1 Formulation

$$x = \begin{bmatrix} T_w \\ T_r \\ v \\ ht * 16 \\ ct * 16 \end{bmatrix}, \qquad \underbrace{x\_1 = \begin{bmatrix} T_{w1} \\ T_{r1} \\ v_1 \\ ht_1 * 16 \\ ct_1 * 16 \end{bmatrix} + \overbrace{\begin{bmatrix} w\_Tw \\ w\_Tr \\ 0 \\ 0 * 16 \\ 0 * 16 \end{bmatrix}}^{Variance\_for\_each\_state}}_{\text{Next States}}$$

$$y = \begin{bmatrix} T_w \\ T_r \\ w\_Tw \\ w\_Tr \end{bmatrix}$$

$$\underbrace{yref\_0 = \begin{bmatrix} T\_w\_m \\ T\_r\_m \\ 0 \\ 0 \\ x0\_1 \\ x0\_2 \end{bmatrix}}_{\text{cost\_y\_ref (0)}}, \qquad \underbrace{yref\_1 = \begin{bmatrix} T\_w\_m2 \\ T\_r\_m2 \\ 0 \\ 0 \end{bmatrix}}_{\text{cost\_y\_ref (1)}}, \qquad \underbrace{yref\_2 = \begin{bmatrix} T\_w\_m3 \\ T\_r\_m3 \\ 0 \\ 0 \end{bmatrix}}_{\text{cost\_y\_ref (2)}}$$

$$Vx * x + Vu * u = y$$

$$Vx_{4X35} + x_{35X1} = \begin{bmatrix} T\_w \\ T\_r \\ 0 \\ 0 \end{bmatrix}$$

$$Vu_{4X35} + u_{35X1} = \begin{bmatrix} 0 \\ 0 \\ w\_Tw \\ w\_Tr \end{bmatrix}$$

States (nx) = 35: T_w, T_r, v, ht * 16, ct * 16
Controls (nu) = 2: w_Tw and w_Tr
Output (ny) = 4
Parameters (p) = 5: 3 predefined controls(M_acc, M_brk, M_fric) + 2 other (v_r, phi)