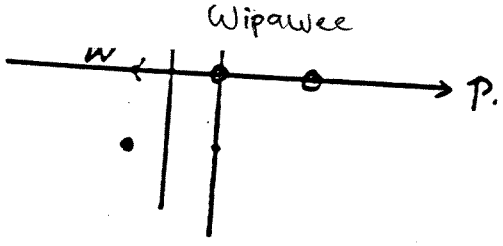
ENEE434

Homework # 2 solution

(The matlab part, I sent you the files yesterday)

E4.2. i.



decision boundary: $p_1 = -0.5$

choose: $W = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$ then $W^T p + b = 0$, $b = -0.5$

ii. Test the solution with all four input vectors.

① $a_1 = \text{hardlim}\left(\begin{bmatrix} -1 & 0 \end{bmatrix}\begin{bmatrix} -1 \\ 1 \end{bmatrix} - 0.5\right) = \text{hardlim}(0.5) = 1 = t_1$

② $a_2 = \text{hardlim}\left(\begin{bmatrix} -1 & 0 \end{bmatrix}\begin{bmatrix} -1 \\ -1 \end{bmatrix} - 0.5\right) = \text{hardlim}(0.5) = 1 = t_2$

③ $a_3 = \text{hardlim}\left(\begin{bmatrix} -1 & 0 \end{bmatrix}\begin{bmatrix} 0 \\ 0 \end{bmatrix} - 0.5\right) = \text{hardlim}(-0.5) = 0 = t_3$

④ $a_4 = \text{hardlim}\left(\begin{bmatrix} -1 & 0 \end{bmatrix}\begin{bmatrix} 1 \\ 0 \end{bmatrix} - 0.5\right) = \text{hardlim}(-1.5) = 0 = t_4$

E18.5 i. $W = p_1 (p_1)^T + p_2 (p_2)^T$

$$= \begin{bmatrix} 1 & -1 & -1 & 1 \\ -1 & 1 & 1 & -1 \\ -1 & 1 & 1 & -1 \\ 1 & -1 & -1 & 1 \end{bmatrix} + \begin{bmatrix} 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \\ 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 2 & -2 & 0 & 0 \\ -2 & 2 & 0 & 0 \\ 0 & 0 & 2 & -2 \\ 0 & 0 & -2 & 2 \end{bmatrix}$$

$$b = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$