Perceptron (Reflected Ptototypes) (DHS 5.5)

$\underline{w}(i+1) = \underline{w}(i)+\alpha \underline{\tilde{y}}_m^{(k)}$ if $\underline{w}^T(i)\ \underline{\tilde{y}}_m^{(k)} \le 0$

(i.e., if $\underline{\tilde{y}}_m^{(k)}$ is misclassified)

$=\underline{w}(i)$ if $\underline{w}^T(i)\ \underline{\tilde{y}}_m^{(k)} > 0$

Perceptron Example

Prototypes(augmented)		Class	Desired Condition
$\underline{y}_1$	1 1 -1 0 2 1	S_2	$\underline{w}^T\underline{y}_1<0$
$\underline{y}_2$	0 0 1 2 0 1	S_1	$\underline{w}^T\underline{y}_2>0$
$\underline{y}_3$	-1 -1 1 1 0 1	S_2	$\underline{w}^T\underline{y}_3<0$
$\underline{y}_4$	4 0 1 2 1 1	S_1	$\underline{w}^T\underline{y}_4>0$
$\underline{y}_5$	-1 1 1 1 0 1	S_1	$\underline{w}^T\underline{y}_5>0$
$\underline{y}_6$	-1 -1 -1 1 0 1	S_1	$\underline{w}^T\underline{y}_6>0$
$\underline{y}_7$	-1 1 1 2 1 1	S_2	$\underline{w}^T\underline{y}_7<0$

Reflected Prototypes	Class	Desired Condition
-1 -1 1 0 -2 -1	S_2	$-\underline{w}^T\underline{y}_1>0$
0 0 1 2 0 1	S_1	$\underline{w}^T\underline{y}_2>0$
1 1 -1 -1 0 -1	S_2	$-\underline{w}^T\underline{y}_3>0$
4 0 1 2 1 1	S_1	$\underline{w}^T\underline{y}_4>0$
-1 1 1 1 0 1	S_1	$\underline{w}^T\underline{y}_5>0$
-1 -1 -1 1 0 1	S_1	$\underline{w}^T\underline{y}_6>0$
1 -1 -1 -2 -1 -1	S_2	$-\underline{w}^T\underline{y}_7>0$

Use fixed increment, $\alpha(i)=1$, one-at-a-time update

Reflected Prototypes		**Weight Vector, w**	$\mathbf{w}^T\mathbf{y}$
$\mathbf{y}_1$	**-1 -1 1 0 -2 -1**	**1 1 1 -1 -1 1**	**0**
$\mathbf{y}_2$	**0 0 1 2 0 1**	**0 0 2 -1 -3 0**	**0**
$\mathbf{y}_3$	**1 1 -1 -1 0 -1**	**0 0 3 1 -3 1**	**-5**
$\mathbf{y}_4$	**4 0 1 2 1 1**	**1 1 2 0 -3 0**	**3**
$\mathbf{y}_5$	**-1 1 1 1 0 1**	**1 1 2 0 -3 0**	**2**
$\mathbf{y}_6$	**-1 -1 -1 1 0 1**	**1 1 2 0 -3 0**	**-4**
$\mathbf{y}_7$	**1 -1 -1 -2 -1 -1**	**0 0 1 1 -3 1**	**-1**
	-1 -1 1 0 -2 -1	**1 -1 0 -1 -4 0**	**8**
	0 0 1 2 0 1	**1 -1 0 -1 -4 0**	**-2**
		1 -1 1 1 -4 1	**-3**
		2 0 0 0 -4 0	**4**
		2 0 0 0 -4 0	**-2**
		1 1 1 1 -4 1	**-1**
		0 0 0 2 -4 2	**-2**

Reflected Prototypes	**Weight Vector, w**	$\mathbf{w}^T\mathbf{y}$
-1 -1 1 0 -2 -1	**1 -1 -1 0 -5 1**	**8**
	1 -1 -1 0 -5 1	**0**
	1 -1 0 2 -5 2	**-4**
	2 0 -1 1 -5 1	**5**
	2 0 -1 1 -5 1	**-1**
	1 1 0 2 -5 2	**2**
	1 1 0 2 -5 2	**-1**
-1 -1 1 0 -2 -1	**2 0 -1 0 -6 1**	**8**
	2 0 -1 0 -6 1	**0**
	2 0 0 2 -6 2	**-2**
	3 1 -1 1 -6 1	**8**
	3 1 -1 1 -6 1	**-1**
	2 2 0 2 -6 2	**0**
	1 1 -1 3 -6 3	**-2**

Reflected Prototypes	**Weight Vector, w**	$\mathbf{w^T y}$
-1 -1 1 0 -2 -1	**2 0 -2 1 -7 2**	**8**
	2 0 -2 1 -7 2	**2**
	2 0 -2 1 -7 2	**1**
	2 0 -2 1 -7 2	**3**
	2 0 -2 1 -7 2	**-1**
	1 1 -1 2 -7 3	**4**
	1 1 -1 2 -7 3	**1**
-1 -1 1 0 -2 -1	**1 1 -1 2 -7 3**	**8**
	1 1 -1 2 -7 3	**6**
	1 1 -1 2 -7 3	**-2**
	2 2 -2 1 -7 2	**3**
	2 2 -2 1 -7 2	**1**
	2 2 -2 1 -7 2	**1**
	2 2 -2 1 -7 2	**5**
	2 2 -2 1 -7 2	**6**
	2 2 -2 1 -7 2	**2**
	2 2 -2 1 -7 2	**3**