MLCHIP HW2

Channel and Interface

1. sc_signal

All materials are the same as HW1, and the details have been described in the previous files. main.cpp serves as channel (sc_signal<T>) to connect sc_out to sc_in for different modules. The output of cat image comes out at cycle 14, and the output of dog image comes out at cycle 15.

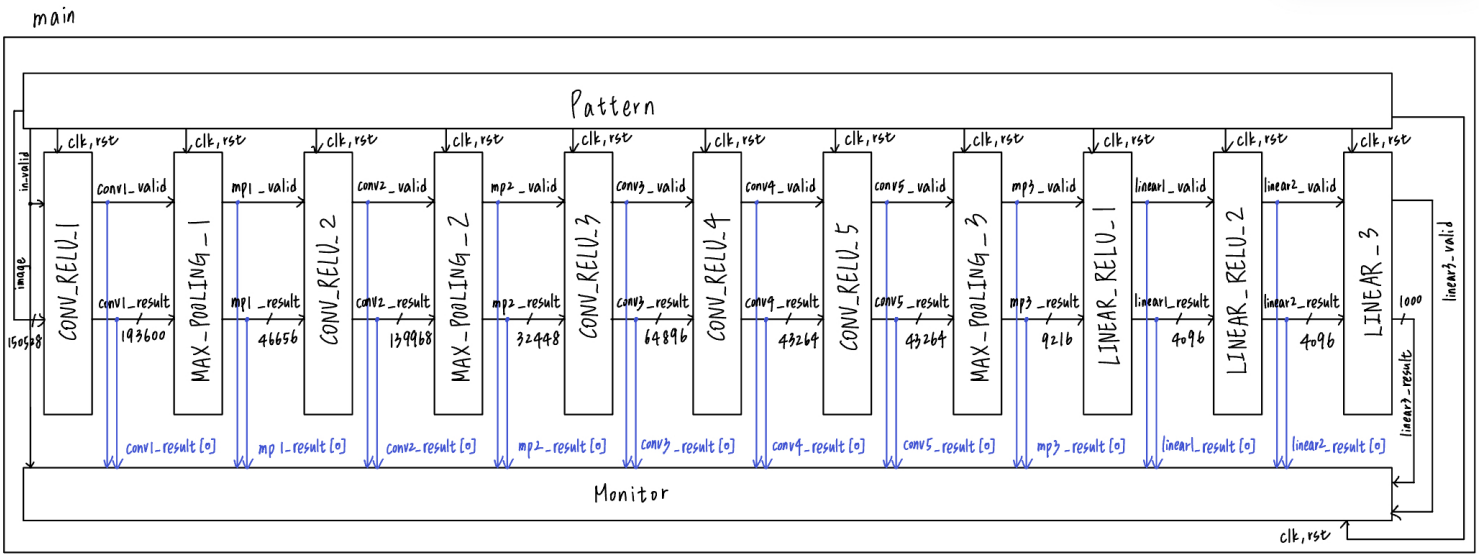

Fig. 1 Module Connections for sc_signal and sc_buffer

2. sc_buffer

In main.cpp, change all sc_signal to sc_buffer. The difference between sc_signal and sc_buffer is that sc_signal checks the values before updating and sc_buffer updates the values anyway.

3. sc_fifo

Since sc_fifo only supports at most one output port connection, the blue lines in Fig. 1 are disconnected inside this version. The clk, rst, image[150528] and linear3_result[1000] remain sc_signal datatype, while the valid and intermediate results between different AlexNet layers are sc_fifo datatype (blue lines in Fig. 2). All sc_fifo channels are implemented in AlexNet.h, and main.cpp only needs to connect Pattern, ALEXNET top

module and Monitor.

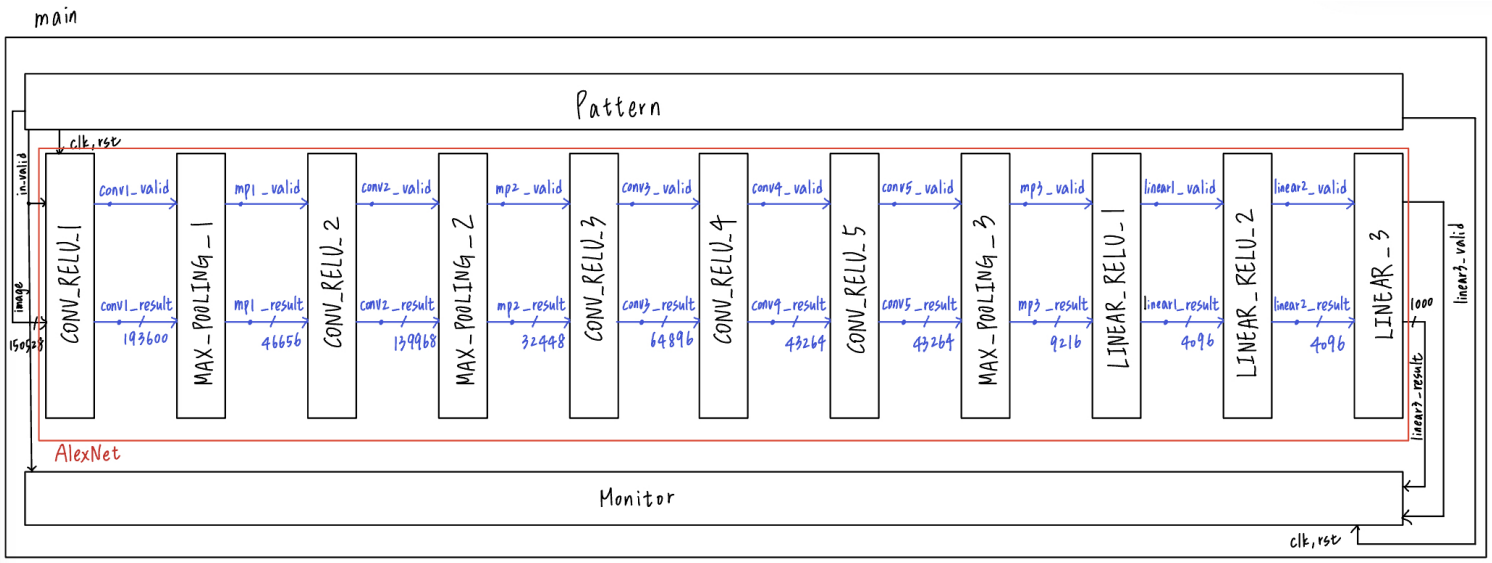

Fig. 2 Module Connections for sc_fifo

I observe that once the data is written to fifo, it can be read out immediately. Therefore, in order to perform only one layer for each input image in one cycle, I use wait(clk->posedge_event()); before writing the output results after the MAX_POOLING_1 layers. This modification results in waiting one more cycle to get the second output. Thus, the output of dog image comes out at cycle 16 instead of cycle 15.

Result:

Cat:

Top	idx	val	possibility	class name
1	285	20.206692	96.381295	Egyptian cat
2	281	16.136835	1.646177	tabby
3	282	15.733846	1.100171	tiger cat
4	287	14.790861	0.428477	lynx
5	728	14.411860	0.293311	plastic bag

Dog:

Top	idx	val	possibility	class name
1	207	16.594540	38.627504	golden retriever
2	175	15.569658	13.861038	otterhound
3	220	15.361864	11.260354	Sussex spaniel
4	163	15.002676	7.862463	bloodhound
5	219	14.593217	5.220751	cocker spaniel