CSE 306
Computer Architecture Sessional

Assignment 02: 16 bit Floating Point Adder Circuit Design
Report of Group 01 Section B1

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Introduction

In this assignment, we need to design a 16 bit floating point adder circuit using 16 bit ALU, multiplexers and gates. This adder circuit will be used to add two floating point values and to show the output.

Problem Specification

16 bit floating point representation has a sign bit, 4 bits for the exponent and remaining 11 bits for the fraction part. We will be given two floating points as input and we need to show the sum of the inputs which will also be a floating point. We also have to show the overflow and underflow flags in case any result exceeds the bits alloted (exponent - 4bits and fraction - 11 bits).

Flowchart of the Addition/Subtraction Algorithm

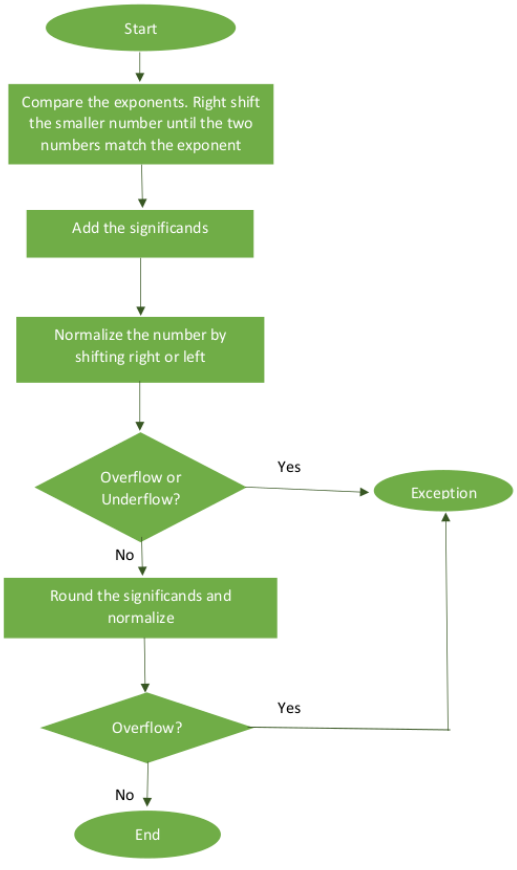

Figure 1: Flow chart of the Algorithem

High-level Block Diagram of the Architecture

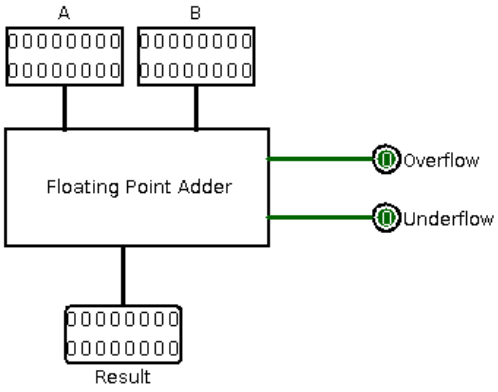

Figure 2: Block Diagram of Main Circuit

Detailed Circuit Diagram of Important Blocks

Normalization Circuit

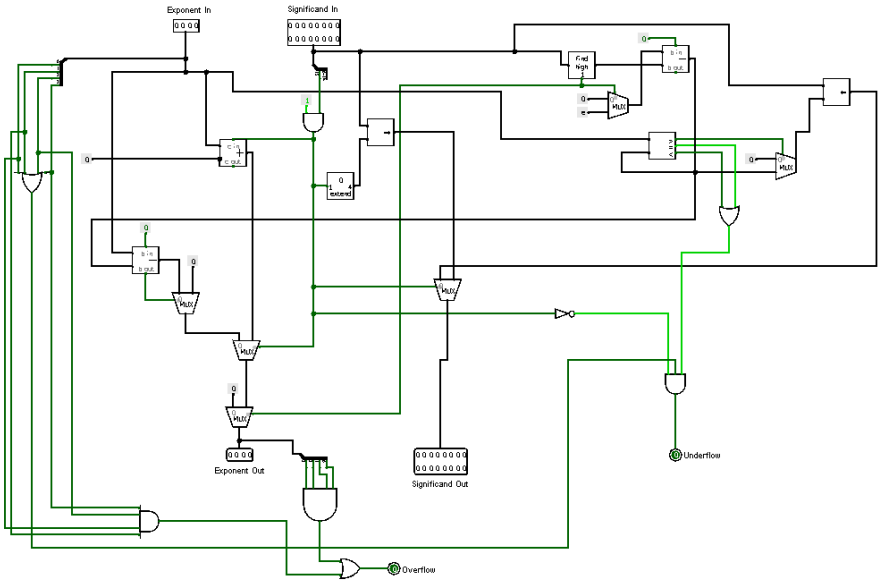

Figure 3: Circuit Diagram of Normalizing Hardware

Rounding Circuit

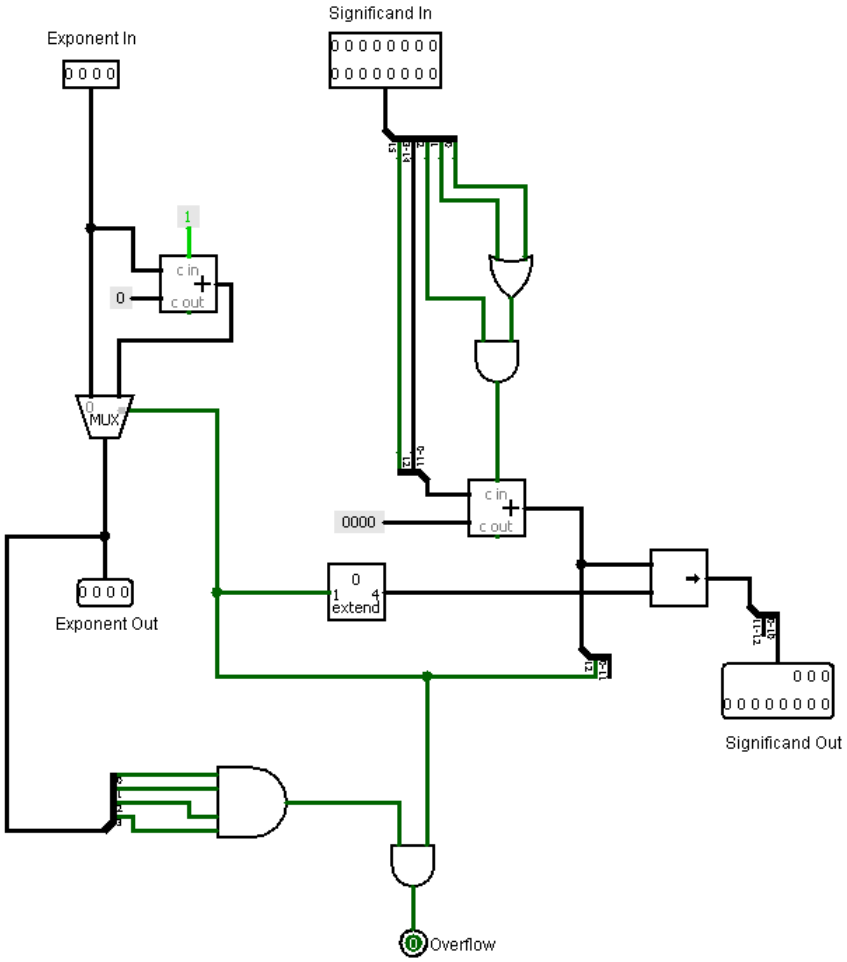

Figure 4: Circuit Diagram of Rounding Hardware

Adder Circuit

This is the main part of the circuit that adds the two floating numbers, normalizes the result and also rounds the result if required. This circuit also sets the overflow or underflow flags when either of them occurs. This adder circuit uses the two blocks we have mentioned before : Normalization Circuit and Rounding Circuit.This adder also uses two ALUs, a 4bit ALU and a 16 bit ALU.

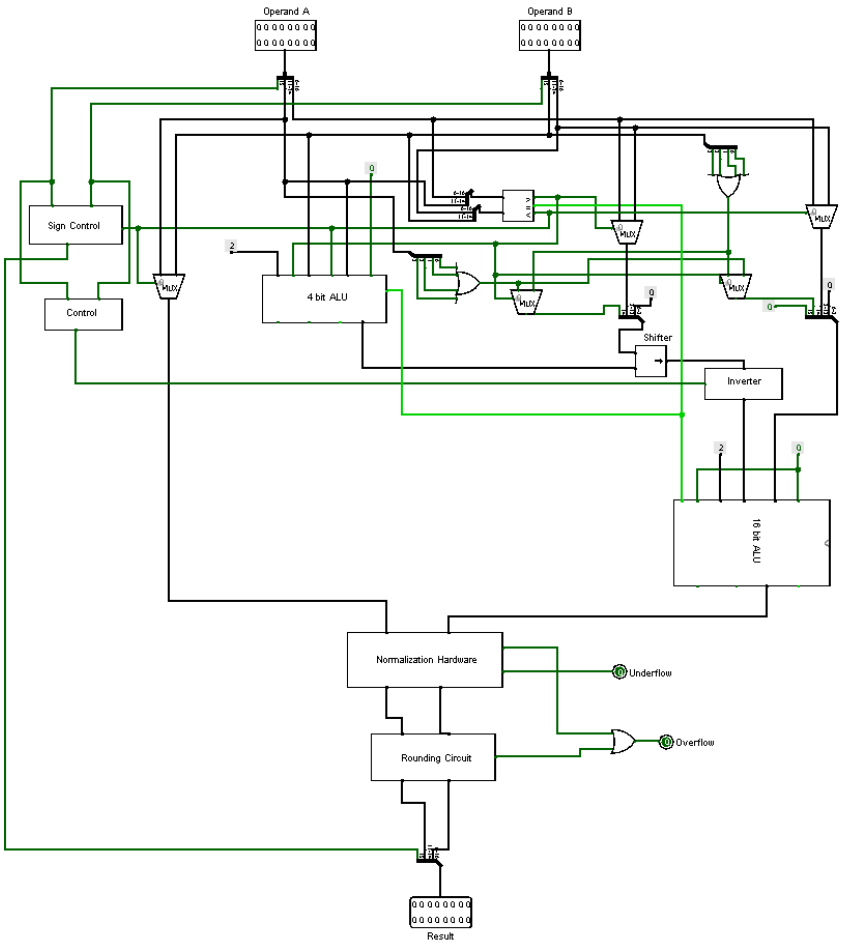

Figure 5: Circuit Diagram of Adder Circuit

ICs with count as Charts

IC No.	Count
7432(OR)	8
7408(AND)	3
7404(NOT)	2
7486(XOR)	4
74LS83(4 bit full adder)	10
74HC157(2:1 MUX))	5

Simulator Used along with version number

Name : Logisim **Version** : 2.7.1

Discussion

The main objective of this assignment was to design the floating point adder circuit using 16 bit ALU. For the ALU, we took help from the internet but the other parts of the circuit were designed and implemented by us. We have used multiplexers, shifter and comparator circuits for the design. We have designed the important blocks like Normalizing and Rounding blocks as separate sub-circuits for our convenience. While doing this assignment, we faced some challenges designing the Rounding circuit and the Normalizing circuit. Also, the concept of underflow was a new thing for us. While designing the normalizing circuit, we faced problems like it was showing underflow where it shouldn't. We faced some other problems including fixing this kind of issue here and there but we managed to complete the assignment due to the effort of all the group members.