

Homework SET #1

Homework 1: Problems 2.1-2.6 at the end of Chapter 2 in the Nilsson textbook

Due Tuesday August 30, 2011, Lecture 4, in class

2.1 Write the following Boolean function in DNF:

$$f = (x_1 + x_2)(x_3 + x_4)$$

2.2 Show that

$$x_1x_2x_3 + \bar{x}_1x_2x_3 = x_2x_3$$

2.3 Indicate which of the following Boolean functions of three input variables can be realized by a single threshold element with weighted connections to the inputs. You do *not* need to calculate the weight and threshold values:

1. x_1
2. $x_1x_2x_3$
3. $x_1 + x_2 + x_3$
4. $(x_1x_2x_3) + (\bar{x}_1\bar{x}_2\bar{x}_3)$
5. 1

2.4 Prove that there are exactly 3^n monomials of n dimensions and 3^n clauses of n dimensions. {This is simple! Note that the values are {T,F, and none or HiZ}, the system is ternary and not binary.}

2.5 Refer to the definitions of the features, x_1, x_2, x_3, x_4 on page 24 and to the rules for action on page 25. Show that the assumption that there are no “tight spaces” in the two-dimensional grid world implies that no two of the action rules can be satisfied simultaneously.

2.6 Design (by hand) a neural network that accepts as inputs the sensory signals s_1, s_2, \dots, s_8 and produces as outputs the conditions needed by a network of TISA units to implement the action rules on page 25 for the wall-following robot. {This is simple! See the TSA figures in the book (e.g., Figure 2.6) and change as appropriate to match your answer.}

CLASS 2 OUTLINE

An example of a Classical AI Problem
N-Queens Problem
An Example of a Modern Machine Intelligence Problem
Q-Learning: Learning to Push a Box
Stimulus-Response (SR) Agents