Receptor-Based Controller

Legend:
- **CP**: Cytoplasm
- **PM**: Plasma Membrane
- **ECS**: Extracellular Space
- **STD**: Signal Transducing Domain
- **TMD**: Transmembrane Domain
- **ECD**: Extracellular Domain

Regulated Network

Disturbance

Input X_1

Regulated Output X_L

$u = kz_5$ ③
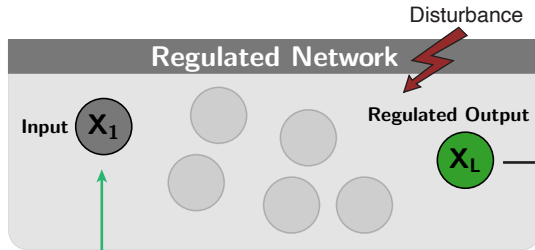
$$x_L \to -\frac{q^T \mu}{q^T \theta} = \frac{\mu_1}{\theta_2}$$

$\mathcal{C}$	$\mathcal{N}$	$\mathcal{S}$
Z_1	Z_2	Z_3
Z_5		Z_4
Z_6		

ⓘ Reaction Rule i

$$
\begin{array}{ccc}
q^+ & q^- & q^0 \\
\begin{bmatrix}
1 & 0 & 0 \\
0 & 1 & 0 \\
0 & 0 & 1 \\
0 & 0 & 2 \\
2 & 0 & 0 \\
1 & 0 & 1
\end{bmatrix}
\end{array}
\begin{array}{c}
Z_1 \\ Z_2 \\ Z_3 \\ Z_4 \\ Z_5 \\ Z_6
\end{array}
$$

$$
\begin{array}{ccc}
q & \mu & \theta \\
\begin{bmatrix}
1 & \mu_1 & 0 \\
-1 & 0 & \theta_2 \\
0 & 0 & 0 \\
0 & 0 & 0 \\
2 & 0 & 0 \\
1 & 0 & 0
\end{bmatrix}
\end{array}
\begin{array}{c}
Z_1 \\ Z_2 \\ Z_3 \\ Z_4 \\ Z_5 \\ Z_6
\end{array}
$$

Z_2 ② η Z_4

$+\boxed{O}$ Z_6

Z_2 η Z_4 $\boxed{O}\boxed{O}$ ⑤

wa / d

$\boxed{O}$ Z_3

d / wa Z_6 ⑥

Z_1 $\boxed{+}$

Cross-phosphorylation

$\boxed{+}\boxed{+}$ Z_5

2η ②

Z_2 $\boxed{-}$

θ_2 ①

CP

PM

ECS

d

wa ⑤

- Hormones
- Voltage
- Light
- Cytokines
- ...

W Gain

Setpoint

μ_1

| ECD | TMD | Int^c | STD |

Plasmid 1