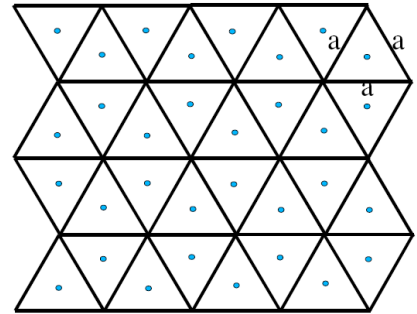


**IYTE EE 431 Intro. to Image & Video Processing**  
**Ş.Gümüştekin**  
**Homework 1, Due Nov 9 2016**

**(Can be done by teams of 2 members. Each member of the group should contribute to the solutions equally. Teams decided here will be the same for the rest of the homeworks and projects)**

1. Develop a strategy for storing an image given over a triangular tessellation into a 2D array. Then show how to:
  - a. Compute Euclidian distances
  - b. Determine 3-adjacencygiven only the indices (in the new data structure) of two arbitrary pixels



2. Consider the connected component (cc) labeling algorithm involving single pass of an operator propagating labels and keeping equivalences.

$$\begin{matrix} a & b & c \\ & d & p \end{matrix}$$

where p is the pixel under consideration. Explain in the form of a table what happens in the algorithm for all possible states (There are 32 possible states for the 5 binary variables). Also give an example on a simple image.
3. Show that to connect the three vertices of an equilateral triangle by a closing operator with a disk shaped structuring element, the radius of the disk must be larger than the side length of the triangle.
4. Determine the value of  $|P|^2/A$  (perimeter squared, divided by area) for a regular polygon having N sides and show that it is always greater than the value of  $|P|^2/A$  for a circle.
5. Find the parameters of a forward affine transformation which first rotates the image 30 degrees clockwise around the image center and alters the aspect ratio of the resulting image from 3:4 (NR:NC) to 9:16 keeping the column size (NC-Number of Columns) constant.
6. Write a computer program that reads a pgm format image file and creates another image by adding a value (+ or -) which is specified at the command line, to the pixel values. Make sure that the final pixel values are between 0-255. You can simply modify the file example1.c which is part of [SGimproV1.2.zip](#) (downloadable from CMS site). Submit a printout of your code attached to the rest of your solutions.