FUZZY LOGIC CONTROL (SIMULINK) · CARIMO DCMK KIT

FUZZY LOGIC SPEED CONTROL

Intelligent control with no model and no equations — on a real motor

13 HARDWARE EXPERIMENTS



IDEAL FOR CONTROL SYSTEMS, MECHATRONICS & INTELLIGENT-SYSTEMS LABORATORIES

IN ONE BREATH

Fuzzy logic control throws away the equations. Instead of a plant model it follows a handful of plain-English rules — "if the motor is too slow, push harder; if it's overshooting, ease off." Four intuitive dials shape how it behaves, and the same rules run on any motor — no identification, no math.

ZERO
equations or plant model

4
plain-English dials

13
hardware experiments

How it thinks — rules, not equations

1 ERROR
How far the speed is from its target, right now.

2 CHANGE IN ERROR
Which way the gap is moving — closing or opening.

3 FUZZY RULES
15 plain-English if-then rules map the two into an action.

4 DRIVE NUDGE
Push the motor drive up or down — then repeat every 15 ms.

Model-free by design

PID and MPC both need a plant model first. Fuzzy needs none — students control real hardware before deriving a single transfer function, and the very same rule-set drops onto any motor.

One kit, three paradigms

	PID	MPC	FUZZY LOGIC
Needs a plant model?	Yes	Yes	No
How you tune it	gains	weights & horizons	plain-English rules
Captures expert intuition	✗	✗	✓
Math to get started	transfer function	state-space model	none

What you'll run — 13 hardware experiments

1. **Plant Identification** — the plant — and that fuzzy ignores it
2. **First Closed-Loop Step** — it works
3. **Step Across Setpoints** — tracking across the range
4. **Staircase Tracking** — real-world reference following
5. **Dead-Zone Sweep** — precision vs chatter
6. **Aggressiveness (Speed) Sweep** — rise time vs overshoot
7. **Brake / Damping Sweep** — overshoot suppression
8. **Smoothness Sweep** — steady-state ripple
9. **Load-Disturbance Rejection** — model-free robustness
10. **Membership-Function Study** — fuzzification design
11. **Rule-Base Study** — rule design
12. **Defuzzification Comparison** — centroid vs MOM vs bisector
13. **Fuzzy vs PID & MPC benchmarks** — compared to published results

Why students win

No-math entry
Control real hardware before deriving a single equation.

Real hardware
13 experiments on a live spinning motor — both kit generations.

Design, not just tune
Every dial and design choice is its own isolated experiment.

Industry-relevant
Fuzzy runs appliances, cameras, automotive & process plants.

Open, not a black box
Full editable Simulink® source code + a plain-language rule builder.

What you need

Software
MATLAB® R2021a or later
Simulink®
Fuzzy Logic Toolbox™

System
Windows 10 / 11
One free USB port (COM)

Hardware
CARIMO DC Motor Kit (V1.0/V2.0) with magnetic load disk
sold separately · see kit datasheet

One kit, three paradigms: PID · MPC · Fuzzy — and fuzzy needs no model.

Part of the CARIMO DCMK control family · built on a 15-year control-education heritage

Request a demo or quote | www.carimotech.com | contact@carimo.tech | +91 90823 97027

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