

Control

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Control

Kalman filter

`ctrlKalman` · `ctrlKalman(settings: object, state: object, measurement: double)`

One step of a one-dimensional Kalman filter, smoothing a noisy measurement. Like `ctrlPID` it returns the whole state and takes its own previous state back in. Read the filtered value from the `o` field.

Parameters

Name	Type	Description
<code>settings</code>	<code>object</code>	The tuning, keys in lower case: <code>q</code> the process noise per second, <code>r</code> the measurement noise.
<code>state</code>	<code>object</code>	The variable holding the previous state - normally the variable being computed. Missing or null on the first pass, which initialises it.
<code>measurement</code>	<code>double</code>	The raw reading for this pass. A null reading leaves an existing state unchanged; the first null reading, with no state yet, creates one with <code>o = 0</code> .

Returns `object` : The new state: `o` the filtered value, `p` the estimate covariance, `ts` a whole number from the engine's clock. The first reading is taken as it is: `o` equals it.

Examples

```
ctrlKalman({q: 0.01, r: 0.5}, null, LEVEL).o # 42.5
ctrlKalman({q: 0.0, r: 0.5}, {o: 40.0, p: 0.5, ts: 0}, LEVEL).o # 41.25
ctrlKalman({q: 0.01, r: 0.5}, null, null).o # 0.0
```

Data Orchestrator: available in plant formulas.

PID controller

`ctrlPID` · `ctrlPID(settings: object, state: object, error: double)`

One step of a PID control loop. It returns the whole controller state, output included, so the variable this formula feeds is the state itself and the state parameter is that same variable - that self-reference is how the loop carries its integral and derivative terms between evaluations. Read the output from the `o` field.

Parameters

Name	Type	Description
settings	object	The tuning, keys in lower case: p, i and d gains, plus mino and maxo bounding the output. The integral term is held inside those same bounds, which is what stops it winding up.
state	object	The variable holding the previous state - normally the variable being computed. Missing or null on the first pass, which initialises it.
error	double	How far the process is from its setpoint, right now.

Returns `object` : The new state: o the output, a the accumulated integral, e the previous error, ts a whole number from the engine's clock. The first pass starts the loop at rest: o, a and e are 0.

Examples

```
ctrlPID({p: 2.0, i: 0.1, d: 0.0, mino: 0.0, maxo: 100.0}, null, 50.0 - LEVEL).o # 0.0
ctrlPID({p: 2.0, i: 0.0, d: 0.0, mino: 0.0, maxo: 100.0}, {a: 0.0, o: 0.0, e: 0.0, ts: 0}, 50.0 - LEVEL).o # 15
```

Data Orchestrator: available in plant formulas.

PWM controller

`ctrlPWM` · `ctrlPWM(settings: object, state: object, input: double)`

One step of a pulse-width-modulation loop, turning a continuous input into an on/off duty cycle: in each period the output is on for the input's share of it. Like `ctrlPID` it returns the whole state and takes its own previous state back in. It only switches when it is evaluated, so drive it with a Scheduler. Read the on/off decision from the `o` field.

Parameters

Name	Type	Description
settings	object	The configuration, keys in lower case: period, the cycle length in seconds; minin and maxin, the inputs that give 0 % and 100 % on; and optionally mintoggle, the fewest seconds between two switchings (0 when left out).
state	object	The variable holding the previous state - normally the variable being computed. Missing or null on the first pass, which initialises it.
input	double	The demand, somewhere between minin and maxin.

Returns `object` : The new state: o the on/off output (a boolean), cs the cycle start and lt the last switching, both whole numbers from the engine's clock. The first pass returns o = false.

Examples

```
ctrlPWM({period: 60, minin: 0, maxin: 100}, null, LEVEL).o # false
ctrlPWM({period: 60, minin: 0, maxin: 100, mintoggle: 5}, {o: false, cs: 0, lt: 0}, LEVEL).o # true
```

Data Orchestrator: available in plant formulas.

This page describes Amtiri Script 5.4.1 as shipped with Data Orchestrator engine 6.12.1 and Site 1.22.7.