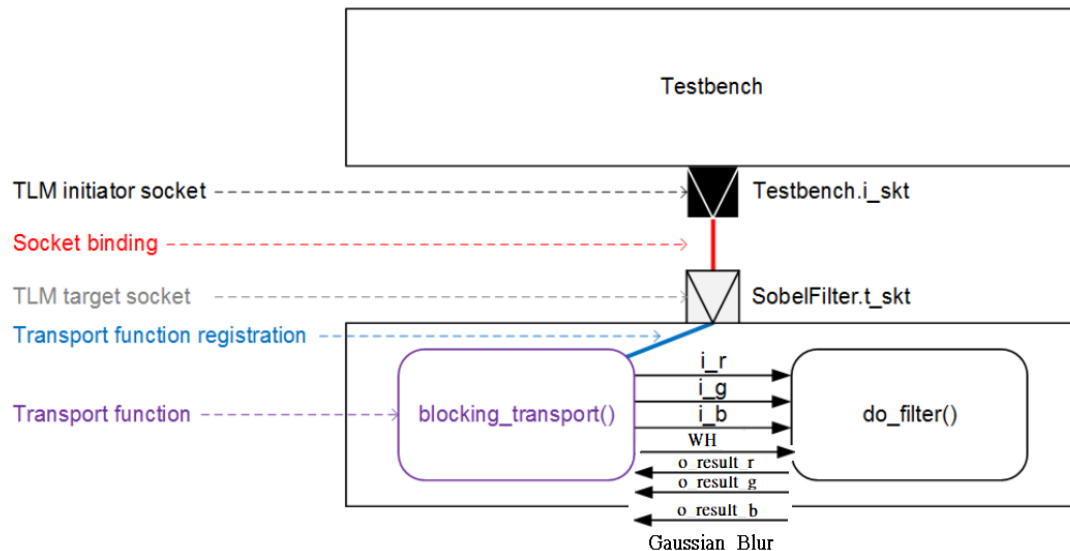## problem

In this homework we will wrap the Gaussian blur and testbench modules (same function as defined in homework 2) with TLM 2.0 sockets. And all modules will be connected through point-to-point TLM.

Solution algorithms

SystemC processes
A Gaussian blur with TLM 2.0 sockets
Architecture shown below:

Gaussian_Blur.cpp do filter and blocking transport with sc_module and Testbench.cpp do read/write file with sc_module, and Initiator.cpp do read, write to socket

In hw02 used fifo to implement, however in this TLM the sentence wait();

change to `wait(CLOCK_PERIOD, SC_NS);`

TLM write data in the begin at init < 2

```
100        case tlm::TLM_WRITE_COMMAND:
101          switch (addr) {
102          case Gaussian_B_FILTER_R_ADDR:
103            if (init < 2)
104            {
105              buffer.uc[0] = data_ptr[0];
106              buffer.uc[1] = data_ptr[1];
107              buffer.uc[2] = data_ptr[2];
108              buffer.uc[3] = data_ptr[3];
109              WH.write(buffer.uint);
110              init = init + 1;
111            }
112            else
113            {
114              if (mask_ptr[0] == 0xff) {
115                i_r.write(data_ptr[0]);
116              }
117              if (mask_ptr[1] == 0xff) {
118                i_g.write(data_ptr[1]);
119              }
120              if (mask_ptr[2] == 0xff) {
121                i_b.write(data_ptr[2]);
122              }
123            }
124            break;
125          default:
```
Gaussian_Blur.cpp

set the fifo channel

```
class Gaussian_Blur : public sc_module {
public:
  tlm_utils::simple_target_socket<Gaussian_Blur> t_skt;

  sc_fifo<unsigned char> i_r;
  sc_fifo<unsigned char> i_g;
  sc_fifo<unsigned char> i_b;
  sc_fifo<unsigned int> WH;
  sc_fifo<unsigned char> o_result_r;
  sc_fifo<unsigned char> o_result_g;
  sc_fifo<unsigned char> o_result_b;

  SC_HAS_PROCESS(Gaussian_Blur);
  Gaussian_Blur(sc_module_name n);
  ~Gaussian_Blur() = default;

private:
  void do_filter();
  double red, green, blue;

  int init = 0;
```
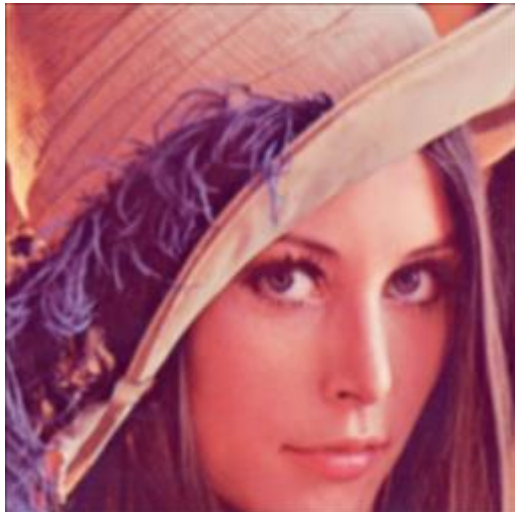Gaussian_Blur.h

Experimental results

Before filter

After filter

Number of pixel:

```
pixel : 65536

Info: /OSCI/SystemC: Simulation stopped by user.
Simulated time == 655365 ns
[100%] Built target run
```

Discussions and conclusions

Before this homework I do lab03 to learn the architecture of TLM, and this homework I learn about TLM architecture and coding in C and systemC. I think

TLM is very useful to transport data. I derive much benefit in this class, thanks.