$$w_1' = r(v - v_\theta)u_1 \qquad w_2' = r(v - v_\theta)u_2$$

$u_1 \;\; u_2$

a) $v = v_\theta$:

$$w_1' = r(0)u_1 \quad \& \quad w_2' = r(0)u_2$$

$$w_1' = 0 \qquad\qquad w_2' = 0$$

b) Stability of (w_1, w_2) :

$$F_{w_1} = r(v - v_\theta)u_1 = r\left(f(w_1u_1 + w_2u_2) - v_\theta\right)u_1$$

$$= r\,f(u_1)\,u_1$$

$$F_{w_2} = r f(u_2)\,u_1$$

$$G_{w_1} = r f(u_1)u_2 \quad , \quad G_{w_2} = r f(u_2)\,u_2$$

$$J = \begin{pmatrix} r u_1^2 & r u_2 u_1 \\ r u_1 u_2 & r u_2^2 \end{pmatrix}$$

$$\begin{pmatrix} \lambda - \gamma u_1^2 & -\gamma u_2 u_1 \\ -\gamma u_1 u_2 & \lambda - u_2^2 \gamma \end{pmatrix}$$

$$\lambda^2 - \lambda(\gamma u_1^2 + \gamma u_2^2) \Rightarrow \lambda(\lambda - (\gamma u_1^2 - \gamma u_2^2))$$

$$\lambda = 0, \ \gamma(u_1^2 + u_2^2)$$

So if $\gamma \leq 0$ the pre-neurons are stable.

This rule is hebbian when $\gamma \geq 0$ and anti-hebbian when $\gamma < 0$.