Pattern Recognition Exercises
Sheet 6 "Clustering Algorithms"

Exercises: M.Sc. Chen Li, M.Sc. Cong Yang
Lectures: Prof. Dr.-Ing. Marcin Grzegorzek
Pattern Recognition Group, University of Siegen
http://www.pr.informatik.uni-siegen.de

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Submission Form:	Email to **cong.yang@uni-siegen.de** with a PDF attachment
File Name:	PR-ES6-Surname.pdf
Exercise Discussion:	July 15, 2014, 8:30am, H-F 001

1 Clustering - Basic Sequential Algorithmic Scheme (BSAS) (10 Points)

Consider the following two-dimensional vectors: $\boldsymbol{x}_1 = [1,1]^{\mathrm{T}}$, $\boldsymbol{x}_2 = [2,1]^{\mathrm{T}}$, $\boldsymbol{x}_3 = [5,4]^{\mathrm{T}}$, $\boldsymbol{x}_4 = [6,5]^{\mathrm{T}}$, $\boldsymbol{x}_5 = [6,6]^{\mathrm{T}}$. Also consider the case that each cluster is represented by its mean vector. Run the BSAS algorithm when the vectors are presented in the given order. Use the Euclidean distance between two vectors and take the threshold $\Theta = \sqrt{2}$.

2 Clustering - Matrix Updating Algorithmic Scheme (MUAS) (10P)

For exactly the same feature vectors as in Task 1, please present all steps of the MUAS algorithm using the Euclidean distance function. Assume that the clusters are represented by their mean vectors.

3 Clustering - Minimum Spanning Tree (MST) Algorithm (10P)

Consider the set $X = \{\boldsymbol{x}_i, i = 1, \ldots 7\}$, where $\boldsymbol{x}_1 = [1,1]^{\mathrm{T}}$, $\boldsymbol{x}_2 = [1,2]^{\mathrm{T}}$, $\boldsymbol{x}_3 = [2,1]^{\mathrm{T}}$, $\boldsymbol{x}_4 = [3,1]^{\mathrm{T}}$, $\boldsymbol{x}_5 = [6,1]^{\mathrm{T}}$, $\boldsymbol{x}_6 = [7,1]^{\mathrm{T}}$, $\boldsymbol{x}_7 = [6,2]^{\mathrm{T}}$. Determine the value of q for which the MST clustering algorithm gives two clusters.