

Computer Organization Project 3 – Booth's Multiplication

Due: 23:59, Apr. 23, 2024

In this project, you are required to perform a complete run of Booth's algorithm on two 16-bit signed numbers. The generation steps for the two numbers are described as follows.

- 1- Assume that the numerical part of your student ID is A .
- 2- The square of A is B ($B = A^2$). Use binary representation to represent B .
- 3- Right shift B for 16 bits, take the lower 15 bits, and append an extra bit '0' to the most significant bit (MSB) to form a new 16-bit number C . (i.e., C is a positive number.)
- 4- Right shift B for 16 bits, take the lower 15 bits, and append an extra bit '1' to the most significant bit (MSB) to form a new 16-bit number D . (i.e., D is a negative number.)
- 5- Perform $C \times D$ by using the Booth's algorithm.

Please submit your Booth's multiplication result according to the following rules:

- 1- You are required to write every detailed step according to our lecture notes.
- 2- Upload your homework in TEXT format.
- 3- The filename is your student ID (e.g., B12345678.txt).

Example:

```
A = 12345678
B = 100010101001111100001111100011000011001111000100
C = 0000111110001100
D = 1000111110001100
CxD
```

Step	Product	Next
0	0000000000000000 1000111110001100 0	00 -> shift
1	0000000000000000 0100011111000110 0	00 -> shift
2	0000000000000000 0010001111100011 0	10 -> sub
3	+1111000001110100 1111000001110100 0010001111100011 0 111100000111010 0001000111110001 1	11 -> shift
...		
14	0000001111000110 1101001001000010 0	00 -> shift
15	0000000111100011 0110100100100001 0	10 -> sub
16	+1111000001110100 1111001001010111 0110100100100001 0 111100100101011 1011010010010000 1	done

CxD = 111100100101011 1011010010010000