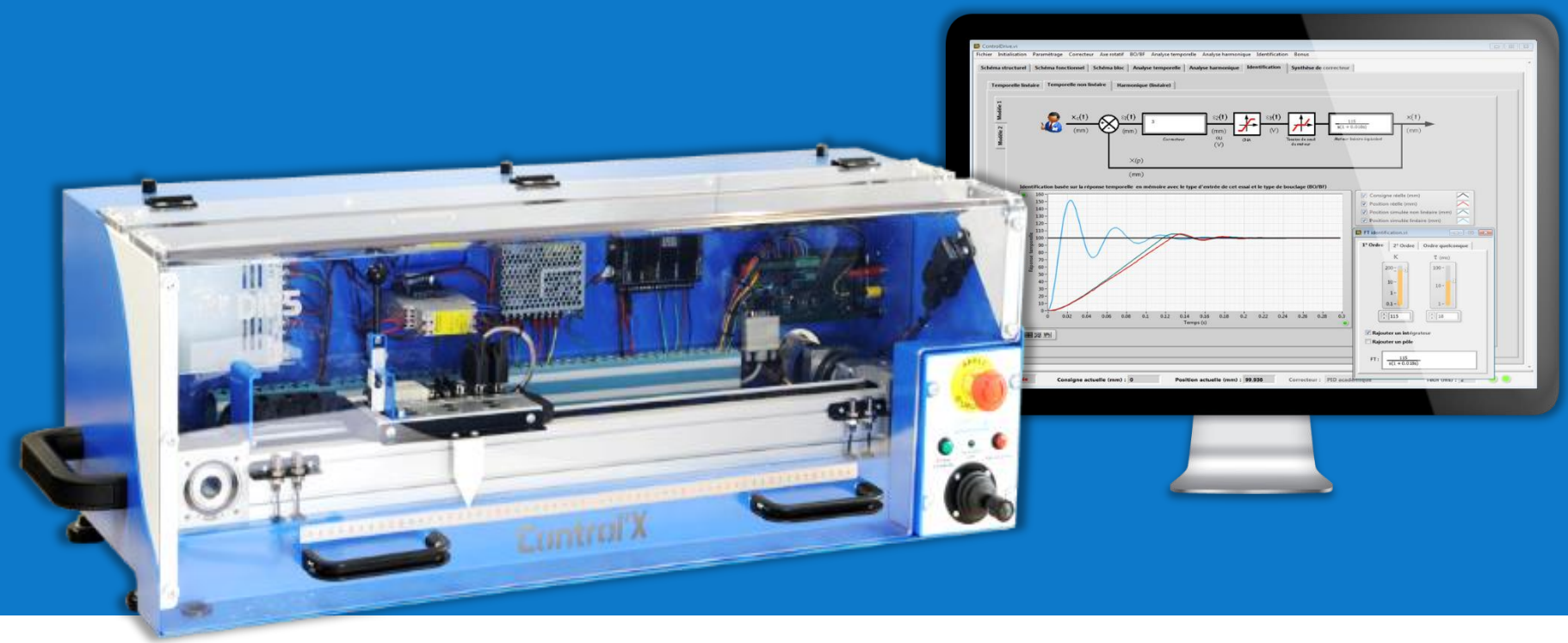
Discover a new mechatronic system:

Control 'X



www.dmseducation.com

Advanced training system to illuminate control concepts

Control'X: what is it?

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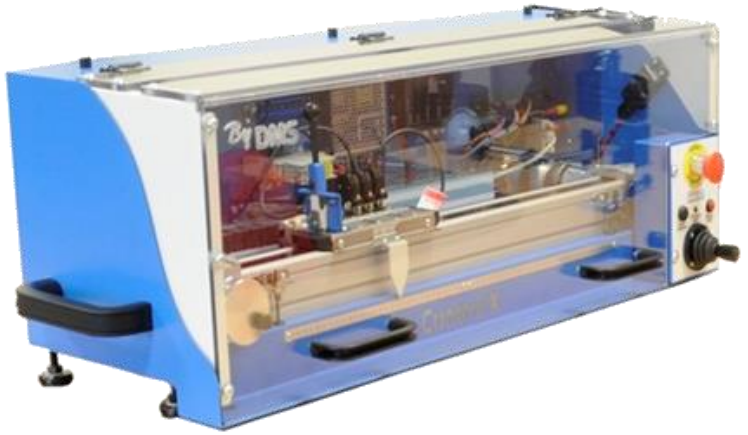
Control'X

Control'X is a didactic linear axis designed from a real industrial «Pick and Place» multi-axis system.



Control'X allows a highly dynamic positioning:

- ✓ Settling time (5%) < 100 ms
- ✓ Max acceleration ≈ 5 g
- ✓ Resolution = 13 microns

An axis that doesn't hide anything

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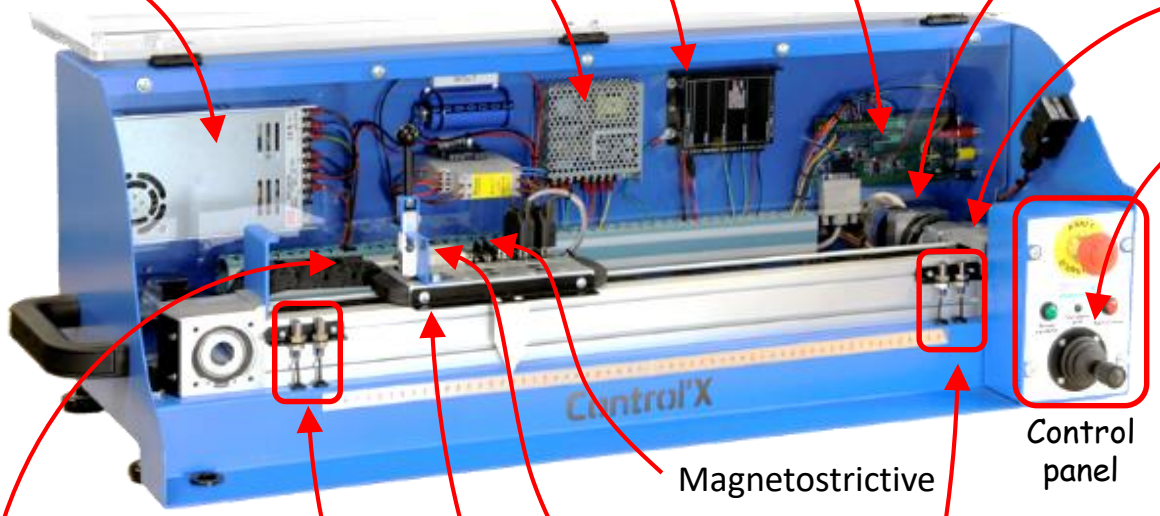

Signal conditioning card

Servo amplifier

Control power

Power supply

110W DC motor + Incremental encoder + tachogenerator

Reversible planetary gear train

2 axis joystick + buttons

Control panel

Magnetostrictive sensor

IR distance sensor

Carriage

Limit switches

Force sensor (disturbance intensity)

An very rich instrumentation

- 9 analog sensors
- 6 digital sensors
- 3 incremental encoders

Control'Drive

… much more than a control software

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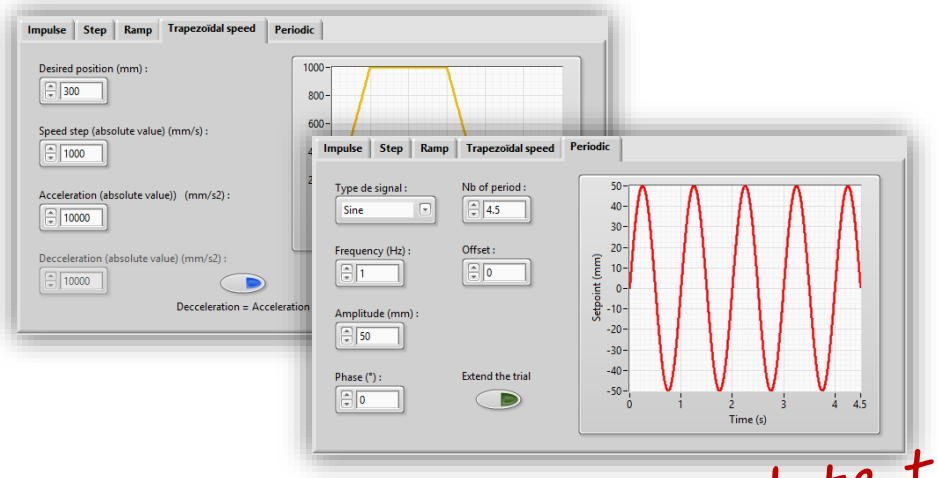
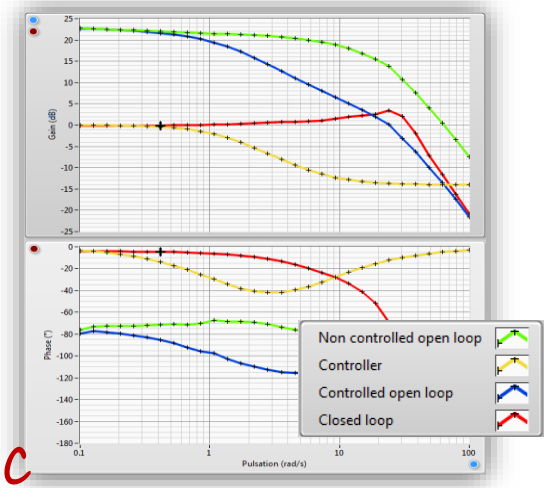
Control' X

Wide range of inputs : impulse, step, ramp, trapeze, sinus, PWM...

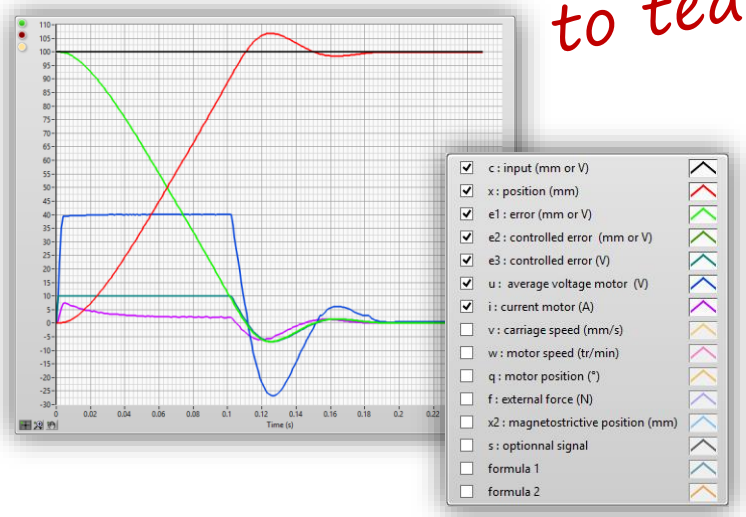


Axis under test to auto-trace frequency diagram (Bode, Nichols)

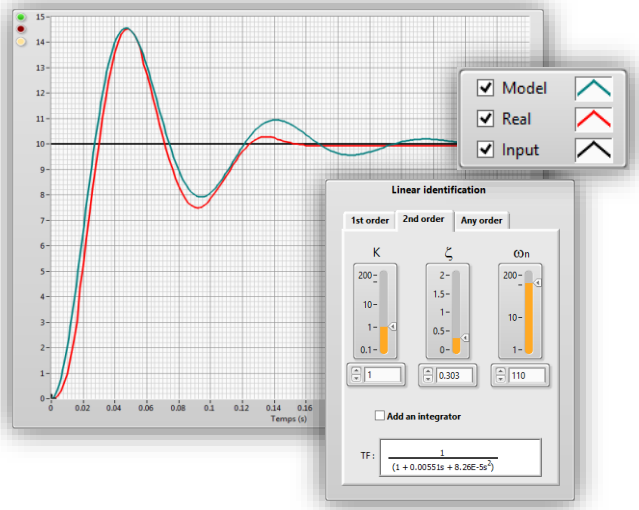


Complete toolchain to teach mechatronic

Time domain tests : 14 measures

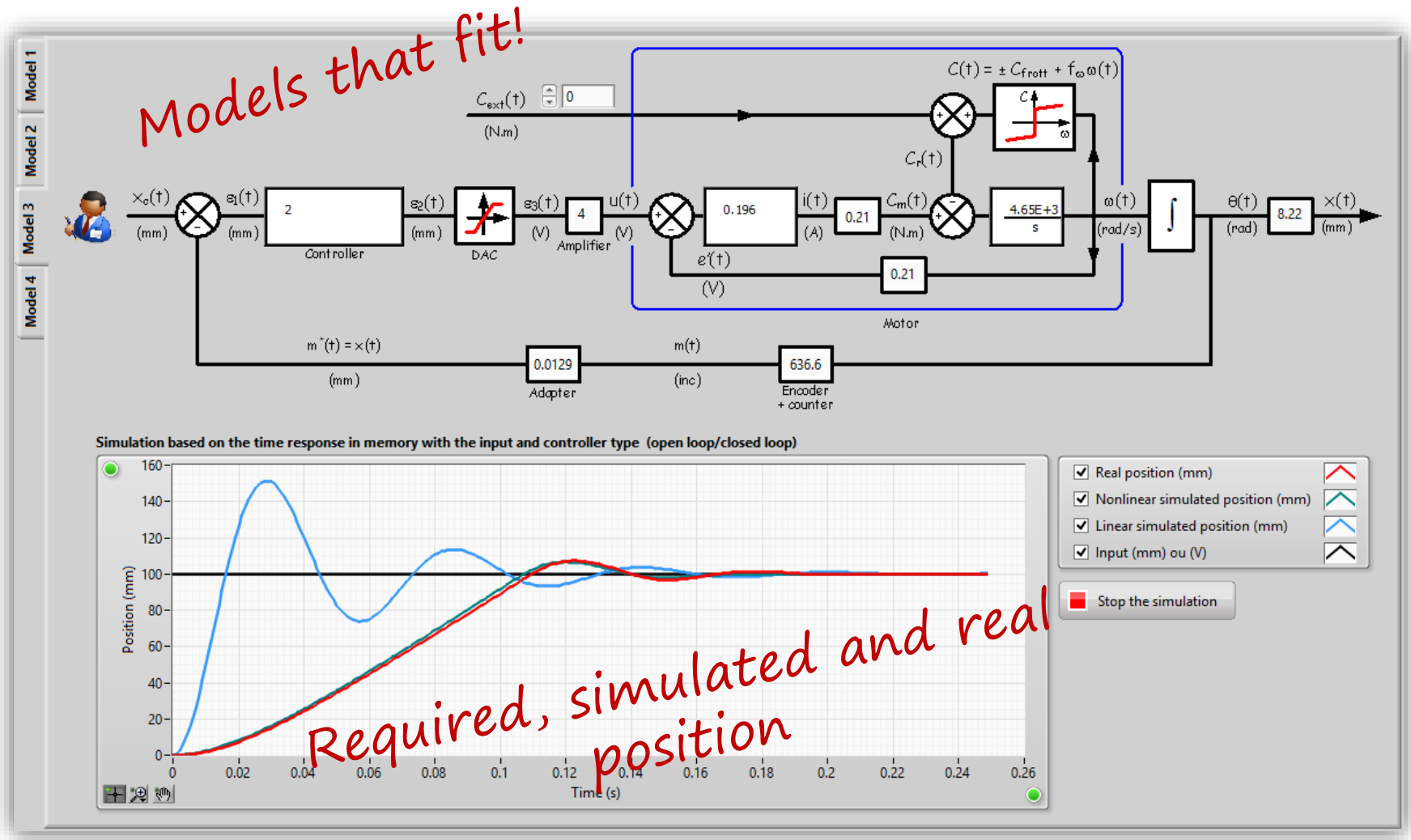


Interactive time domain identification



Study under Control'Drive

… no «black box»



An exceptional software environment for a complete Model-Based Design workflow

Control' X

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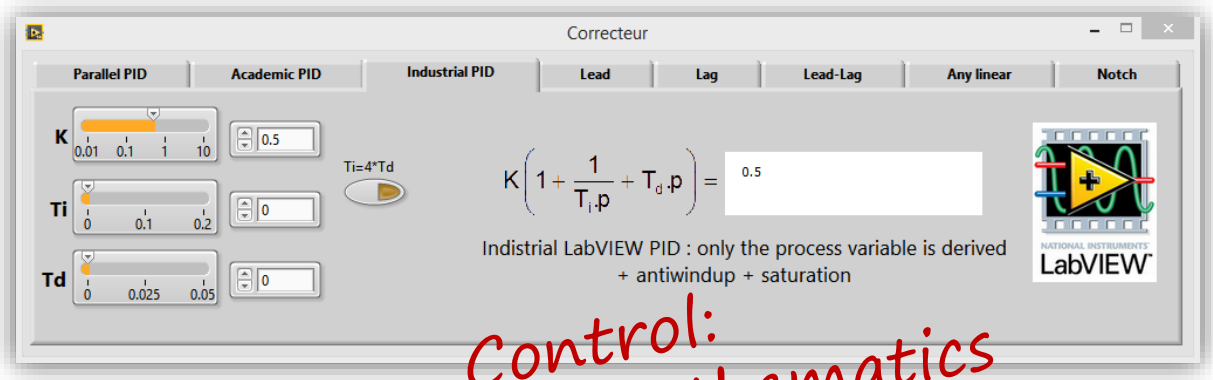
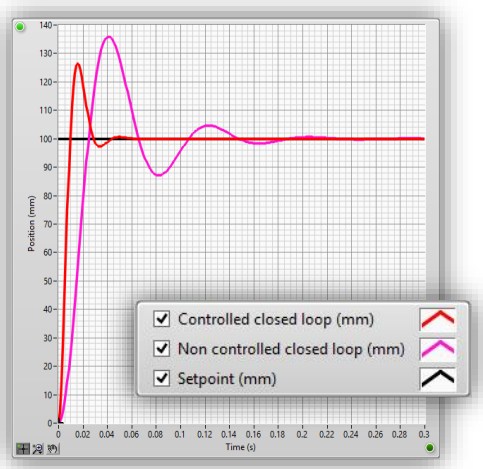
Wide range of controllers... For the simulation but also the control.
Transparent and instantaneous encoding and implementation on target

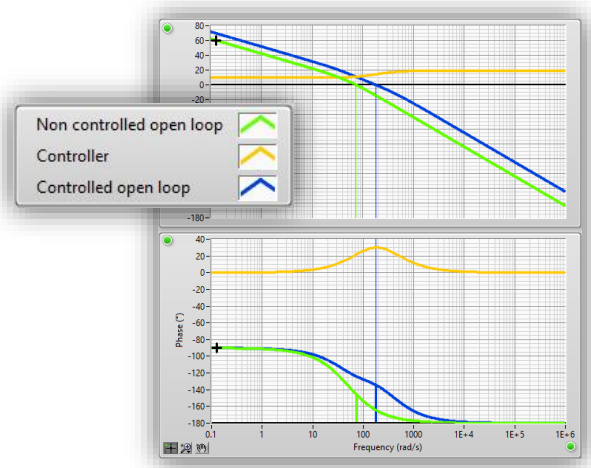


Control:
... not only mathematics

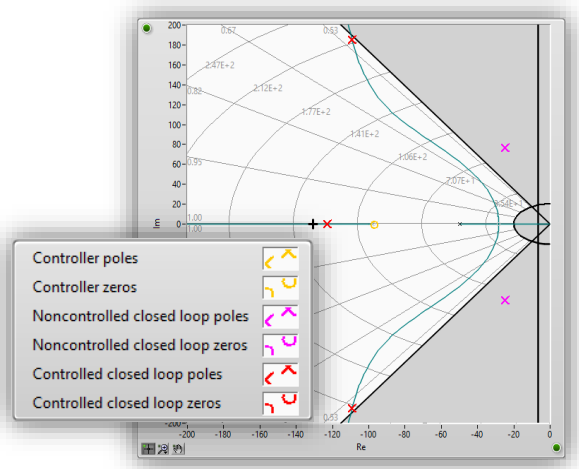
Time domain simulation



Frequency domain analysis



Poles zeros map analysis



All input-output relations in a few clicks

Control'X … not only control

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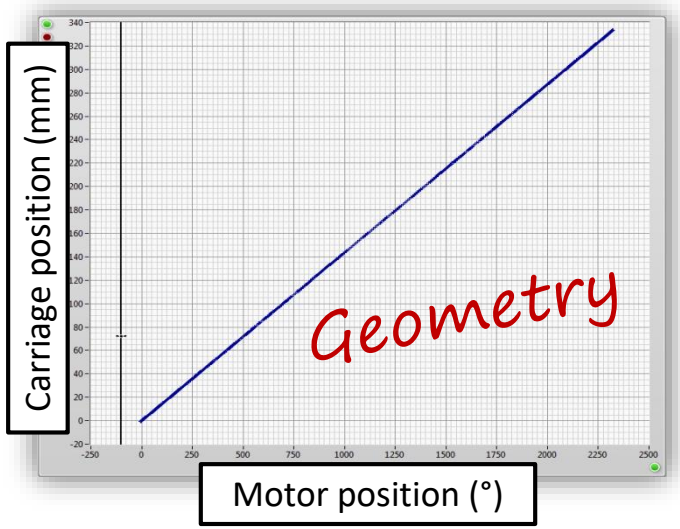
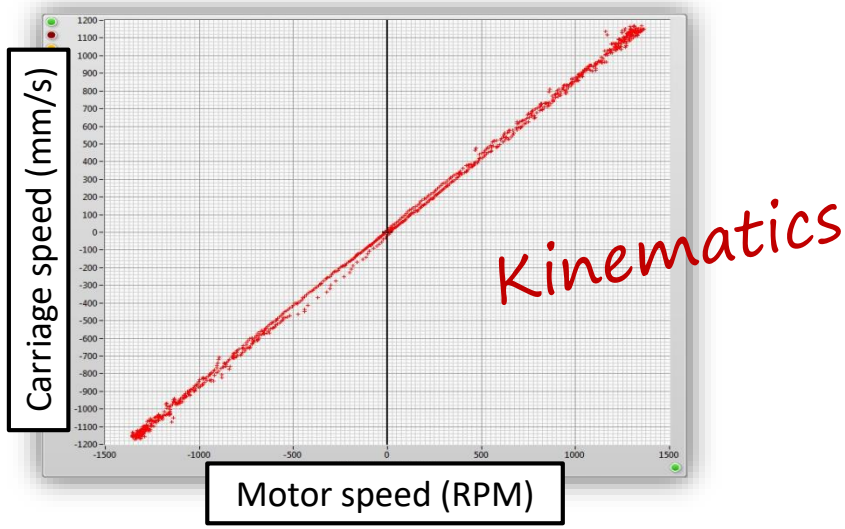
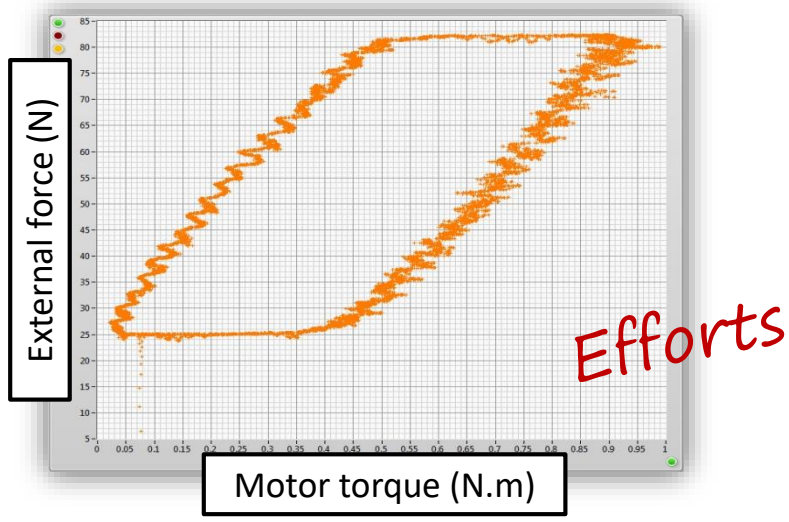
Control' X







Study under Control'Drive

Control'X... not only control

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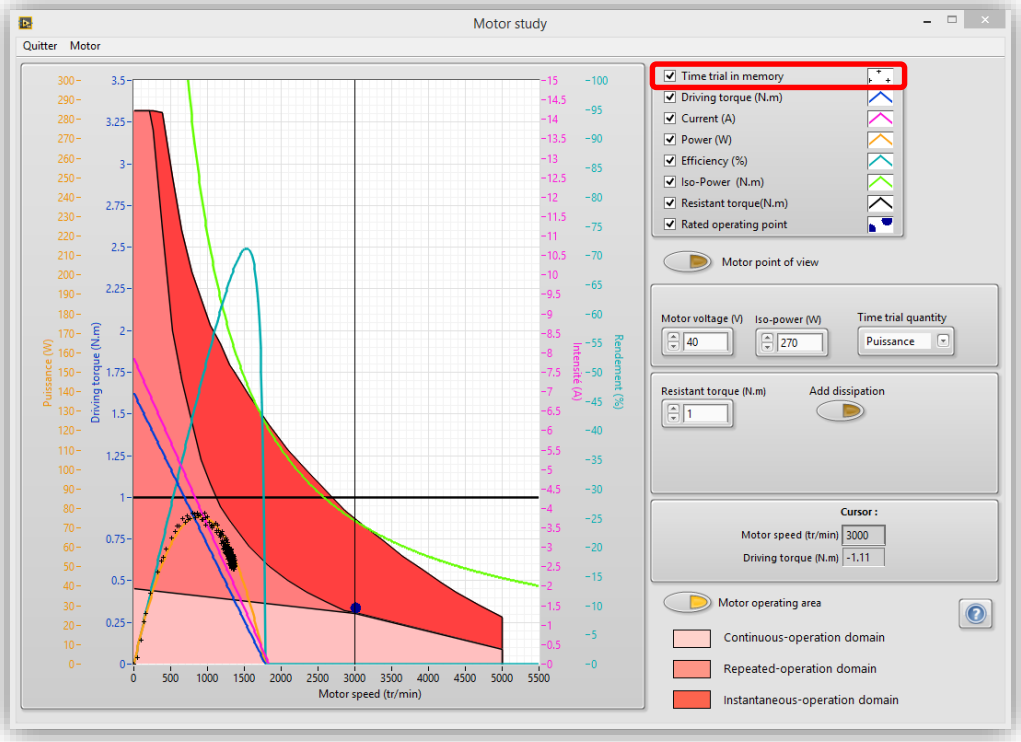
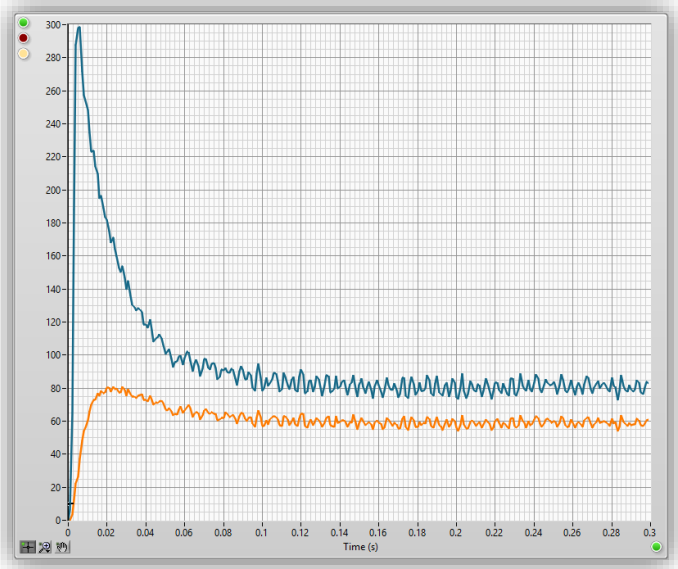
Control' X

Focus on what matters





Electrical power (W) and mechanical power (W) for a 10 V step response test in open loop

Complete characteristic curves of the motor

Driving torque, resistant torque, intensity, mechanical power, efficiency, iso-power...

Superimposed : the trace of the resulting actual behavior of a time trial (open or closed loop)

Study under Control'Drive

Control'X... not only control

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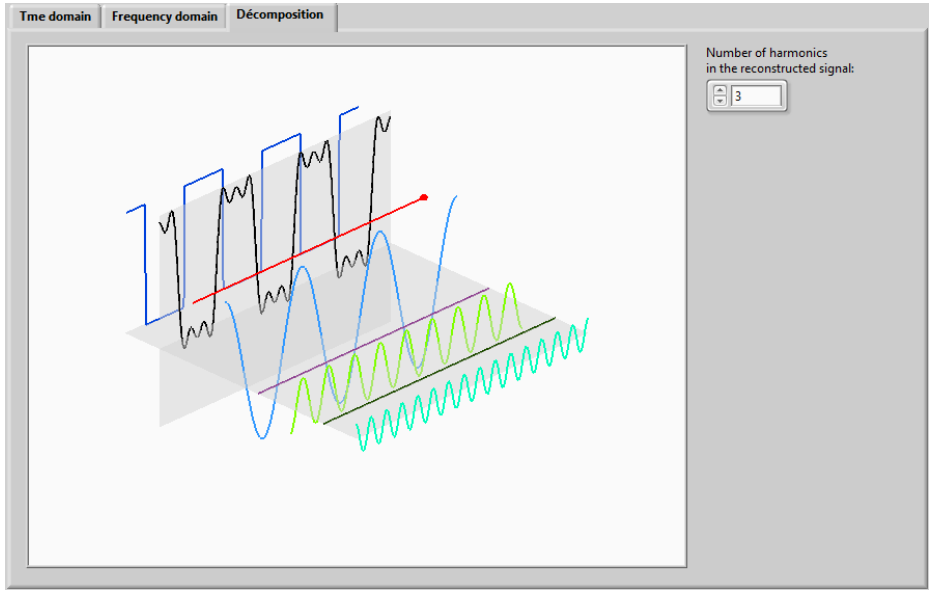
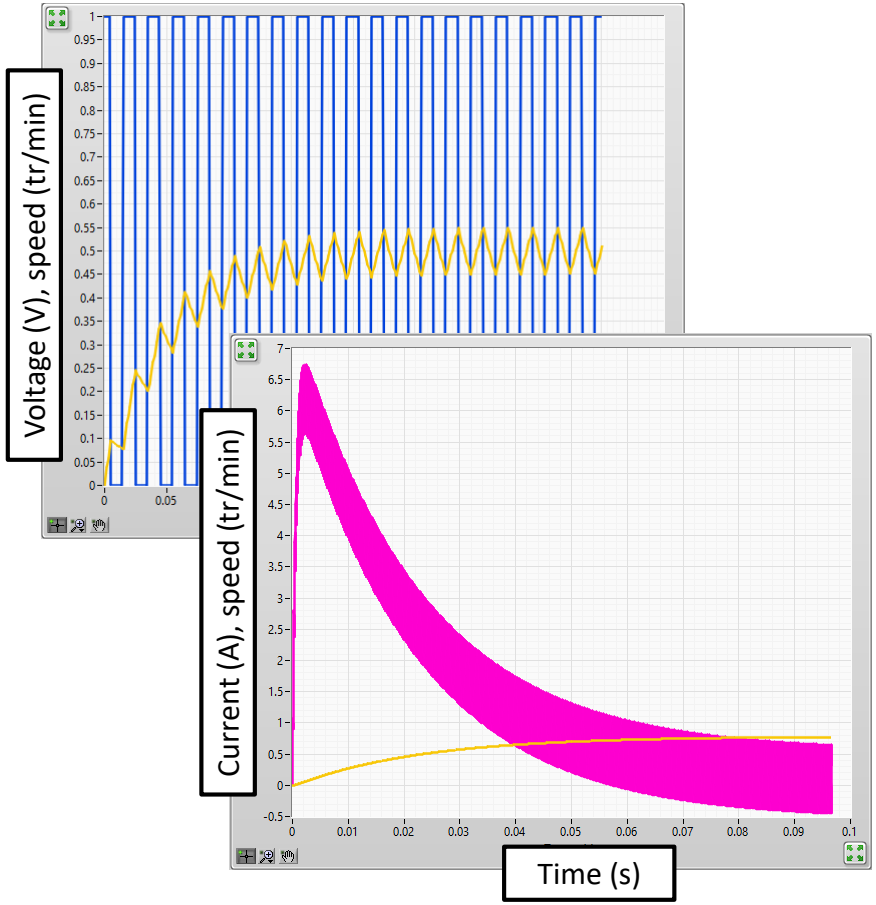
Control' X

All about PWM!



H-bridge effect: frequency and time analysis



H-bridge effect: influence of the PWM frequency on the speed and current ripple

Axis study under LabVIEW

...control on the fingertips

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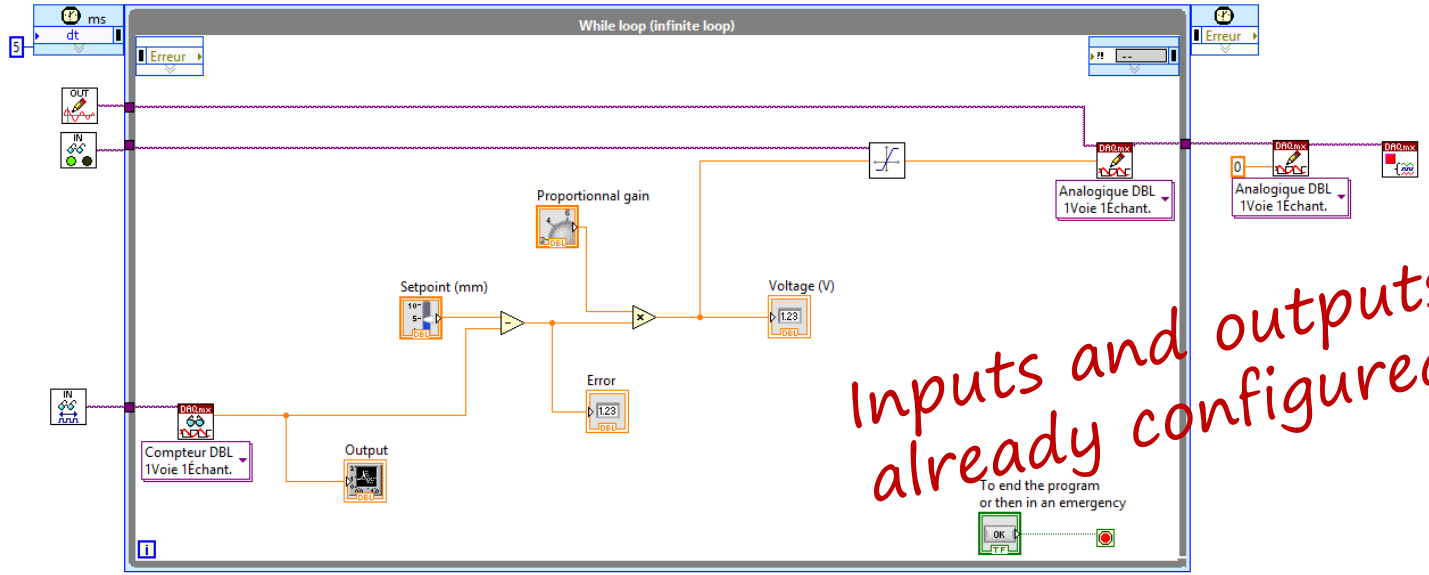
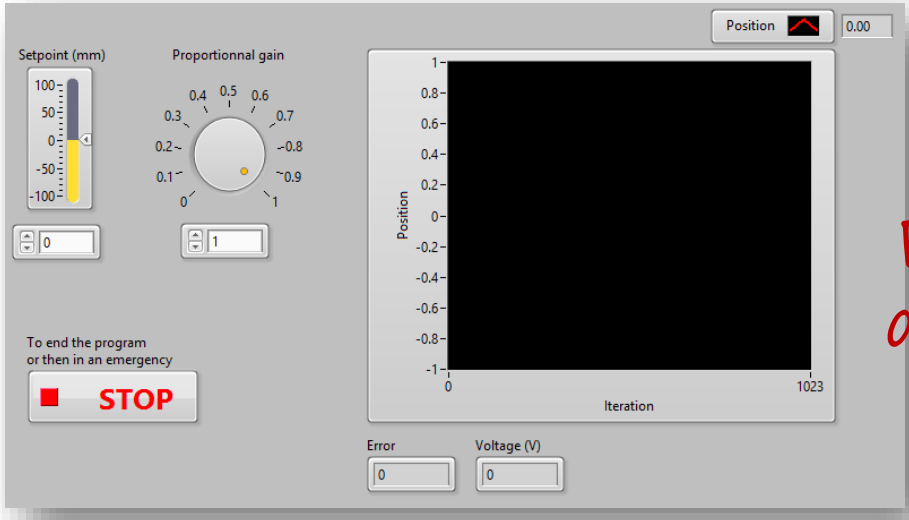
Control' X



Inputs and outputs already configured



Fully open architecture

Axis study under Matlab-Simulink

Hardware In the Loop in a few clicks

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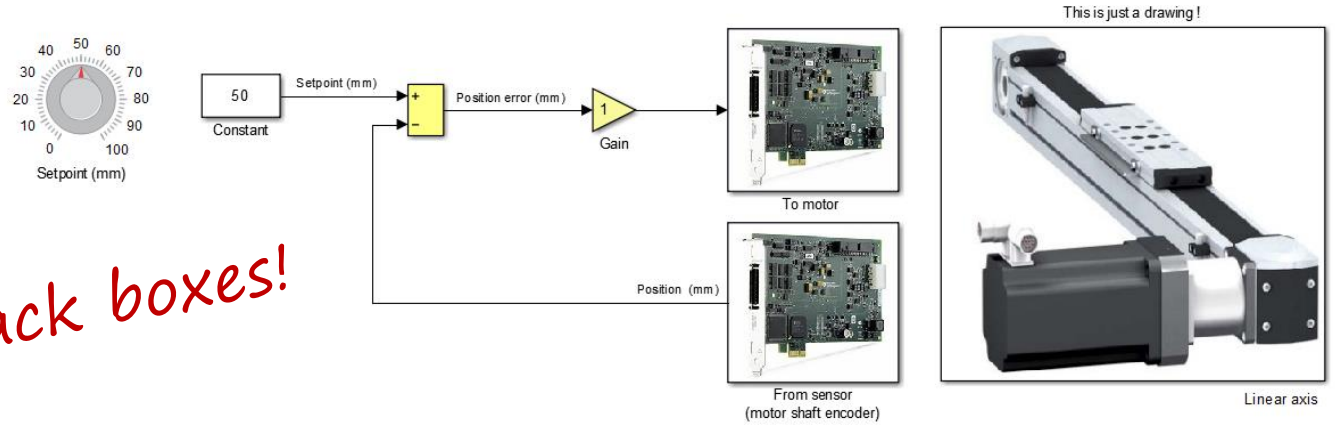
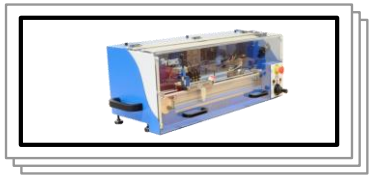
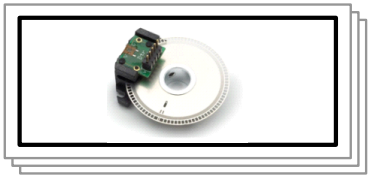
Control'X

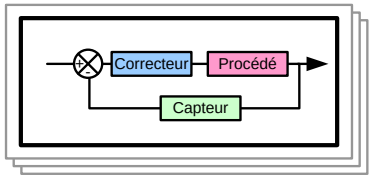


No black boxes!

Hardware in the loop simulation example, sampling frequency up to 20 kHz


From Control'X
(raw values from sensor)


From Control'X
(calibrated sensors)



Models


To Control'X

Custom library : drag and drop all sensors or motor voltage

Control:
... not only mathematics

Fully compatible with Matlab-Simulink

Hardware in the loop with sampling frequency up to 20 kHz

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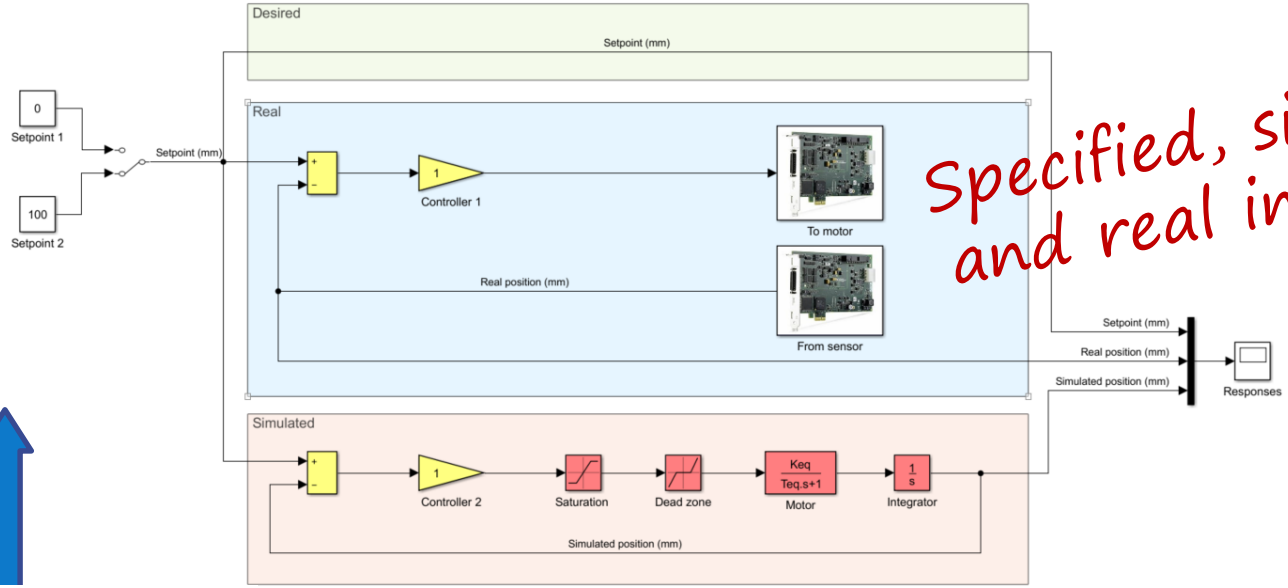
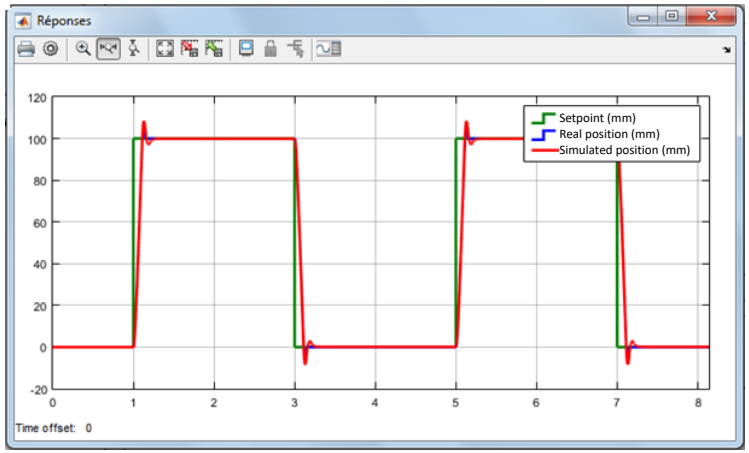
Control' X



Specified, simulated and real in parallel

Editing the blocks on the fly (model and controller)

Control



The axis at the service of your imagination…

Model-Based-Design in student's projects

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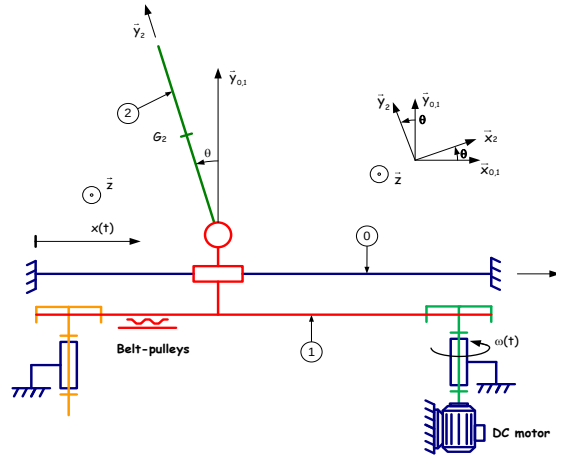
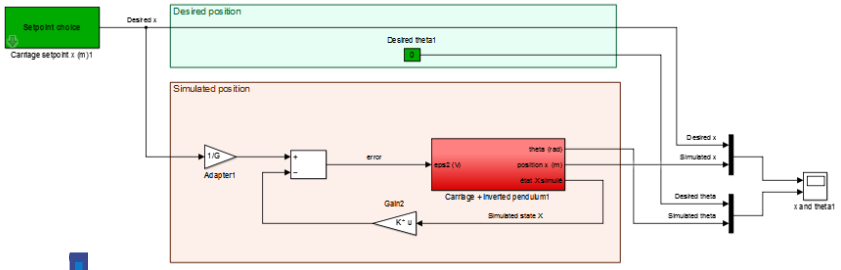
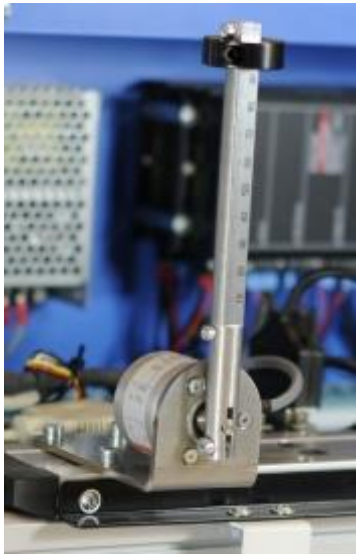
Control' X

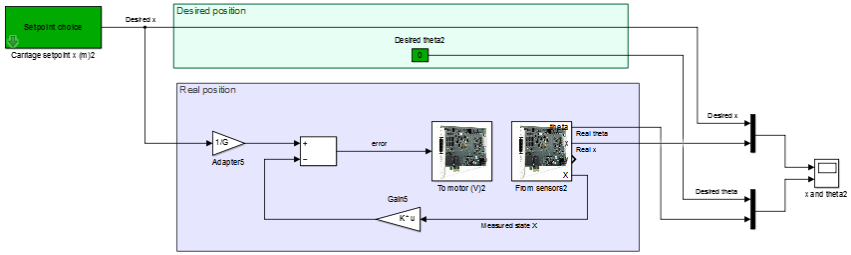
Specification → Modelling, validation → Simulation → Implementation → Control → Validation





The model (in red area) is replaced by the hardware (in blue area)





Example of inverted pendulum with LQR controller

The axis at the service of your imagination…

Headacheless Model-Based Design

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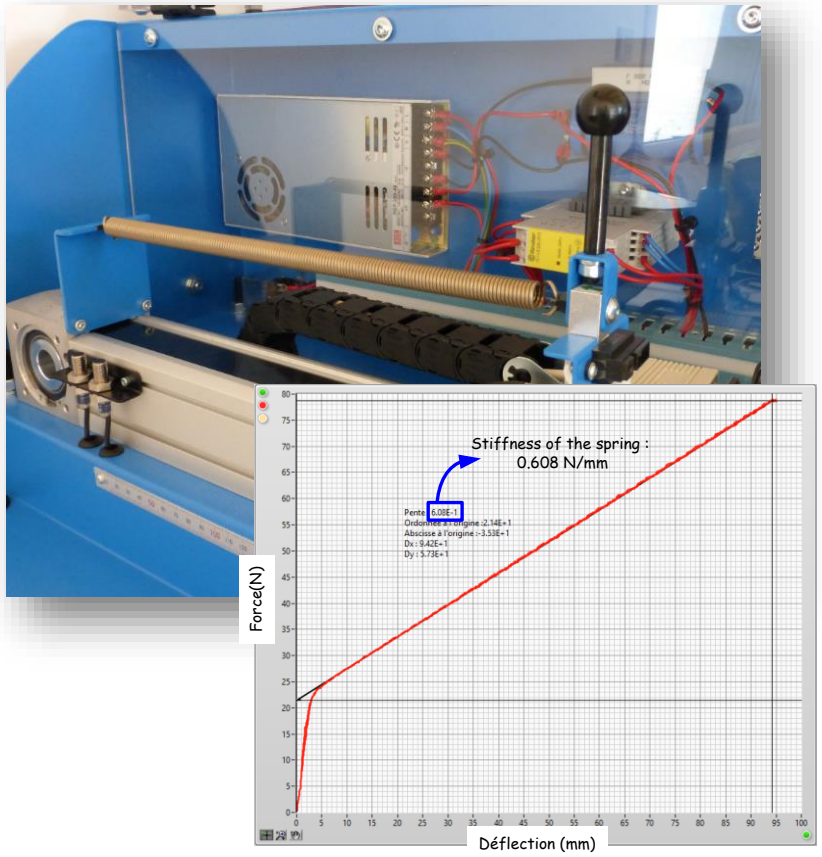
Control' X



Exemple on a prestressed spring of the tensile-testing machine

The V Cycle to prepare students for the tomorrow challenges

Simulate and control in a few clicks…

Fun projects to engage students in engineering

- Anti-ballant crane
- Inverted pendulum
- Tuned mass damper
- Haptic controller
- Collaborative robot
- Tensile-testing machine

…and much more

Control'X open to all challenges

The only limit: your imagination

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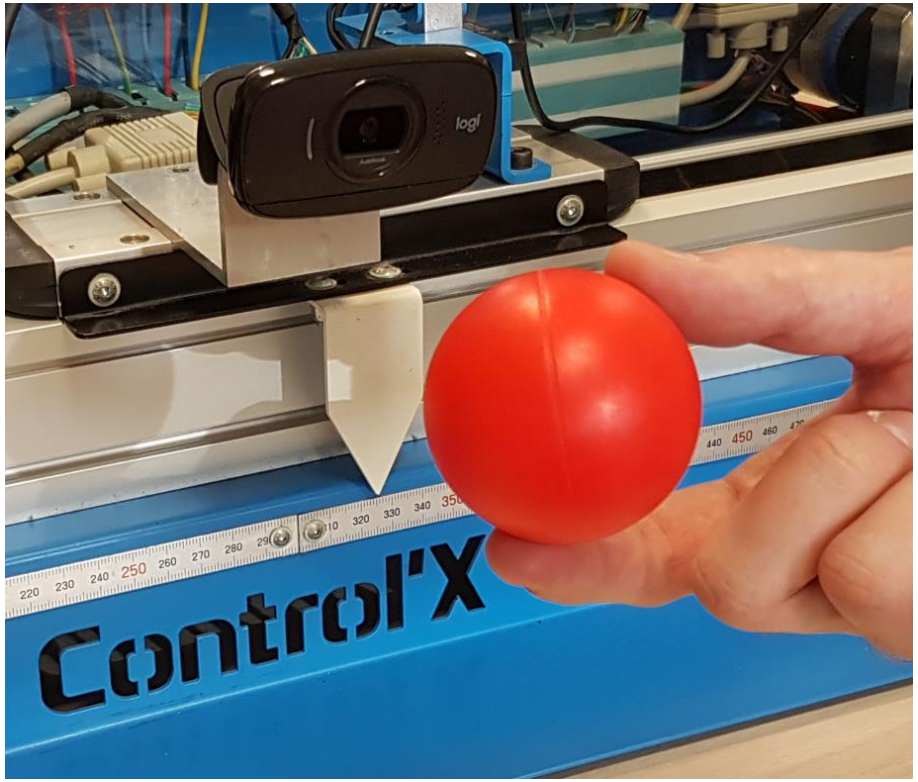

Target tracking by image analysis under Simulink

From college to university,
turn your students
in active learners

Training system perfectly designed
for project-based learning

Control' X

Control'X open to all challenges

The only limit: your imagination

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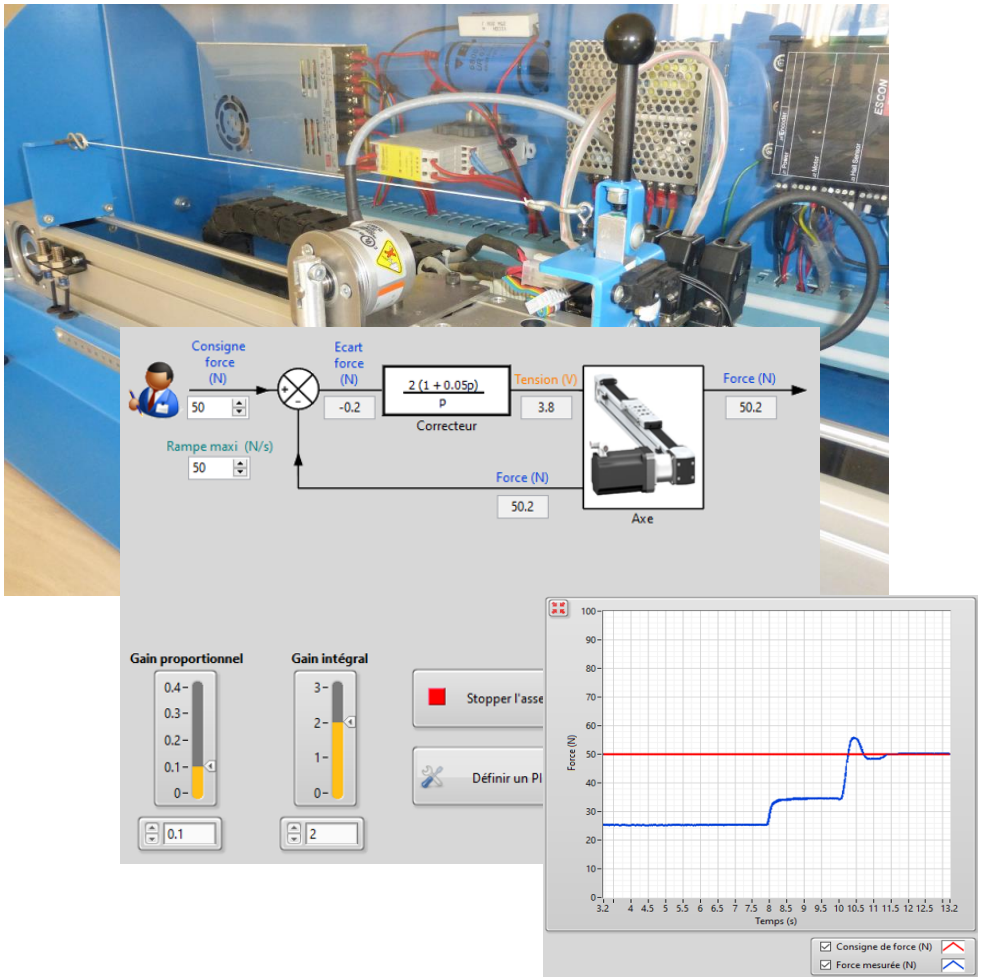
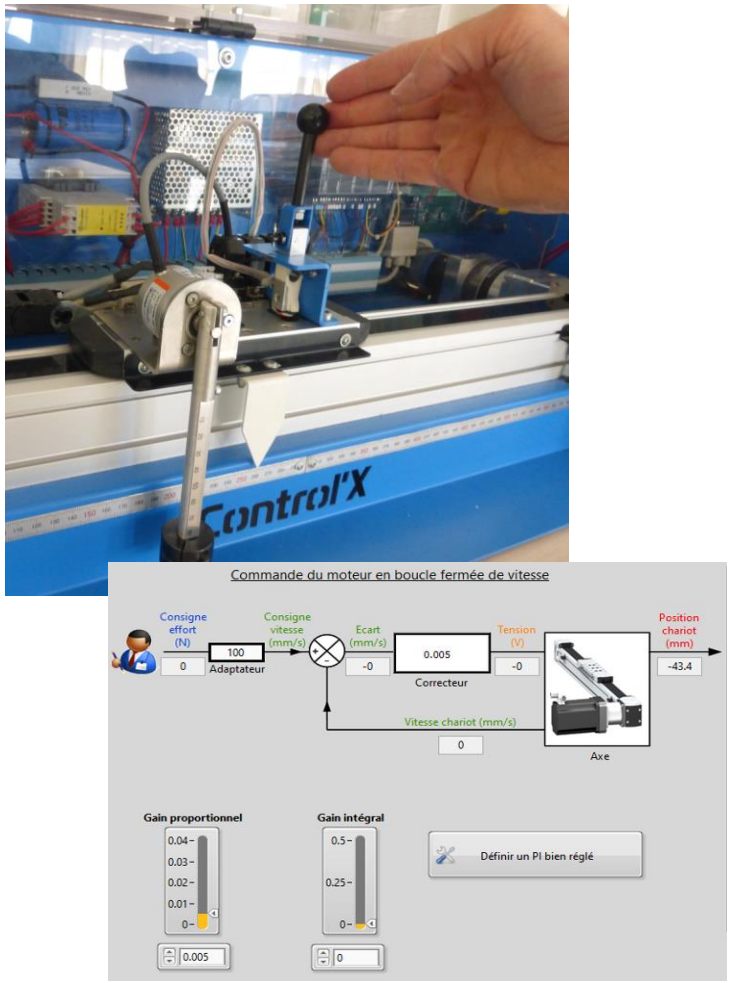


Tennis racket stringer



Collaborative robot

Control'X open to all challenges

The only limit: your imagination

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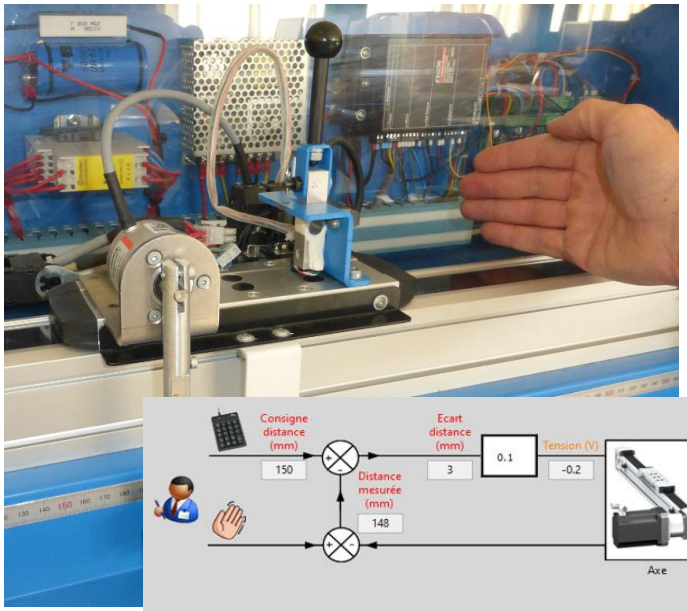
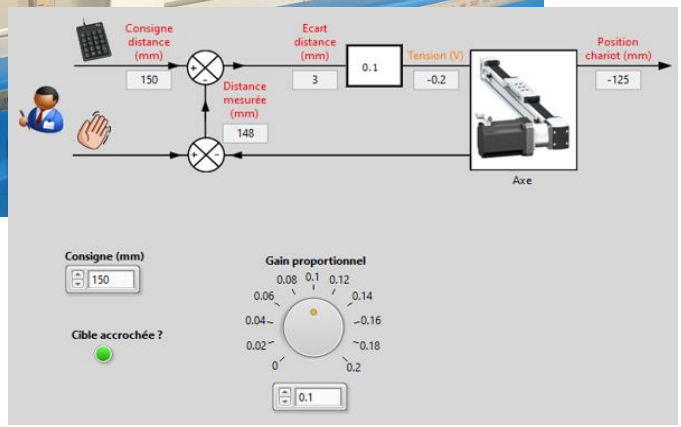
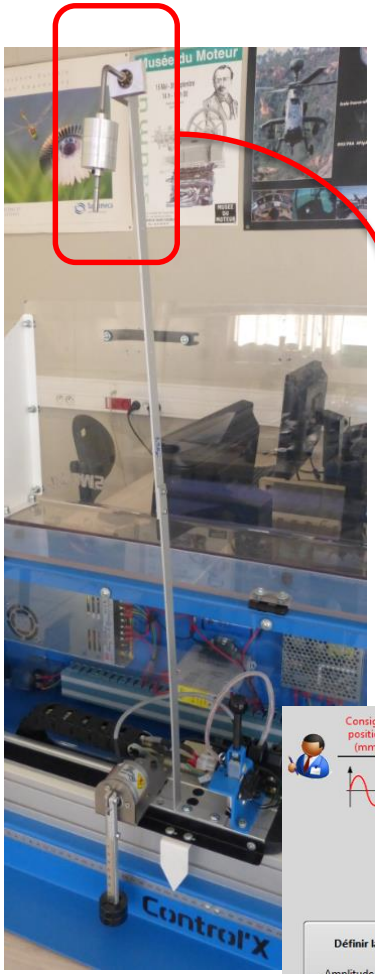
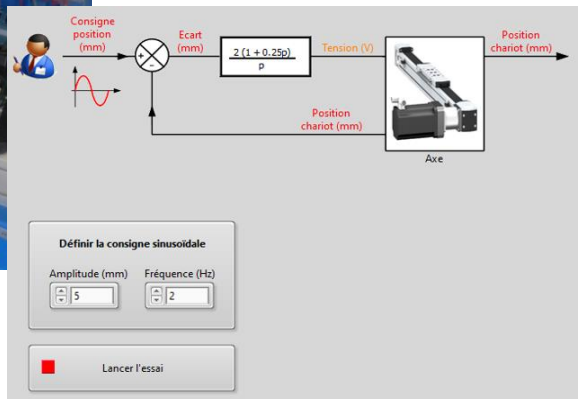




Anti-collision algorithm, adaptive regulator





Tuned mass Damper

Control'X at the service of your imagination

Simulate and then control your axis by StateCharts

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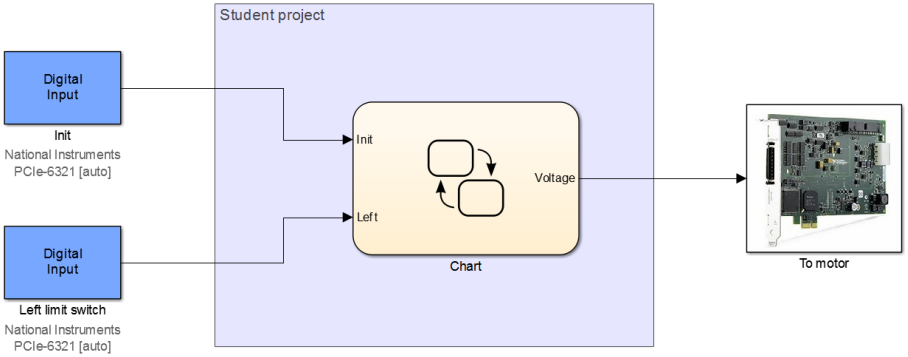
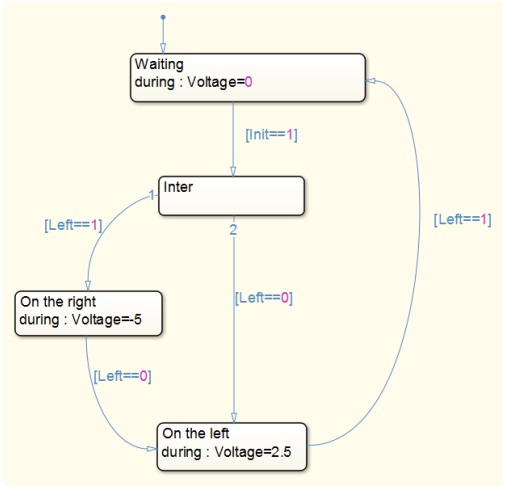
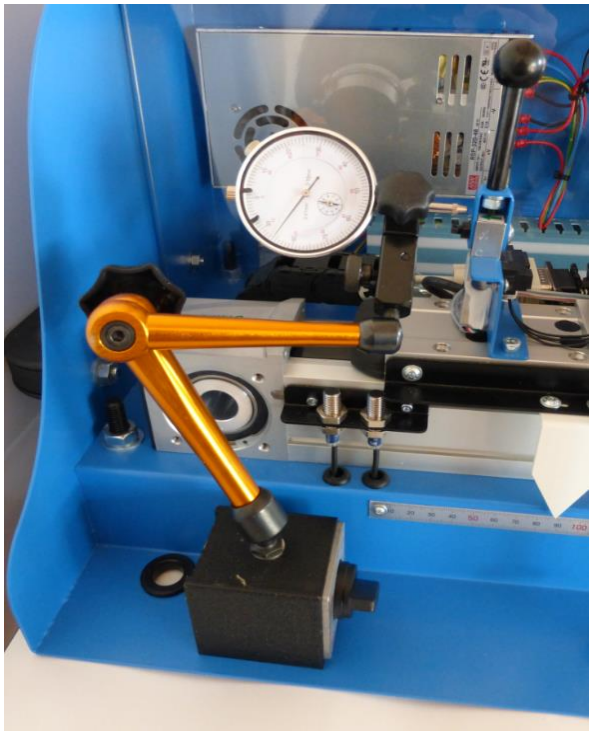
Control' X





The reset algorithm… in a few clicks



Study of the accuracy and repeatability of the reset algorithm

Artificial intelligence artificielle

Take the challenge!

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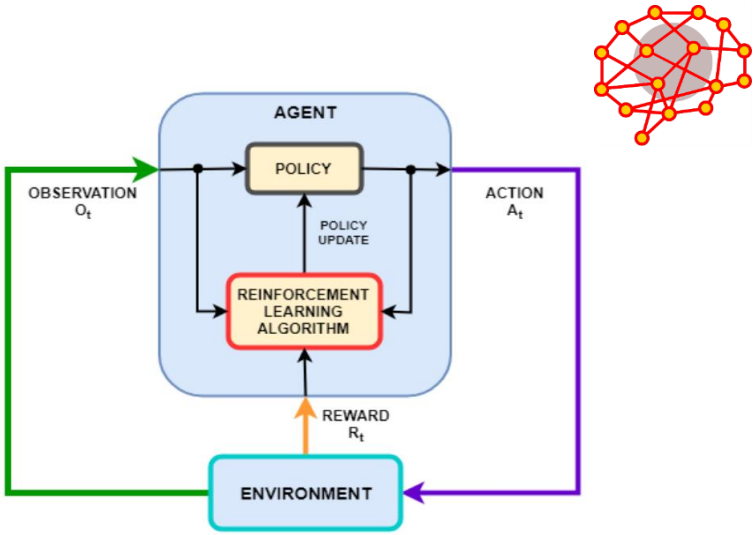
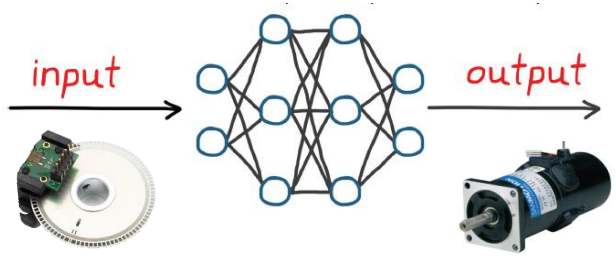
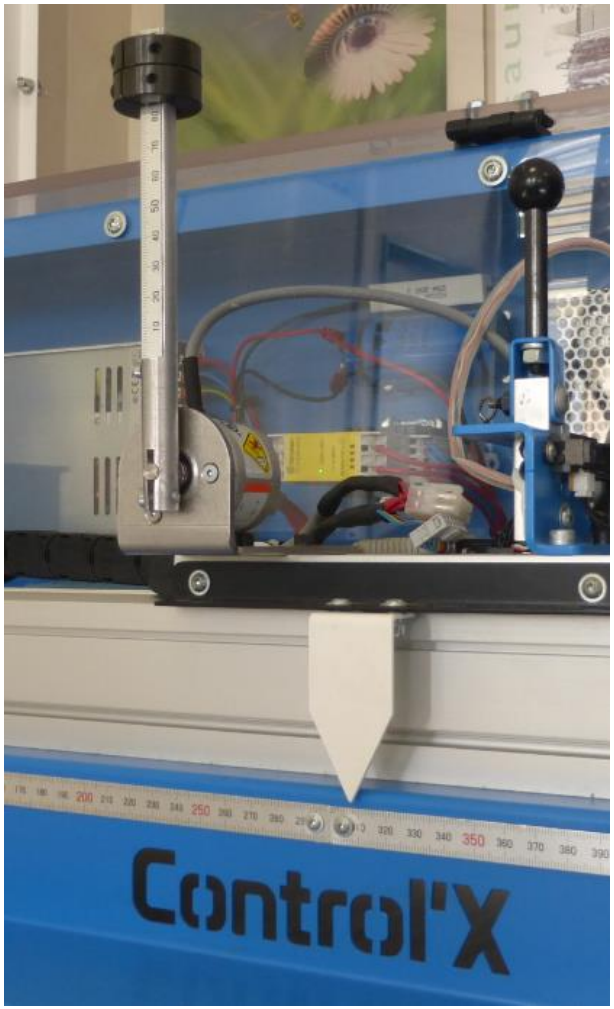
Control' X







Reinforcement learning: Control'X can learn from its mistakes: train it!

Artificial intelligence

… if you put your mind to it: everything is possible!

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Control' X

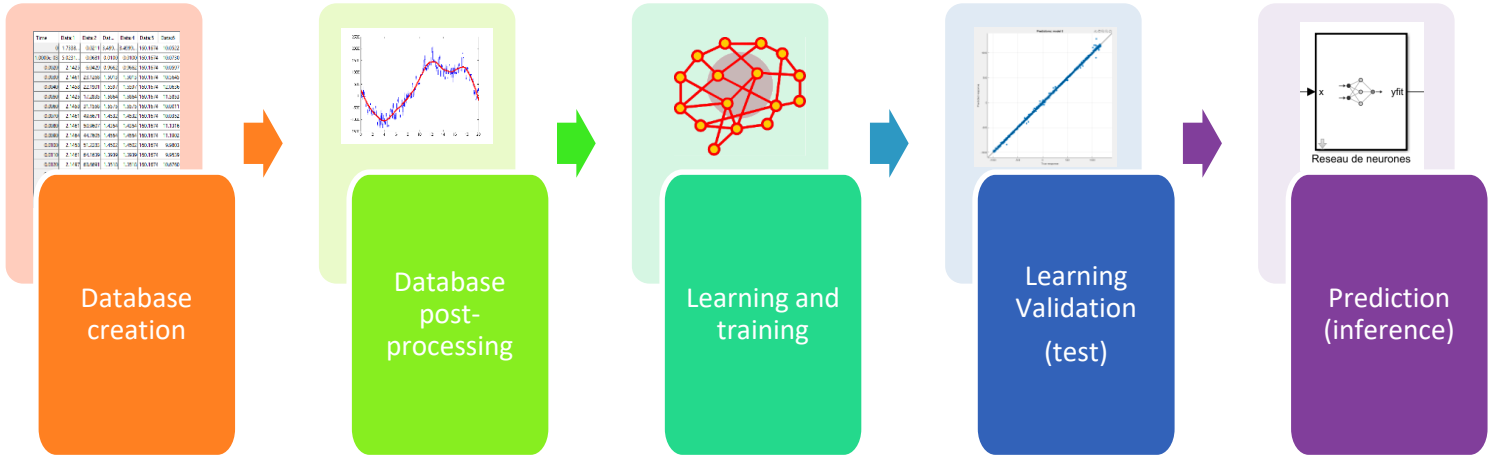
Delegate the work: compute a classical corrector thanks to an AI

Don't write any more equations: substitute an AI for a classic corrector

Bypass the modeling: replace all or part of a model with an AI

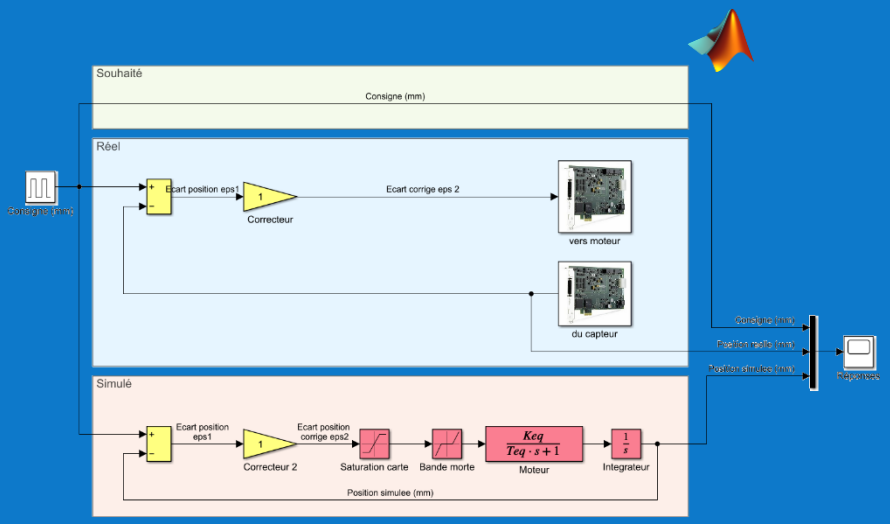
Simply specify: substitute an AI for any algorithm

Improve your perception of the world: integrate image analysis into your algorithms

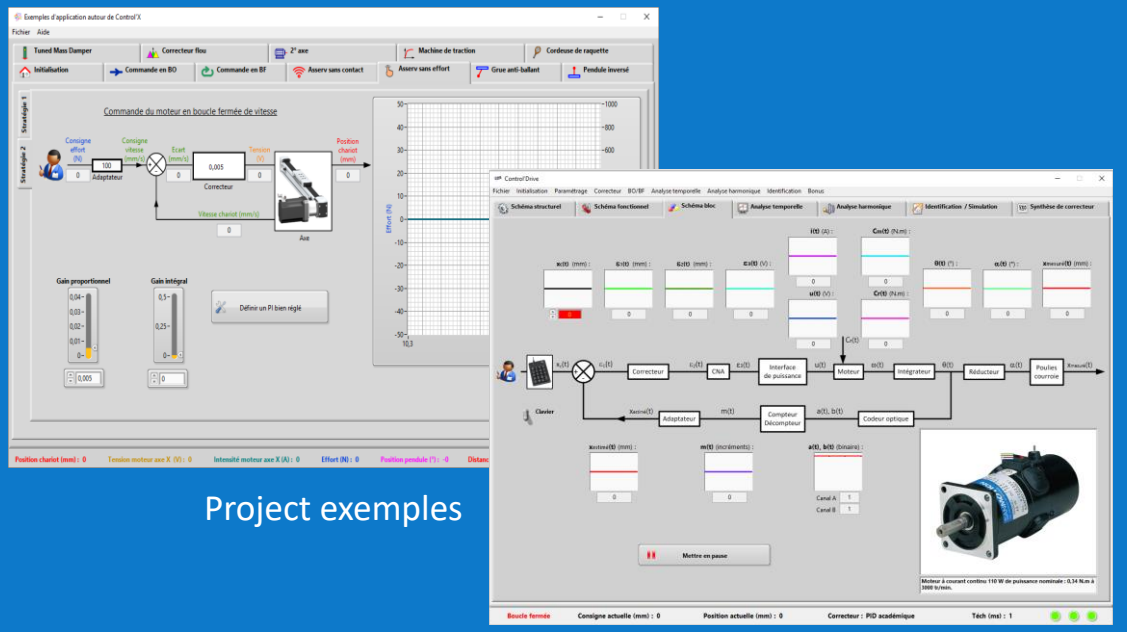


A complete workflow… in a few clics!

Control ’X complete software toolchain



Specified, simulated and real in parallel under Simulink



Project exemples

Control'Drive

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Advanced training system to illuminate control concepts