4. Lab Series – Programming with Threads and Processes

To be handed in at exercise/lecture at January 16, 2002.

Assignment 4.1:

Design, implement, and demonstrate a simple program that computes fractal images (especially the Mandelbrot-set – see the course script for an description of the algorithm). The program should fill an area of given size (say 100x100 pixels corresponding to the range {-1,1},{-1,1}i in the complex number space) with different colors depending on iteration depths for each pixel. If a maximum iteration depth (say 256) is exceeded for any given point, the corresponding pixel should be colored black.

The program should create data in bitmap format (.bmp) on the standard output, which may be viewed subsequently with a standard image viewer application.

Assignment 4.2:

Modify your program from 4.1 in such a way that multiple threads are employed to compute disjunctive sub-areas (lines) of the pixel array. The number of threads to be used should be specified as a command line argument.

Your program should employ a special master thread that distributes work and waits for termination of all worker threads before program termination.

Assignment 4.3:

Compare the concepts and features of *named pipes* under Win32 and UNIX Sys V (see `mkfifo()`).