# ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE

## School of Computer and Communication Sciences

This the final graded homework. Due date is Monday May 30, 2011, at midnight. You can send your solution by email to mine.alsan@epfl.ch. You can work in groups of size up to 4.

**Problem 1** (Compression of Images)**.** This final graded homework takes the form of a project. Your task is simple. You are given an image. Compress the image by a factor at least 10 while maintaining the best image quality you can. There are many ways of doing this, and so there is not just one "right" answer. Try things out! Your grade depends not only on how well you succeeded but also on how creative you have been and what you have tried. Needless to say, you cannot use any commercial software for image compression. You can look on the web to get ideas but you must cite any reference you have used.

More precisely.

(i) Our picture is "Baboon.pgm". You find it at
http://www.ece.umd.edu/class/enee631/am/am3/bb2.htm

It is encoded in the extremely simple PGM format (just google the format for a detailed description). The first few symbols in the beginning tell you that the picture has 512 x 512 samples and that each sample is a gray scale value from 0 to 255. The rest is the array of 512 x 512 8bit numbers. So the total file size is just a little bit more than $512^2$ bytes which is just about 2.1 million bits.

(ii) Matlab, Mathematica, or C (using simple routines you find on the web) have the ability to read in such a file and to display it as well as to extract from it the array which describes the data.

(iii) Your task is to compress this picture to no more than 200000 bits. More precisely, devise and *encoding algorithm* as well as a *decoding algorithm* which do the following. The encoding algorithm takes the picture and compresses it to at most 200000 bits and stores these bits into a file. The decoding algorithm takes the file and recreates from it the desired picture in PGM format. The recreated PGM picture must have the same format as the original, i.e., it must have size 512 x 512 and the gray scale values must be in the range 0 to 255.

Your aim is that the resulting picture is as close to the original as possible. Of course, the algorithms should be generic, i.e., work in principle for general pictures.

(iv) Please hand in (a) the file, (b) the algorithms (e.g., the Matlab code), (c) the resulting PGM figure called "QBaboon.pgn," and (d) any description or explanation which we might need to figure out what you have done. If you have tried things which did not work, also describe them. If you know why some things worked or did not work let us know.