2025-11-01

E016: Attribution and Citations

DIP-SMC-PSO Educational Series

January 25, 2026

Overview

This episode covers attribution and citations from the DIP-SMC-PSO project.

Part: Part3 Advanced
Duration: 15-20 minutes
Source: Comprehensive Presentation Materials

section0 Configuration System Architecture

Central Configuration: ‘config.yaml‘

Configuration Domains:

- **Physics Parameters**

- Cart mass, pole lengths/masses/inertias - Gravitational constant, friction coefficients

- **Controller Settings**

- Gains, boundary layers, adaptation rates - Specific parameters per controller type

- **PSO Parameters**

- Particles (30), generations (50-100) - Inertia weight (0.729), cognitive/social coefficients (1.494)

- **Simulation Settings**

- Time step (0.01s), duration (10s) - Initial conditions, solver method (RK45)

- **HIL Configuration**

- Network addresses, ports, timeouts - Safety limits, emergency stop thresholds

section0 Web Interface: Streamlit Dashboard

Interactive Web UI for Non-Technical Users:

Dashboard Features:

- **Controller Selection**

- Dropdown menu for 7 controller types - Real-time parameter adjustment sliders

- **Simulation Control**

- Start/stop buttons - Duration and time step configuration - Initial condition presets

- **Real-Time Visualization**

- Animated pendulum motion - State trajectory plots (angles, velocities) - Control input time series

- **Performance Metrics**

- Settling time calculation - Overshoot percentage - Energy consumption (u^2dt) - Chattering frequency analysis

- **PSO Integration**

- One-click gain optimization - Convergence curve visualization - Gain comparison table

Resources

- **Repository:** `https://github.com/theSadeQ/dip-smc-pso.git`
- **Documentation:** See `docs/` directory
- **Getting Started:** `docs/guides/getting-started.md`

Educational podcast episode generated from comprehensive presentation materials