Lab Exercise 4: Using the DE10-Lite & Repetition and Selection

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ELEC2850 Microcontrollers Using C Programming

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1 Problem Statement

Create a program that will find the real roots of a quadratic equation. The program should prompt the user to enter the values of a, b, and c. The program should then calculate the roots of the equation using the quadratic formula, then displaying the roots.

2 Analysis

2.1 Inputs

num1, num2, num3 (int)

2.2 Outputs

rootOne, rootTwo (floats)

2.3 Formulas

Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

3 Flowchart

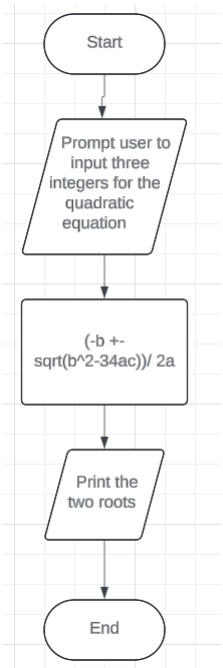

Figure 1: Flowchart for finding the roots of a quadratic equation

4 Output

```
Do you want to solve a quadratic? (y/n): y
y
Enter the values of a, b and c: 1 5 6
1.00, 5.00, 6.00
Roots of the equation are: -2.00 and -3.00
Do you want to solve a quadratic? (y/n): y
y
Enter the values of a, b and c: 1 2 1
1.00, 2.00, 1.00
Roots of the equation are: -1.00 and -1.00
Do you want to solve a quadratic? (y/n): y
y
Enter the values of a, b and c: 2 -10 12
2.00, -10.00, 12.00
Roots of the equation are: 3.00 and 2.00
Do you want to solve a quadratic? (y/n): y
y
Enter the values of a, b and c: 1 0 -4
1.00, 0.00, -4.00
Roots of the equation are: 2.00 and -2.00
Do you want to solve a quadratic? (y/n): n
n
```

Figure 2: Four test cases for the program

5 Code

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

int main()
{
    char ch;
    float a, b, c;
    float rootOne, rootTwo;
    while (1 == 1)
    {
        printf("Do you want to solve a quadratic? (y/n): ");
        scanf(" %c", &ch);
        printf("%c\n", ch);
        if (ch != 'y')
        {
            break;
        }
        printf("Enter the values of a, b and c: ");
        scanf("%f %f %f", &a, &b, &c);
        printf("%.2f, %.2f, %.2f\n", a, b, c);
        if (a == 0 || ((b * b) - 4 * a * c) < 0)
        {
            printf("The equation is not quadratic\n");
        }
        else
        {
            rootOne = (-b + sqrt((b * b) - 4 * a * c)) / (2 * a);
            rootTwo = (-b - sqrt((b * b) - 4 * a * c)) / (2 * a);
            printf("Roots of the equation are: %.2f and %.2f\n", rootOne, rootTwo);
        }
    }
    return 0;
}
```

6 Part 4

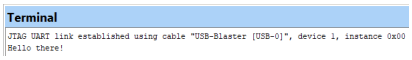

Figure 3: Hello World runnning on the DE10

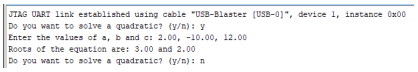

Figure 4: Part 3 code runnning on the DE10