$$\tau_s \frac{ds_i}{dt} = \beta_i + \sum_j w_{ij} z_j - g_a a_i - s_i + \sigma d\xi(t) + I_i(t) \tag{1}$$

$$o_i = \begin{cases} 1, & s_i = \max_{hypercolumn}(\mathbf{s}), \\ 0, & \text{otherwise} \end{cases} \tag{2}$$

$$\tau_a \frac{da_i}{dt} = o_i - a_i \tag{3}$$

$$\tau_{z_{pre}} \frac{dz_i}{dt} = o_i - z_i \qquad \tau_{z_{post}} \frac{dz_j}{dt} = o_j - z_j \tag{4}$$

$$t\frac{dp_i}{dt} = z_i - p_i \qquad t\frac{dp_{ij}}{dt} = z_i z_j - p_{ij} \qquad t\frac{dp_j}{dt} = z_j - p_j \tag{5}$$

$$w_{ij} = \log\left(\frac{p_{ij}}{p_i p_j}\right) \qquad \beta_i = \log(p_i) \tag{6}$$