**Computer Organization and Assembly Language**

**Mayada Shoman, Youssef Zoheiry & Hazem Walid**

**Implementation:**

The first part our program implemented was finding the *opcode, rd, func3, rs1, rs2, func7* which is used for the R type FMT, to implement *add, sub, xor, OR, AND, sll, srl, sra, slt and sltu*. The way those instructions were implemented was first by the value of the opcode. If the opcode were 0110011 which is 33; that means the risc-v instruction is one of those. Knowing which instruction exactly was determined by the func3 variable was implemented by using switch cases. If two func3 variables were the same, the program looks at the func7 variable and accordingly decides. To illustrate, both the add and sub instructions have the same func3 which is 0x0,; therefore, when we’re in case 0, the program looks at the func7 variable. For sub, the func7 variable is 0x20 which is 32. Case 1 is for sll, case 2 is slt, case 3 is sltu, case 4 is XOR, case 5 is either srl or sra, their func3 variables are the same, thus, our code looks at the func7 variable and decides accordingly. Case 6 is OR and the last case is AND. Otherwise, the program prints out unknown instruction.

The rest of the implementation is done in the same way in which it relies on the value of the opcode. If the opcode were 3, then we implement the second part of the I type instructions by looking at the value of func3. If the opcode were 13, that means we implement the first part of the I type instructions. If the opcode were 23, then we implement the S-type format. If the opcode were 63, then we implement the B-type instructions and so on.

For ecall, if reg[17] which is a7 if it equals to 1, that means we print the integer which is whats inside a0 at index 10. However, if reg[17] equals to 5, the program reads the data and stores it into a0. If reg[17] equals to 4, then the program prints the string and if it equals to 10, then we exit. Finally, if it equals to 8, then we read the string.

Contribution:

Mayada Shoman: R type, S type and ecall

Youssef Zoheiry: I type, and U type

Hazem Walid: B type and J type

However, we all contributed in all parts whenever someone needed help