Week 6 & 7 Assignment:
Functional programming & Parallel processing

Introduction

The goal of the present assignment is to give the students hands-on experience with functional programming and with parallel processing.

The first part of the assignment focuses on a functional programming application for Twitter and the second part considers parallel programming in an image processing application.

Preliminary readings:

- A.M. Kuchling, Functional Programming HOWTO, https://docs.python.org/2/howto/functional.html
- Jeremy Bejarano (2012), A Python Introduction to Parallel Programming with MPI, http://materials.jeremybejarano.com/MPIwithPython/
- Software Carpentry (2014), Parallel programming with Python's multiprocessing library, http://wltrimbl.github.io/2014-06-10-spelman/intermediate/python/04-multiprocessing.html

Research Questions

1. Find at least three existing solutions for the problem of feeding long texts to Twitter and describe what they do.
2. Name at least three benefits of functional programming in comparison to imperative programming. Are there any disadvantages as well?
3. Find at least two different ways of blending two images of equal size.
4. Suppose you have a sequential program for blending two images (both 640x480 pixels) together. What speedup would you expect when the program is parallelized over four processors?

Lab assignments

1. *Functional programming*
   Use functional programming (e.g. in Python) to write a program that cuts long strings into “tweetable” chunks. Make sure that the chunks are not completely independent but remain connected somehow, so that people can still read the complete text (for example like the solutions you found in Research Question 1).

2. *Parallel programming*
   Using the tutorial by Software Carpentry as an example (see Preliminary readings), write a parallel processing program to blend together two images of the same size. Choose your own way of blending and use your own example images for testing. Measure and display graphically the execution times when you use different numbers of processors and compare this with your answer to Research Question 4.