The DS4 Equalizer

LAB # 7

SECTION #3

James Gaul

SUBMISSION DATE: 3/29/24

LAB DATE: 3/22/24

Problem

For this lab, we were assigned to use pointers to return function values, and to use the terminal display to create a simple visualizer of the DualShock controller's inputs.

Analysis

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

- As the gyroscope input returns a floating point value between 1.000 and -1.000, I simply multiplied this value by the max number of characters that could be displayed (39). The equation was scaledValue = value * 39;
- As the joystick outputs an integer value between positive and negative 127, I needed to divide this input value by 127 in addition to multiplying it by 39 as before. Thus, I used the equation: scaledValue = inputValue * (39.0 / 127.0);

Design

I used a simple int variable and switch statement to cycle between input modes when the upper (triangle) button was pressed. To ensure that holding down the button didn't change the mode continuously, I used a "prevUp" value to record this state, only allowing the mode to change when the up button was pressed and prevUp was also zero.

Testing

Question 2: As you experiment with the roll and pitch, what do you notice about the graph's behavior near the limits of its values?

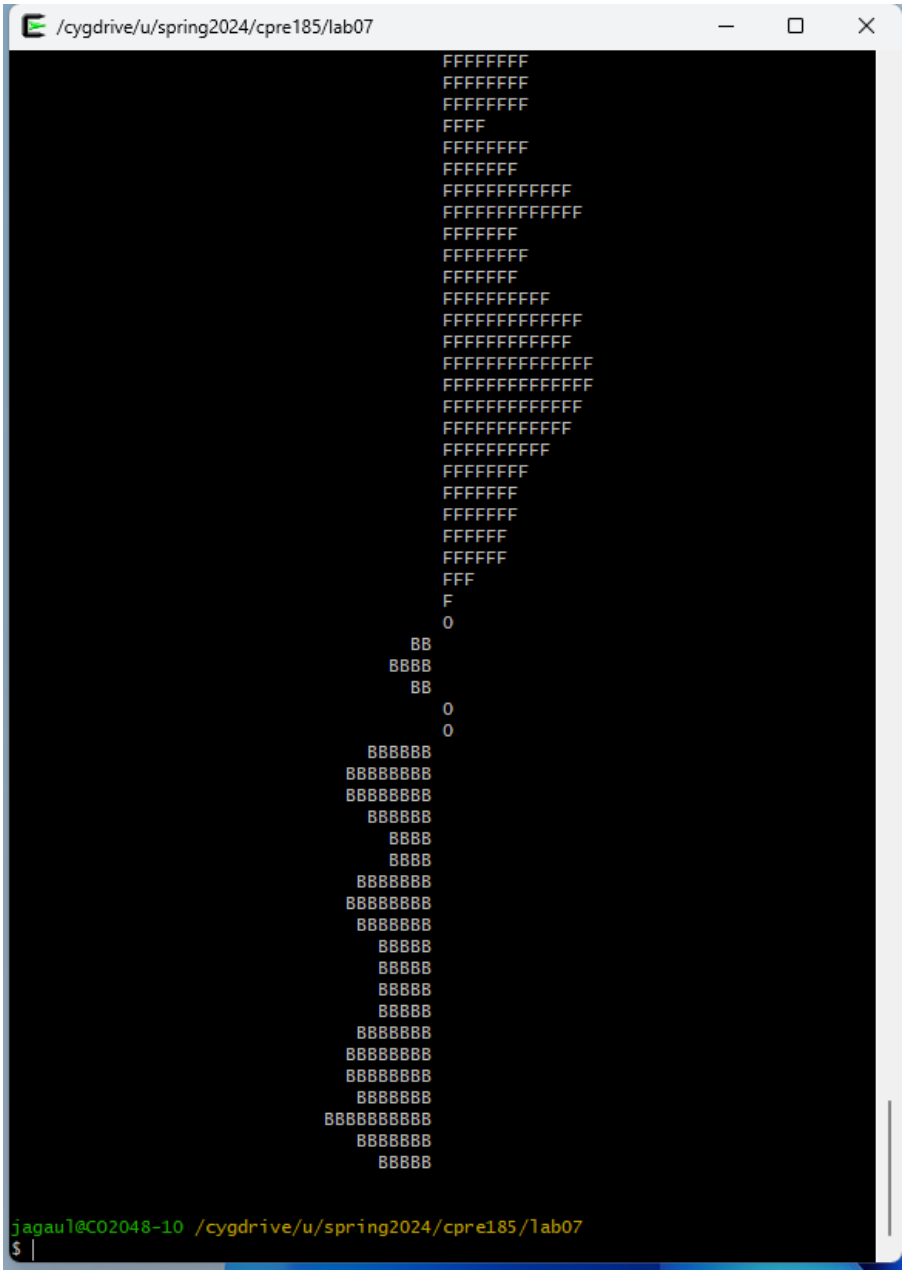
As the graph reaches its limit, it "rolls over" to the opposite extreme, with the line suddenly shifting from "far right" to "far left" and vice-versa.

Comments

By far, the most difficult task for me was simply getting the scanf statement to properly read the controller data. The large number of variables involved (combined with my own inexperience with using pointers) meant that the largest portion of my lab time was on the read_input function alone.

Screen Shots

1. Output - Pitch (forward/backwards):



2. Output - Roll (Right/Left):

```
                                        RRRRRRRRRRRRRRRR
                                        RR
                                 LLLLLL
                           LLLLLLLLLLLL
                    LLLLLLLLLLLLLLLLLLL
         LLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
     LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
   LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
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LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
   LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
      LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
          LLLLLLLLLLLLLLLLLLLLLLLLLLLLL
           LLLLLLLLLLLLLLLLLLLLLLLLLLLL
           LLLLLLLLLLLLLLLLLLLLLLLLLLLL
            LLLLLLLLLLLLLLLLLLLLLLLLLLL
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            LLLLLLLLLLLLLLLLLLLLLLLLLLL
            LLLLLLLLLLLLLLLLLLLLLLLLLLL
           LLLLLLLLLLLLLLLLLLLLLLLLLLLL
           LLLLLLLLLLLLLLLLLLLLLLLLLLLL
      LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
     LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
    LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
          LLLLLLLLLLLLLLLLLLLLLLLLLLLLL
                LLLLLLLLLLLLLLLLLLLLLLL
                       LLLLLLLLLLLLLLLL
                             LLLLLLLLLL
                               LLLLLLLL
                                        RRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRRRRRRRRRR
                                        RRRRRRRRRRRRRRRRRR

jagaul@CO2048-10 /cygdrive/u/spring2024/cpre185/lab07
$
```
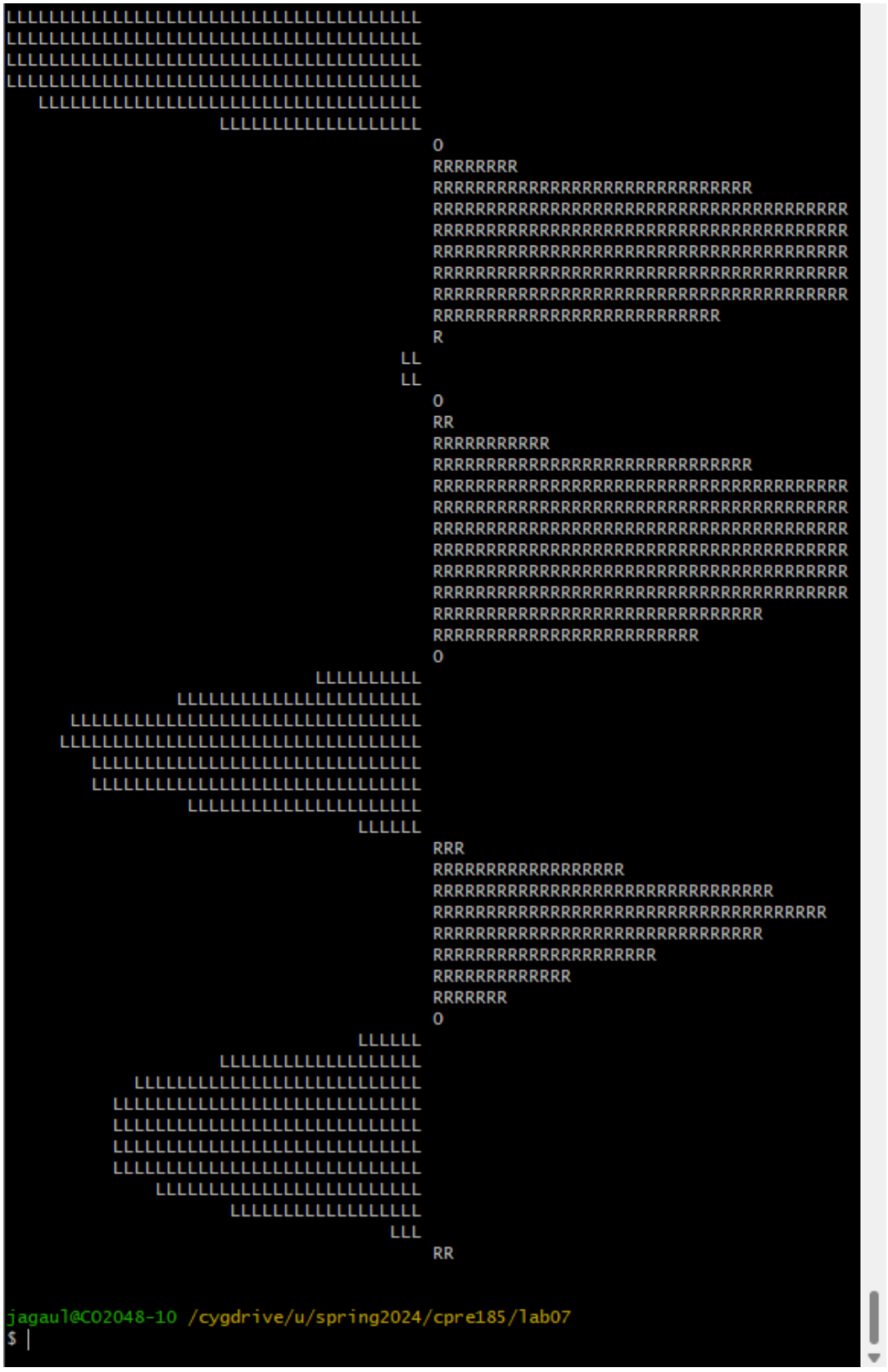

3. Output – Joystick (Right/Left):



Source Code:

```
/*-------------------------------------------------------------------------
--
-                                       SE 185 Lab 07 - The DS4 Equalizer
-             Developed for 185-Rursch by T.Tran and K.Wang
-     Name: James Gaul
-     Section: 3
-     NetID: 947125207
-     Date: 3/24/24
-
-   This file provides the outline for your program
-   Please implement the functions given by the prototypes below and
-   complete the main function to make the program complete.
-   You must implement the functions which are prototyped below exactly
-   as they are requested.
-------------------------------------------------------------------------
*/

/*-------------------------------------------------------------------------
--
-                                                 Includes
-------------------------------------------------------------------------
*/
#include <stdio.h>
#include <math.h>

#include <stdlib.h>
/*-------------------------------------------------------------------------
--
-                                                 Defines
-------------------------------------------------------------------------
*/
#define PI 3.141592653589

/* NO GLOBAL VARIABLES ALLOWED */


/*-------------------------------------------------------------------------
--
-                                                 Prototypes
-------------------------------------------------------------------------
*/
/*-------------------------------------------------------------------------
---------
    PRE: Arguments must point to double variables or int variables as
appropriate
    This function scans a line of DS4 data, and returns
    True when left button is pressed
    False Otherwise
    POST: it modifies its arguments to return values read from the input
line.
-------------------------------------------------------------------------
-------*/
int read_input( int* time,
```

```
                double* g_x, double* g_y, double* g_z,
                int* button_T, int* button_C, int* button_X, int* button_S,
                int* l_joy_x, int* l_joy_y, int* r_joy_x, int* r_joy_y );

/*------------------------------------------------------------------------
--
    PRE: ~(-1.0) <= mag <= ~(1.0)
    This function scales the roll/pitch value to fit on the screen.
    Input should be capped at either -1.0 or 1.0 before the rest of your
    conversion.
    POST: -39 <= return value <= 39
------------------------------------------------------------------------
*/
int scaleMagForScreen(double rad);

/*------------------------------------------------------------------------
--
    PRE: -128 <= mag <= 127
    This function scales the joystick value to fit on the screen.
    POST: -39 <= return value <= 39
------------------------------------------------------------------------
*/
int scaleJoyForScreen(int rad);

/*------------------------------------------------------------------------
-
    PRE: -39 <= number <= 39
    Uses print_chars to graph a number from -39 to 39 on the screen.
    You may assume that the screen is 80 characters wide.
------------------------------------------------------------------------
*/
void graph_line(int number, char indicatorA, char indicatorB);

/*------------------------------------------------------------------------
--
    PRE: num >= 0
    This function prints the character "use" to the screen "num" times
    This function is the ONLY place printf is allowed to be used
    POST: nothing is returned, but "use" has been printed "num" times
------------------------------------------------------------------------
*/
void print_chars(int num, char use);


/*------------------------------------------------------------------------
--
-                                                Implementation
------------------------------------------------------------------------
*/
int main()
{
    double x, y, z;                     /* Values of x, y, and z axis*/
    int t;                              /* Variable to hold the time value */
    int b_Up, b_Down, b_Left, b_Right;  /* Variables to hold the button
statuses */
    int j_LX, j_LY, j_RX, j_RY;         /* Variables to hold the joystick
statuses */
```

```
    int scaled_pitch, scaled_roll;      /* Value of the roll/pitch adjusted
to fit screen display */
    int scaled_joy_rx;                    /* Value of joystick adjusted to
fit screen display */

    /* Put pre-loop preparation code here */

      int quitProg;
      int inputMode = 0;
      int prevUp;

      printf("Press square Button to Quit\n");
    do
    {
        /* Scan a line of input */
            quitProg = read_input(&t, &x, &y, &z, &b_Up, &b_Down, &b_Left,
&b_Right, &j_LX, &j_LY, &j_RX, &j_RY);

        /* Calculate and scale for pitch AND roll AND joystick */
            scaled_pitch = scaleMagForScreen(y);
            scaled_roll = scaleMagForScreen(x);
            scaled_joy_rx = scaleJoyForScreen(j_RX);

        /* Switch between roll, pitch, and joystick*/


            if (b_Up == 1){
                  if(prevUp == 0){
                        if(inputMode < 2){
                        inputMode++;
                        }
                  else{
                        inputMode = 0;
                        }

                  }
                  prevUp = 1;
            }
            else{
                  prevUp = 0;

            }

        /* Output your graph line */
            switch(inputMode){
                  case 0:
                  graph_line(scaled_pitch, 'F', 'B');
                  break;

                  case 1:
                  graph_line(scaled_roll, 'L', 'R');
                  break;

                  case 2:
                  graph_line(scaled_joy_rx, 'L', 'R');
                  break;
```

```
            }

        fflush(stdout);

    } while (quitProg == 0 );

    printf("Goodbye!");

      return 0;
}


int read_input( int* time, double* g_x, double* g_y, double* g_z, int*
button_T, int* button_C, int* button_X, int* button_S, int* l_joy_x, int*
l_joy_y, int* r_joy_x, int* r_joy_y){


      scanf("%d, %lf, %lf, %lf, %d, %d, %d, %d, %d, %d, %d, %d\n",  time,
g_x, g_y, g_z, button_T, button_C, button_X, button_S, l_joy_x, l_joy_y,
r_joy_x, r_joy_y);




      if(*button_S == 1){
            return 1;
      }
      else{
            return 0;
      }
}

int scaleMagForScreen(double rad){

      int scale = 39;
      double cappedSize;

      if (rad > 1.0){
            cappedSize = 1.0;
      }
      else if(rad < -1.0){
            cappedSize = -1.0;
      }
      else{
            cappedSize = rad;
      }

      double scaledSize = cappedSize * scale;

      return round(scaledSize);
}

int scaleJoyForScreen(int rad){

      double scale;

      if(rad >= 0){
```

```
            scale = (39.0 / 127.0);
      }
      else {
            scale = (39.0/128.0);
      }

      return rad * scale;
}

void graph_line(int number, char indicatorA, char indicatorB){

      if(number >= 0){
            print_chars(40, ' ');
            if(number > 0){
                  print_chars(number, indicatorA);
            }
            else{
                  print_chars(1, '0');
            }
      }
      else{
            print_chars(39 + number, ' ');
            print_chars(number * -1, indicatorB);
      }
      print_chars(1, '\n');
}

void print_chars(int num, char use){
      int i;

      for(i = 0; i < num; i++){
            printf("%c", use);
      }
}
```