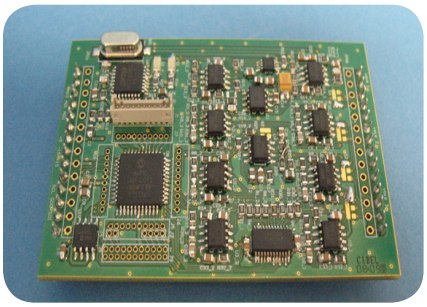
Microcontrollers for piezo-electric actuator applications.

Olivier SOSNICKI , Thomas PORCHEZ - CEDRAT TECHNOLOGIES.

CEDRAT TECHNOLOGIES is now promoting microcontroller-based solutions for controlling piezo-actuators. Microcontrollers provide powerful digital signal processing capability with reduced size and cost, allowing embedded applications to be targeted. The new UC45 board uses a microcontroller to provide fully-digital control of piezo-actuators at 10KHz. It features ADC and DAC with 16-bit resolution, for applications where high resolution is required, such as ultra-precise positioning.

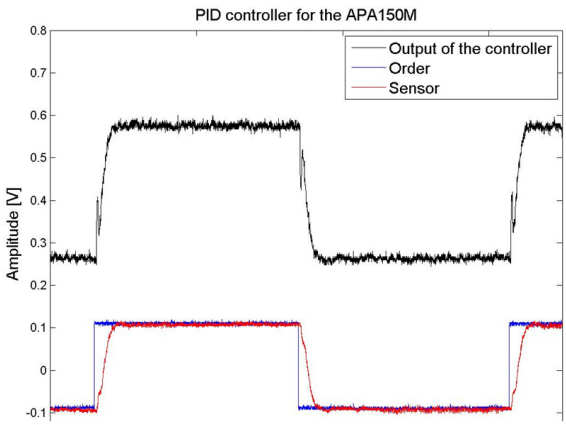
The UC45 aims to replace the SC75 analogous controller for traditional actuator control; it has the same size and is pin-to-pin equivalent. This means that it can be mounted directly inside CEDRAT TECHNOLOGIES drivers for piezo-actuators. It includes a digital PID controller followed by a digital filtering cell. The type of output filtering cell can be changed, notch of order 2, notch of order 4, low-pass of order 2, or a double notch of order 2 for multi-mode controlling. Simply connect the UC45 to the USB port of a computer, and all the control parameters can be modified online using an easy Labview® interface.
Once the parameters are set, it can be disconnected from the computer and it will run autonomously, keeping the control parameters even after reboot. Thanks to the multi-channel ADC and DAC converters, multi-channel control is possible, and up to three control channels are available.
Because it is digitally processed, the UC45 can be adapted to a broad range of other control situations without hardware modifications. Thus, it can be adapted to specific actuators requiring a particular control scheme or a hybrid controller, such as the Stepping Piezo Actuator (SPA). Thanks to numerical control, this new linear piezoelectric motor (see ***http://www.cedrat-groupe.com/en/technologies/actuators/piezo-motors-electronics.html***) is able of nano positioning on a several-milimeters stroke."



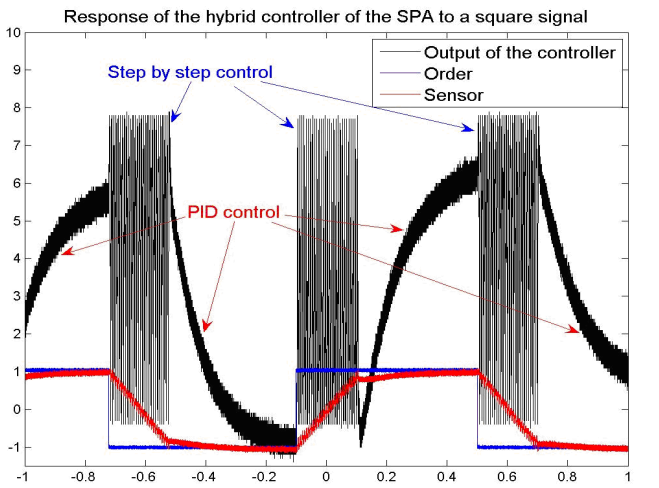
UC45 digital controller for piezo-electric actuators.

References	Unit	UC45
Function		Microcontroller-based digital controller
Supply voltage	Vdc	-15/15/5
Max. number of control channels		3 per board
Sampling time	µs	100µs
Frequency	KHz	10KHz
A/D converters		4 channels 16 bits @ +/- 10V + optional 5 channels 12 bits @ 0-5V
D/A converters		2 channels 16 bits @ +/- 10V
Filter cell @ [minimum cut-off frequency; maximum cut-off frequency]	Hz	2nd order Low-pass filter @ [50 2000]Hz 2nd order stop-band filter @ [150 2000]Hz Two 2nd order stop-band filter in serial independently tuneable @ [150 2000]Hz 4th order stop-band filter @ [150 2000]Hz No filter
Computer interface		USB
Size	mm	50 x 70
Weight	Kg	0.05

Technical specifications of the UC45 board.



PID control of the APA150M.



Digital hybrid control for the Stepping Piezo Actuator.