System Design

2.2.2 System Design Description

2.2.2.1 List of Inputs

- “inputA” - 16-bit integer
- “inputB” - 16-bit integer
- “opcode” - 4-bit operational code

2.2.2.2 List of Outputs

- “outputC” - 32-bit integer
- “error” - 2-bit error code

2.2.2.3 List of Interfaces

- “outputADD” - Adder-subtractor module-to-multiplexor for addition
    - 32-bit wire bus that connects the adder-subtractor modules’ output to 1 out of 16 of the multiplexor’s 32-bit channels.
- “outputSUB” - Adder-subtractor module-to-multiplexor for subtraction
    - 32-bit wire bus that connects the adder-subtractor modules’ output to 1 out of 16 of the multiplexor’s 32-bit channels.
- “outputMUL” - Multiplication module-to-multiplexor
    - 32-bit wire bus that connects the multiplication modules’ output to 1 out of 16 of the multiplexor’s 32-bit channels.
- “outputDIV” - Division module-to-multiplexor
    - 32-bit wire bus that connects the division modules’ output to 1 out of 16 of the multiplexor’s 32-bit channels.
- “outputMOD” - Modulo module-to-multiplexor
    - 32-bit wire bus that connects the modulo modules’ output to 1 out of 16 of the multiplexor’s 32-bit channels.
- “select” - Decoder-to-multiplexor channel select
    - 16-bit wire bus that connects the decoder’s output to the multiplexor’s one-hot channel select.

2.2.2.4 List of Parts

- “addsub” - Adder-subtractor module
    - Adds or subtracts two 16-bit integers and returns a 32-bit integer and a 2-bit error code. Overflow will set the least significant bit of the error code to 1. Uses structured code.

- “mul” - Multiplier module
    - Multiplies two 16-bit integers and returns a 32-bit integer and a 2-bit error code. Uses structured code.
- “div” - Division module
    - Divides two 16-bit integers and returns a 32-bit integer and a 2-bit error code. Divide-by-zero will set the most significant bit of the error code to 1. Uses behavioral code.
- “mod” - Modulo module
    - Performs modulo on two 16-bit integers and returns a 32-bit integer and a 2-bit error code. Uses behavioral code.
- “mux” - Multiplexor module
    - Takes 16 32-bit values as input and returns 1 of them based on a 16-bit decoded one-hot value.
- “decoder” - Decoder module
    - Takes the 4-bit operational code as input and returns a 16-bit one-hot value to the multiplexor’s channel select.

2.2.2.5 Top-Level Circuit Diagram