

THE EXQUALIZER

LAB 7

SECTION X

SUBMITTED BY:

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Problem

The purpose of this lab, the exqualizer, is to create a program, which reads input, and output commands that will calculate the roll and pitch of the esplora. It will read that amount and divide it into 80 characters ranging from left to right. Depending on the scale it will print equivalent characters on the screen. The point of this lab is to practice output parameters/branching and looping structures.

Analysis

The problem stated that I must print l(for left) or r(for right) or 0 depending on the acceleration values of the esplora. Therefore, I have to create a scale that will divide the value and make it fit the screen. I also had to write pitch and roll functions using the equations $\text{asin}(a_x)$ and $\text{asin}(a_y)$.

Design

The problem was to finish writing a skeleton code, so the basic outline of the program was already there for me. I first decided to work on the `read_acc` function because in my opinion it is the most important, as this is how I got values to come into the program. Looking at the comment, all I Needed to do was add a `scanf` statement, and an if statement. Following that, pitch and roll are both calculated the same way only pitch uses y values and roll uses x values. Once I read the mag, I had to make sure it didn't go above 1 or less than -1. Then I had to use the `asin` fuction. To switch between the pitch and roll, I included Boolean, and was able to switch between the two buttons using `true` and `false`.

Testing

In order to verify the results of the solution, I had to try the roll/pitch functions separately first and I saw that they both worked. However, the way I switched between them wasn't working correctly. This is when I decided to add Boolean, and went back to lab5 where I also used Boolean to switch between loops. Afterwards, this fixed the problem and the program ran successfully.

Comments

1. How did you scale your values? Write an equation and justify it:

$(\text{rad} / (\text{PI}/2)) * 39;$

I divided the radians by $(\text{PI}/2)$ because that's the maximum value of each side. $\text{PI}/2$ is equal to 90 degrees, which when multiplies by two is 180 degrees, and that covers the whole area. Then I multiplied it by 39. That will return plus or minus 39, +39 being right characters, or -39 being left characters.

2. How many degrees does each letter in your graph represent? This is the precision of your graph. As you experiment with roll and pitch, what do you notice about the graph's behavior near the limits of its values.

It's 2.3769231 degrees. I found that by dividing 90 degrees by 39. When the graph is near the limit, it fills the 39 characters.

```
UI\Cpe115\lab7\lab7.c - Notepad++
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//Insert any beginning needed code here
61
62
63 do
64 {
65     read_acc(&x, &y, &z, &t, &b_Up, &b_Down, &b_Left, &b_Right); // Get line of input
66
67     if (b_Up == 1) { // check for button input
68         pressUp = true;
69         pressDown = false;
70     }
71
72     if (b_Down == 1) {
73         pressDown = true;
74         pressUp = false;
75     }
76
77     if (pressUp == true) {
78         roll_rad = roll(x); // calculate roll and pitch
79         scaled_value = scaledRadForScreen(roll_rad); // Scale your output value
80         graph_line(scaled_value); // Output your graph line
81     }
82
83     if (pressDown == true) {
84         pitch_rad = pitch(y);
85         scaled_value = scaledRadForScreen(pitch_rad);
86         graph_line(scaled_value);
87     }
88
89     fflush(stdout);
90 }
91 while (b_Left != 1); // Stops when left button is pressed
92 return 0;
93
94 int read_acc(double* a_x, double* a_y, double* a_z, int* time, int* Button_UP, int* Button_DOWN, int* Button_LEFT, int* Button_RIGHT) {
95     int joystick, alider;
96     return scanf("%d %lf, %lf, %d, %d, %d, %d, %d", time, a_x, a_y, a_z, Button_UP, Button_DOWN, Button_LEFT, Button_RIGHT, &joystick);
97 }
98 if (*Button_LEFT == 1) {
99     return 1;
100 }
101 else {
102     return 0;
103 }
104 }
105
106 double roll(double x_mag) {
107     double xx = 0;
108     if (x_mag > 1) {
109         x_mag = 1;
110     }
111     if (x_mag < -1) {
112         x_mag = -1;
113     }
114     xx = asin(x_mag);
115     return xx;
116 }
117
118 double pitch(double y_mag) {
119     double yy = 0;
120     if (y_mag > 1) {
121         y_mag = 1;
122     }
123     if (y_mag < -1) {
124         y_mag = -1;
125     }
126     yy = asin(y_mag);
127     return yy;
128 }
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The image shows a screenshot of a C++ code editor window. The title bar at the top reads "U:\Cp185\lab7\lab7c - Notepad++". The menu bar includes "File", "Edit", "View", "Encoding", "Language", "Settings", "Macro", "Run", "Plugins", "Window", and "?". The toolbar contains various icons for file operations, editing, and running. The main text area displays C++ code for a 2D coordinate system with mouse controls. The code includes functions for button presses, coordinate movement, scaling, and printing. The code is as follows:

```
97     return mouse("bd, xlf, xlf, xlf, bd, bd, bd, bd, bd, bd", time, A_X, A_Y, A_X, Button_UP, Button_DOWN, Button_LEFT, Button_RIGHT, &slider, &isattyk);
98     if (*Button_LEFT == 1) {
99         return 1;
100     }
101     else {
102         return 0;
103     }
104 }
105
106 double roll(double x_mag) {
107     double xx = 0;
108     if (x_mag > 1){
109         x_mag = 1;
110     }
111     if (x_mag < -1){
112         x_mag = -1;
113     }
114     xx = asin(x_mag);
115     return xx;
116 }
117
118 double pitch(double y_mag) {
119     double yy = 0;
120     if (y_mag > 1) {
121         y_mag = 1;
122     }
123     if (y_mag < -1) {
124         y_mag = -1;
125     }
126     yy = asin(y_mag);
127     return yy;
128 }
129
130 int scaleRadForScreen(double rad) {
131     return (rad / (PI/1)) * 39;
132 }
133
134 void print_chars(int num, char use) {
135     for (int i=0; i < fabse(num); ++i){
136         printf("%c", use);
137     }
138 }
139
140 void graph_line(int number) {
141     if (number < 0) {
142         for (int i=0; i < (40 + number); ++i) {
143             printf(" ");
144         }
145         print_chars(number, '1');
146     }
147     if (number > 0) {
148         for (int i=0; i < (40 + number); ++i) {
149             printf(" ");
150         }
151         print_chars(number, '1');
152     }
153     if (number == 0) {
154         for (int i = 0; i < 40; ++i) {
155             printf(" ");
156         }
157         printf("\n");
158     }
159 }
160 }
```

The status bar at the bottom shows "C source file", "length: 4316 lines: 160", "Ln: 87 Col: 145 Sel: 0 | 0", "Dev: Windows", "UTF-8", and "965".