Game rule

Climbing Robot Challenge: Dual-Pier Mission

Objective: Complete a sequential mission on two pier diameters (Ø 0.3m → Ø 0.6m) with an intermediate power-off stability test.

Mission Sequence & Rules

1. **Phase 1: Ascent & Zero-Power Lock (Ø 0.3m Pier)**
    - Robot ascends vertically to **1.2m height** on a **0.3m-diameter pier**.
    - Upon reaching 1.2m, **power is cut** (remote).
    - The robot must **remain locked in place without power for 60 seconds** (no slipping >1 cm).
    - After 60s, power is restored; robot descends to base autonomously.
2. **Phase 2: Transition & Second Ascent (Ø 0.6m Pier)**
    - The robot is repositioned at the base of a **0.6 m-diameter pier**.
    - Ascends to **1.2m height**, power cut again, and maintains position **without power for 60 seconds**.
    - Power restored; descends to base.

Critical Requirements

- **Fail-Safe Locking:** Clamping mechanism must hold position **passively** (no power draw) during 60s tests (e.g., mechanical springs, friction brakes, or self-locking gears).
- **Bidirectional Control:** Drive system must enable **controlled descent** (no free-falling; speed ≤10 cm/s).
- **Position Accuracy:** Stops at 1.2m must be within **±2 cm tolerance** (closed-loop sensors required).
- **Time Limits:**
    - Full mission (both piers) completed in **<10 minutes**.
    - Max 3 attempts total.

Game rule

Scoring (100 Points Total)

Task	Points	Performance Criteria
Phase 1 Success (Ø 0.3m)	30	- 10 pts: Reaches 1.2m (±2 cm) - 10 pts: Holds 60s without power (slip ≤1 cm) - 10 pts: Controlled descent to base
Phase 2 Success (Ø 0.6m)	30	Same as Phase 1
Locking Mechanism Robustness	30	- 10 pts: Zero slip during power-off - 10 pts: Automatic engagement/disengagement
Speed & Efficiency	10	Faster mission time (e.g., <5 min = 10 pts; 5–10 min = 5 pts)