Fall 2020 VLSI Design

Final Project Description

Overview

The Course Project is an opportunity for you to practice what you have learned from this course and apply to some problems that you are interested in. There are two types of projects, Type-A and Type-B.

- **Type-A Project:** This type of project targets students who have no prior background on Verilog and computer architecture. The aim of this project is to provide the opportunity to practice Verilog implementation on some small-size design.
- **Type-B Project:** This type of project is about relatively non-small-size digital VLSI system. The corresponding algorithm in Type-B project is more complex than Type-A, or the design requirement is higher.

Topics of Type-A and Type-B Projects

The following is some example topics you can use for your Type-A and Type-B.

Available Type-A Project Topics

- One layer (FC or CONV, at least 10 neurons) of neural network with 8-bit quantization
- 6-tap Finite impulse response (FIR) design with 8-bit quantization
- High-bit-width (16/32-bit) fast multiplier using booth encoding
- 8-bit 2-input simple calculator (addition, subtraction, multiplier, 2^y). The addition/subtraction should be built on fast adder, and multiplication should be built on fast multiplier.

Example Type-B Projects

- An entire 3-layer neural network
- 8-bit MIPS processor implementation (single-cycle, multiple-cycle, etc.)
- 10-tap FIR filter with pipeline
- 16-bit prefix fast adder
- 16-bit fast multiplier using booth encoding, Wallace tree and fast adder.
- 8-bit 2-input calculator (adder, subtraction, multiplier, exp (x^y), modulo). The addition/subtraction should be built on fast adder, and multiplication should be built on fast multiplier.

Name Your Own Type-B Project

- You can propose a topic for your Type-B project. The complexity of your proposed Type-B project should be higher than Type-A project.
- A one-page project proposal is needed if you would like to name your own Type-B project. The project proposal should include: the motivation of this topic, the planned used data, the state-of-the-art approaches and your planned selection, evaluation metrics.

- The project proposal should be submitted and approved by instructor.

Collaboration Policy

- Type-A project should be done individually.
- Type-B project can be done in a team of 2 persons.

Honor Code

- You may refer to public and online resource when preparing your project as long as sufficient and clear citation and notation is presented.
- Incorporating other students' codes into your project is forbidden.

Submission Guideline

- The due date of final submission is **Jan. 4.**
- The final submission includes final report and source codes.
- The final submission should be submitted in the ZIP/RAR format.
- Your final report should include abstract, introduction, related work, data description, method description, model description, experimental procedure and results, conclusion and reference.
- At least one Type-A or Type-B project should be done and submitted. If multiple projects are submitted, the highest score among those submissions will be counted to your course score.