

## Parallel Programming – A

Use opencv to write a C++ program named simulation.cpp to simulate the temperature changes according to the static heat distribution in a two-dimensional space. Consider a classroom with a rectangle shape. The walls have a fixed temperature +20C. There is a heater along one side of the wall with a fixed temperature +100C. The classroom is initially cold with -20C.

For any location that does not have a fixed temperature, its temperature in the next moment could be calculated by taking the average of the current temperatures of its four neighboring locations in vertical and horizontal directions. You can use either one 2D array (Gauss-Seidel iteration) or two 2D arrays (Jacobi iteration) to do the temperature update in each iteration.

The simulation terminates when the maximum difference between iterations at any location is less than a predefined threshold epsilon.

Use colors to represent different temperatures for the simulation. Use pure green to denote the lowest temperature you consider, and pure red the highest. Pure white would refer to a temperature in the middle.

The width and height of the rectangle, representing the size of the classroom, should be command line arguments.

$$W = 100 \quad H = 75$$

Submission: zip and upload your source code simulation.cpp. Follow the naming convention lastname\_firstname.zip.