up
Echoing output: 4745.152, +0.0021, +0.0273, +0.9922
At  4745152 ms, the acceleration's magnitude was: 0.030015
At 79 minutes, 5 seconds, and 152 milliseconds it was: 0.030015
Speeding Up
Echoing output: 4745.154, +0.0082, +0.0337, +0.9860
At  4745154 ms, the acceleration's magnitude was: 0.035161
At 79 minutes, 5 seconds, and 154 milliseconds it was: 0.035161
Speeding Up
Echoing output: 4745.157, +0.0021, +0.0273, +0.9798
At  4745157 ms, the acceleration's magnitude was: 0.027428
At 79 minutes, 5 seconds, and 157 milliseconds it was: 0.027428
Speeding Up
Echoing output: 4745.159, +0.0021, +0.0273, +0.9860
At  4745159 ms, the acceleration's magnitude was: 0.028075
At 79 minutes, 5 seconds, and 159 milliseconds it was: 0.028075
Slowing Down
Echoing output: 4745.161, +0.0082, +0.0210, +0.9798
```