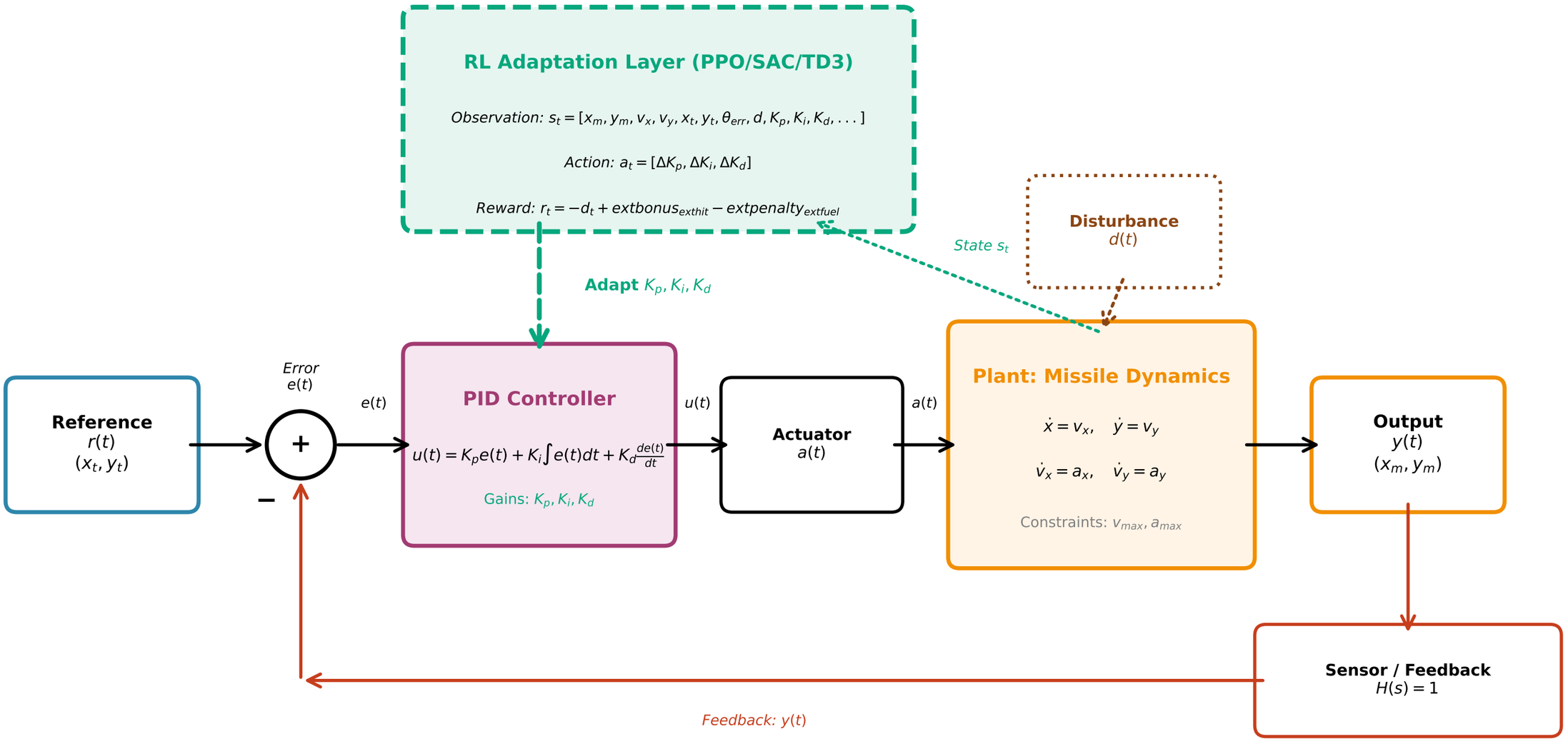
Missile Guidance Control System with RL-Based Adaptive PID Tuning



System Components:

- Reference: Target position (desired state)
- Controller: PID with adaptive gains
- Plant: Missile dynamics (2D kinematics)

Closed-Loop Architecture:

- Negative feedback control
- Unity feedback (H(s) = 1)
- RL-based parameter adaptation

RL Training Objective:

Minimize: $J = \int_0^T (d_t + \text{penalties}) dt$

Subject to: $v \le v_{max}, a \le a_{max}$