ECE 645

PROJECT 2 SPECIFICATIONS

A. TEAM MEMBERS:

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B. TITLE OF THE PROJECT:

DOUBLE PRECISION FLOATING POINT MULTIPLIER

(PROJECT 5, VERSION 2)

C. HARDWARE AND SOFTWARE UNIT INITIAL SPECIFICATION:

1. **FUNCTIONAL REQUIREMENTS:**

   Addition and multiplication of two double precision floating point numbers compatible with ANSI/IEEE Standard 754.

2. **EXAMPLE OF REAL LIFE APPLICATION:**

   General-purpose microprocessor and digital signal processor.

3. **OPTIMIZATION CRITERIA:**

   HARDWARE: Maximum throughput

   SOFTWARE: Maximum throughput in a 32-bit microprocessor.

4. **CAD TOOLS:**

   HARDWARE: Mentor Graphics (MODELSIM) available on the CPE02 Server of GMU, which works on the UNIX operating system.

   This tool is available in most of the ECE labs and can also be accessed from home through X-terminals.

   SOFTWARE: PYTHON

5. **ASSUMPTIONS:**

   HARDWARE:

   The basic gates which we intend to use are AND, OR, XOR and NOT. We have assumed that the basic delay is the same for all the gates and also that the area is proportional to the number of inputs.

SOFTWARE: **The language that we are planning to use is PYTHON. The basic library function is math from Systems.Tools.Utilities.**

6. **TEST PLAN:**

   HARDWARE: Use Leonardo spectrum to verify the functional correctness of the VHDL code and also to check for the area and timing. Else follow the conventional method of keeping a count on the number of gates and the gate levels.

   SOFTWARE: Use the system timing header files to check for the execution time. The amount of memory can be estimated from the data types used.

7. **LIST OF REFERENCES:**

   Intended Application: High performance Digital Signal Processing.

   Hardware Architecture to be used: Structural Architecture.

   Software Algorithm to be used:

   Use IEEE standards and set data in strings.

   Define data types like the mantissa, exponent, sign, bias, etc.

   Initialize all the data.

   Convert IEEE hexadecimal or binary numbers into python floating points and vice versa.

   Normalize all the values.

   To perform multiplication, add the exponents, multiply the mantissa and OR the signs of the two input numbers.

   To perform addition compare both the numbers, normalize if necessary and add their mantissas. The resultant exponent will be the value to which it was normalized.

REFERENCES INTENDED FOR USE:

-Behrooz Perhami,

Computer Arithmetic, Algorithms and Hardware Designs.

-Isreal Koren,

Computer Arithmetic Algorithms.

-Class Notes

-IEEE 754 references on the Internet.