

General problems

Bear in mind the primary goal is to design computational efficient solutions to the problems below, they should be written in C Language and are intended to be run in a single-threaded environment under Linux.

Specific features of C, which are appropriate to code the solutions to these problems, will be discussed in tutorials. You should, however, develop your own solutions first.

1. Write a program that reads in succession several text files `text#.txt` and prints a listing of the occurring frequency of word lengths and the number of vowels in each word for each of the supplied texts.
2. The circular cross-correlation is an important tool to detect similarities between two signals. For two signals with n samples, $x(k)$ and $y(k)$, with $0 \leq k < n$, the circular cross-correlation $rx_y(\tau)$ is defined by the formula

$$rx_y(\tau) = \sum_{k=0}^{n-1} x(k) \cdot y[(\tau+k) \bmod n] .$$

Write a program that reads in succession the values of pairs of signals stored in several data files whose names are provided, computes the circular cross-correlation of each pair and appends it to the corresponding file.