Automatic Generation Control of a Two Area Power System Using Deep Reinforcement Learning

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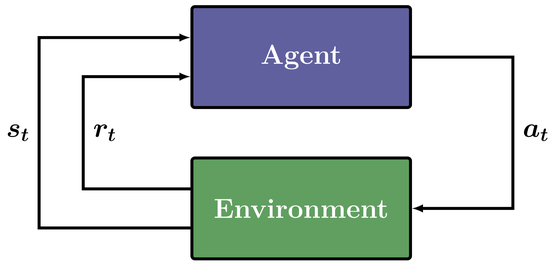
Background

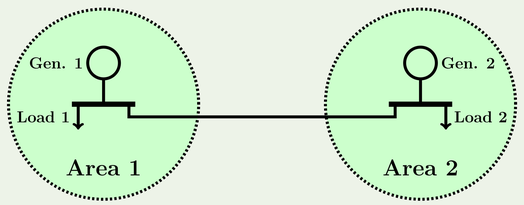
content...

Reinforcement Learning

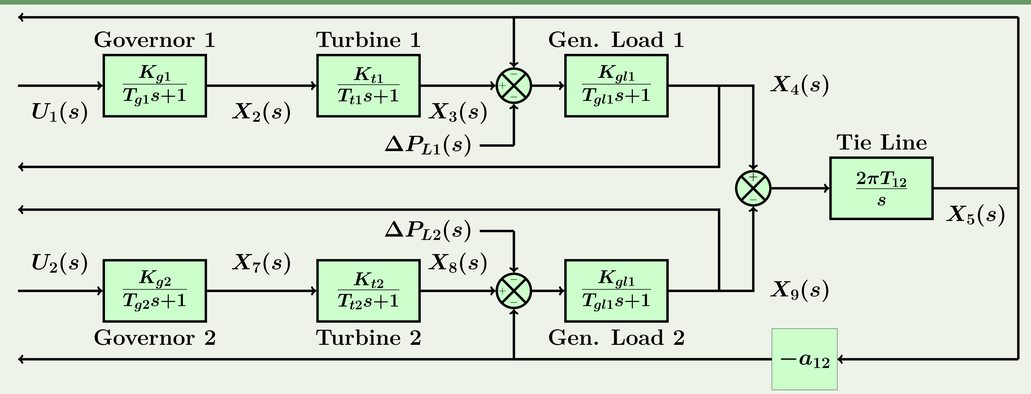
Reinforcement learning is



The Environment



The Environment in the Frequency & Temporal Domains



Two Area System ODE

$$\dot{x}_2(t) = \frac{1}{T_{sg_1}}\Big(K_{sg_1}u_1(t) - x_2(t)\Big)$$
$$\dot{x}_3(t) = \frac{1}{T_{t_1}}\Big(K_{t_1}x_2(t) - x_3(t)\Big)$$
$$\dot{x}_4(t) = \frac{1}{T_{gl_1}}\Bigg(K_{gl_1}\Big(x_3(t) - x_5(t) - \Delta p_{L1}(t)\Big) - x_4(t)\Bigg)$$

$$\boldsymbol{\dot{x}_2(t)} = \frac{1}{T_{sg_1}}\Big(K_{sg_1}u_1(t) - x_2(t)\Big)$$
$$\dot{x}_3(t) = \frac{1}{T_{t_1}}\Big(K_{t_1}x_2(t) - x_3(t)\Big)$$
$$\dot{x}_4(t) = \frac{1}{T_{gl_1}}\Bigg(K_{gl_1}\Big(x_3(t) - x_5(t) - \Delta p_{L1}(t)\Big) - x_4(t)\Bigg)$$

Classical PI Controller

DDPG Controller

Results