SWE 507 PARALLEL PROGRAMMING PROJECT STUDY 1 (2025)

Due date: 07 March 2025, class time.

In this project, you are expected to do build an image precessing tool by thread level parallel computing, and measure the performance (execution time). The tool will be designed and implemented using Pthreads in C language, compiled with gcc compiler. If you are using Windows OS, than you can use MinGW compiler bundle. The tool is supposed to do image filtering on BMP images by convolution and ReLU as shown in Figure 1.

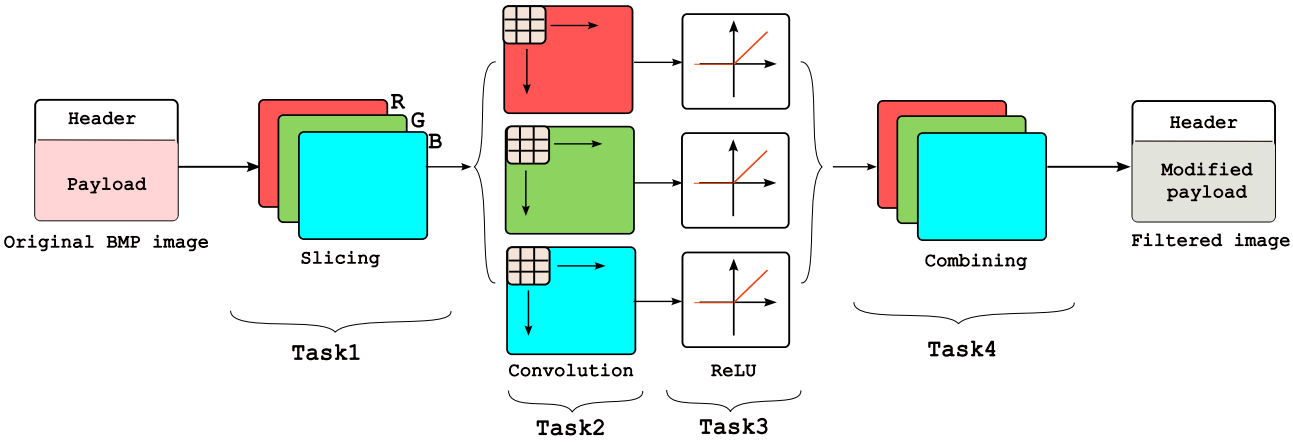

Figure 1. Project study internals: Tasks show different stages of computation.

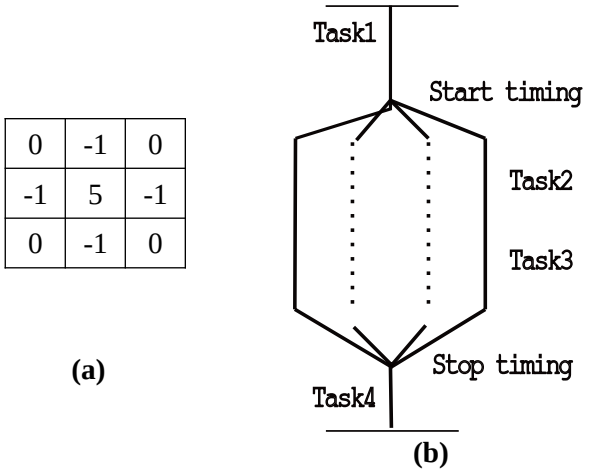

Figure 2. a) Example kernel, b) Program activity graph (PAG).

An example 3X3 kernel is shown in Figure 2.a., which you can use in your implementation. Hoowever, you can try other kernels as well. Figure 2.b. shows how tasks are going to be executed in time.

Do the experiments as follows:

1) Start timing just before creating the threads and stop it after the threads return as shown in the figure.
2) Create 1, 3, 6, 9, and 12 threads and measure the timing.
3) For each thread configuration repeat the experiments (and time measuring) at least 5 times and take average execution time to reduce cache effects.
4) Put your results in a graph; X axis will show thread count and Y axis will show timing.

No	Task	Grade
1	Program with Pthreads work without error.	**60**
2	Time measurements done correctly and results are meaningful.	**20**
3	Presentation and discussions are done.	**20**

PS: In class presentation is required.