

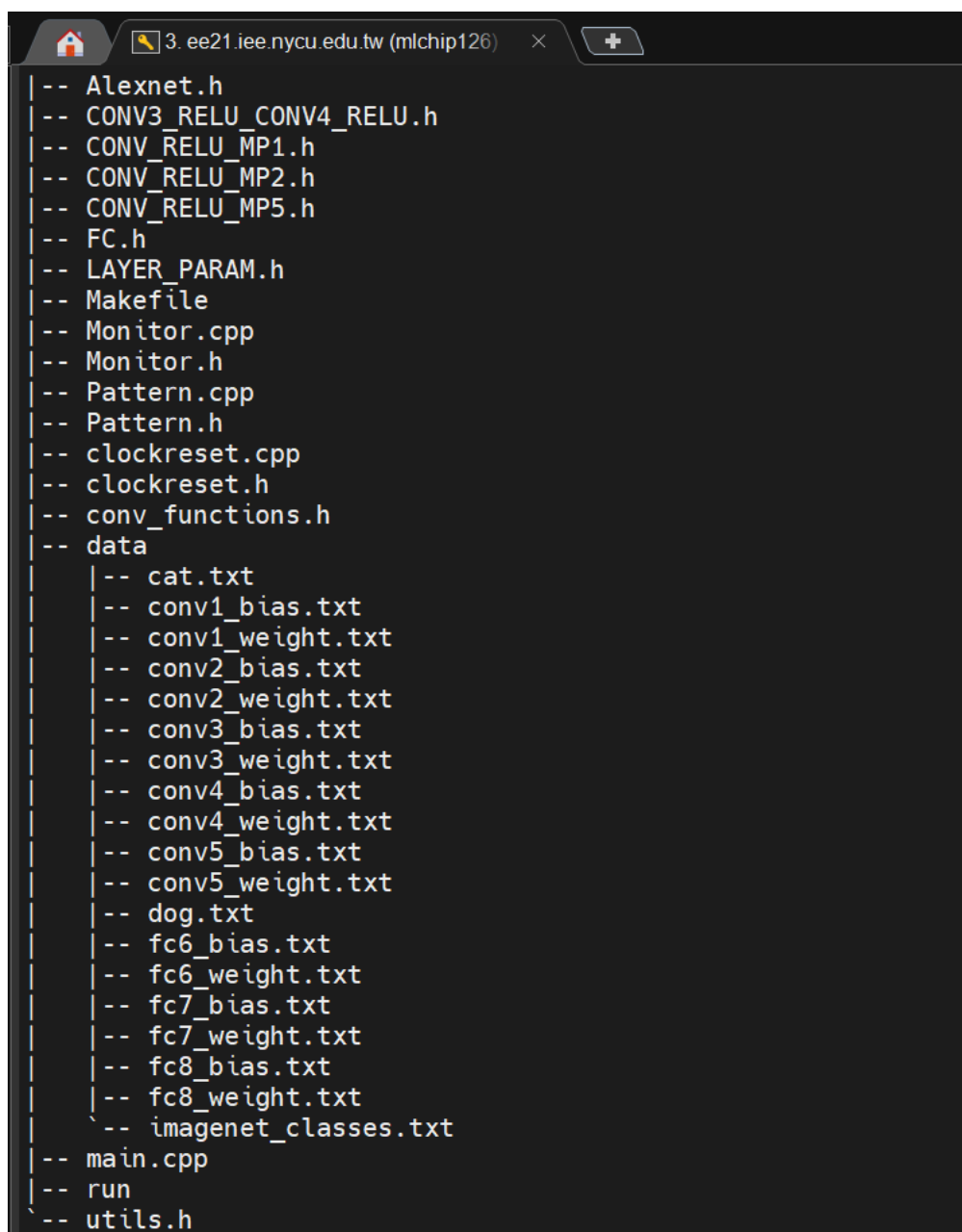
HW2 AlexNet modularization, Interfaces & Channels

Machine learning Chip Design

312591037, Shun-Liang Yeh, NYCU ICST

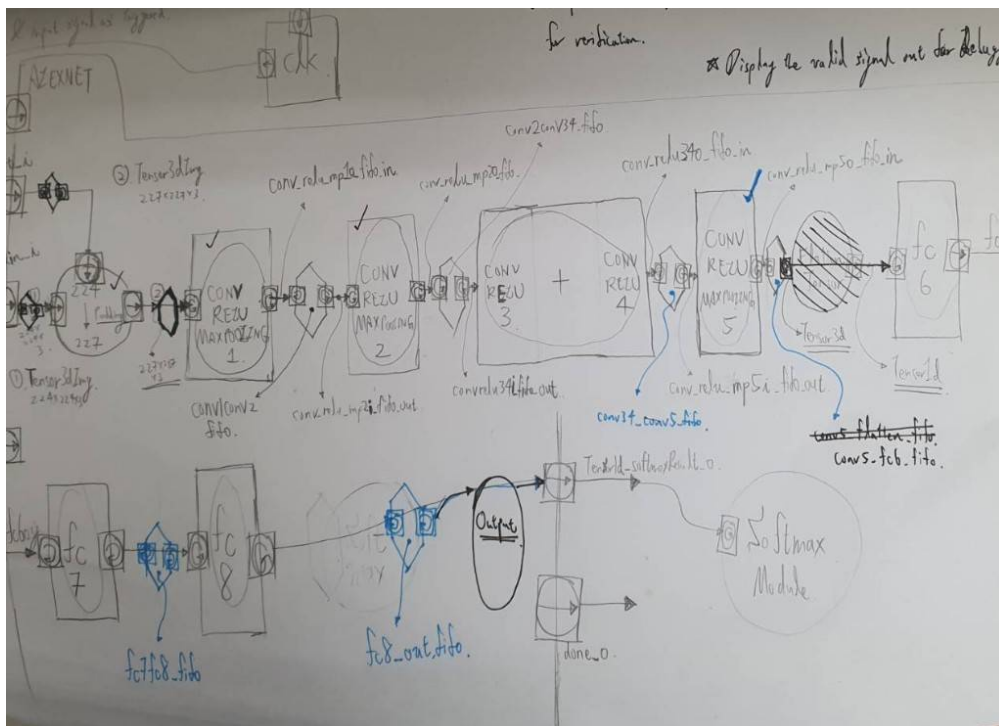
4/5/2024

File structure



```
-- Alexnet.h
-- CONV3_RELU_CONV4_RELU.h
-- CONV_RELU_MP1.h
-- CONV_RELU_MP2.h
-- CONV_RELU_MP5.h
-- FC.h
-- LAYER_PARAM.h
-- Makefile
-- Monitor.cpp
-- Monitor.h
-- Pattern.cpp
-- Pattern.h
-- clockreset.cpp
-- clockreset.h
-- conv_functions.h
-- data
|  -- cat.txt
|  -- conv1_bias.txt
|  -- conv1_weight.txt
|  -- conv2_bias.txt
|  -- conv2_weight.txt
|  -- conv3_bias.txt
|  -- conv3_weight.txt
|  -- conv4_bias.txt
|  -- conv4_weight.txt
|  -- conv5_bias.txt
|  -- conv5_weight.txt
|  -- dog.txt
|  -- fc6_bias.txt
|  -- fc6_weight.txt
|  -- fc7_bias.txt
|  -- fc7_weight.txt
|  -- fc8_bias.txt
|  -- fc8_weight.txt
|  -- imagenet_classes.txt
-- main.cpp
-- run
-- utils.h
```

Architecture



- First partition the whole AlexNet into multiple blocks, then connect each blocks with `sc_fifo` channel and `sc_fifo` interfaces

Results

```
Running
=====
Cycle: 8                      Start signal: 0
=====
Running
=====
Cycle: 9                      Start signal: 0
=====
Running
=====
Cycle: 10                     Start signal: 0
=====
Running
=====
Cycle: 11                     Start signal: 0
=====
Running
=====
Cycle: 12                     Start signal: 0
=====
Running
=====Classification  Results=====
Egyptian cat: 96.3813
tabby: 1.64618
tiger cat: 1.10017
lynx: 0.428477
plastic bag: 0.293311
=====Alexnet ends=====
Cycle: 13                     Start signal: 0
=====
Running
Softmax result
1D Tensor:
7.81833e-10 1.05251e-08 4.51618e-12 1.13753e-10 4.86924e-10 4.97937e-08 7.3327e-12 1.33738e-06 1.7439e-05 1.78405e-09

Running
=====
Cycle: 16                     Start signal: 0
=====
Running
=====
Cycle: 17                     Start signal: 0
=====
Running
=====
Cycle: 18                     Start signal: 0
=====
Running
=====
Cycle: 19                     Start signal: 0
=====
Running
=====
Cycle: 20                     Start signal: 0
=====
Running
=====Classification  Results=====
golden retriever: 38.6275
otterhound: 13.861
Sussex spaniel: 11.2604
bloodhound: 7.86246
cocker spaniel: 5.22075
=====Alexnet ends=====
Cycle: 21                     Start signal: 0
=====
Running
Softmax result
1D Tensor:
9.46803e-09 1.50581e-09 7.20349e-10 7.73659e-11 7.90989e-11 4.00161e-08 1.95022e-11 1.82944e-09 5.08848e-09 2.65134e-10
```

Problem faced

- Understand the Virtual system Modeling of systemC
- Partitioning of Blocks are not ideal at first, thus need some time to do the correct partitioning. Fifo is a good tool to use but seeing the stuff within the fifo does not seems to be permissible, which hinders the validation.
- Understand that fifo is useful for auto managing the data stream within a huge system, also slightly understand the power of SystemC as a HW/SW Co-Design language.
- SystemC sc_port, sc_in, sc_out does not support way too complex data type. I declared a complex data type here which are unable to be identify by the in/out ports.

```
typedef std::vector<std::vector<std::vector<std::vector<double>>>> Tensor4d;
```

- Changing it to the following solve the problem.

```
double * tensor;
```

- Segmentation fault occurs if the data you passed to other modules are NULL pointer, beware of that by printing out all stuff in each layer.

Comment

- Understand how SC_THREAD() and interface works also how it interacts with the Modules. And the parametrization of Modules to enable HW reuse. Lots of examples are studied to implement this lab.

References

- [Lab1 MAC exercise and handouts](#)
- [Jimmy Chenのyoutube](#), [陳坤志](#)
- [Introduction to ESL NTU](#),[簡韶逸](#)
- [Multi-Media SOC Design NTU, SystemC Tutorial \(I\)](#),[簡韶逸](#)
- [Multi-Media SOC Design NTU, SystemC Tutorial \(I\) lecture](#),[簡韶逸](#)
- [Multi-Media SOC Design NTU, SystemC Tutorial \(II\)](#),[簡韶逸](#)
- [Multi-Media SOC Design NTU, SystemC Tutorial \(II\) lecture](#),[簡韶逸](#)