AS-74.3115 NEURO-FUZZY Computing in Automation
Exam 12.5.2010
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All questions are of equal value.
Use of books or lecture notes is not allowed.

1)
a) Define a fuzzy set.
b) Who is considered the inventor of fuzzy logic?
Mention one other person that has been influential in developing basic ideas of fuzzy logic.
c) Given two fuzzy sets. Define fuzzy sets $A \cup B$ and $A \cap B$. Use a figure to illustrate!

2) a) Give two ways how fuzzy logic can be used in fuzzy control. Draw a block diagram of each.
b) Draw the basic block diagram of a fuzzy system. Explain what the task of each block is.

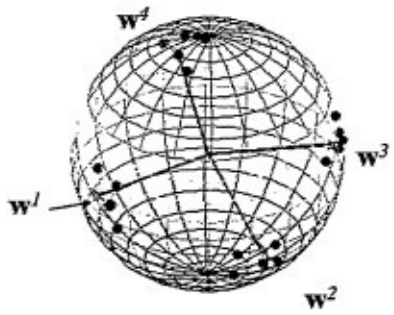
3) Measurements have been performed with a system. They are given in Table 1. Here x is input and y is output.

TABLE 1

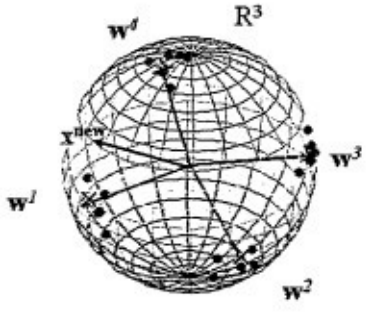
x	y
-2	4
-1	1
0	0
0.5	0.25

Set up a fuzzy system that represents the data!

4) a) Suppose you have four weight vectors of unit length $\mathbf{w}^j = \left[w_1^j, w_2^j, w_3^j \right], j = 1,...,4$ as shown in Figure (a) (on the left).



(a)



(b)

A new input vector $\mathbf{x}^{new}$ is introduced. Figure (b) on the right. Explain how competitive learning works.

b) How does Kohonen Self-Organizing Map differ from competitive learning?

5) a) Name at least three types of neural network architectures and describe them for example using drawings.

b) Compare the characteristics of the neural networks that you mentioned in a).