• We have :

① P_i is the power transmitted by transmitter i.
② S_i is the signal power at receiver i.
③ G_{ij} is the path gain from transmitter j to receiver i.
④ SINR is the signal to interference plus noise ratio.

→ $S_i = G_{ii} P_i$

→ $q_i = \sigma + \sum_{j \neq i} G_{ij} P_j \quad , \sigma > 0$

→ $SINR(S_i) = \frac{S_i}{q_i} = \frac{S_i}{\sigma + \sum G_{ij} P_j} \quad , S_i \geq \gamma$

→ $S_i(t) = \frac{S_i(t)}{q_i(t)} = \alpha \gamma \quad , \alpha > 1$

→ $P_i(t+1) = P_i(t) * \frac{\alpha \gamma}{S_i(t)} \quad , \alpha \gamma = S_i(t+1)$

Solution

$$P_i(t+1) = \frac{\alpha \gamma P_i(t) \left[\sigma + \sum G_{ij} P_j(t)\right]}{G_{ii} P_i(t)} = \alpha \gamma * \frac{\sigma + \sum G_{ij} P_j}{G_{ii}}$$

$$\begin{bmatrix} P_1(t+1) \\ P_2(t+1) \\ \vdots \\ \end{bmatrix} = \begin{bmatrix} 0 & \frac{\alpha\gamma G_{12}}{G_{11}} & \frac{\alpha\gamma G_{13}}{G_{11}} & \cdots & \frac{\alpha\gamma G_{1n}}{G_{11}} \\ \frac{\alpha\gamma G_{21}}{G_{22}} & 0 & \frac{\alpha\gamma G_{23}}{G_{22}} & \cdots & \frac{\alpha\gamma G_{2n}}{G_{22}} \\ \vdots & & & & \vdots \\ \frac{\alpha\gamma G_{n1}}{G_{nn}} & \frac{\alpha\gamma G_{n2}}{G_{nn}} & \frac{\alpha\gamma G_{n3}}{G_{nn}} & \cdots & 0 \end{bmatrix} \begin{bmatrix} P_1(t) \\ P_2(t) \\ \vdots \\ P_n(t) \end{bmatrix} + \begin{bmatrix} \frac{\alpha\gamma\sigma}{G_{11}} \\ \frac{\alpha\gamma\sigma}{G_{22}} \\ \vdots \\ \frac{\alpha\gamma\sigma}{G_{nn}} \end{bmatrix}$$