A new concept – proactive regulator

By Octavian Capatina

Abstract: The paper present one idea about the next step after the adaptive regulator to come. It is a prediction, no more. The idea was workout on the last phase of the CONMEC project postponed by National Research Agency , in the frame of CEEX program.

Keywords: future, concept, controller

As part of the CONMEC thematic which approached a new line of research and development thorough models and modeling brought into attention the decrease in life of the development cycle of a complex electronic programmable product by ten times. It does not exist a "universal" formula for mathematical modeling or experimental identification, iteration method and verification and re-verifications is the method which is used in every modeling case with real and practical purposes. Determining the model through experimental identification is the only solution which is considered outside the classroom and laboratory and into the real world works which is more complex, sophisticated, non-linear, not ideal or truncated. By analyzing the modeling problem and that of the models I have proposed an axiom, in fact a truism: „*a single process multiple models*", multiple models, depending on the used modeling modality. It was used the „philosophy of designing and testing complex programmable electronic products based on virtual models", in particular designing process regulators. There were defined and delimited the programmable electronic product, our regulator, from the process that has to be adjusted. It was defined the process simulation, through mathematical models, the necessity of a hard interface with the product and it was defined "the simulator" as a hard-soft product, an ensemble: mathematical model, hard interface animated by a real time soft. I have defined as product, the simulator, in action/function as an emulator; because it emulates a process, an installation, a machine, a device, etc. The emulation can be realized by a hybrid - part virtual, part real. The programmable electronic product, which is to be tested, has in front the physical inputs from certain sensors; the product "emits" signals (obviously real) acquired by the real inputs of certain actuators which are virtual.

These process inputs (real signal from the testing product) reach virtually in the mathematical model, model which considers and modifies its command towards real outputs from the simulator/emulator, outputs which reflects the real process behavior, but in the way it was encrypted in the model (outputs that will be the input of the tested product). There were described tools which concur to this approach put into order by Mathwork and dSpace and an interaction module. By studying different structures of adaptive regulators based on modern algorithms and imagining new technological implementations, it was developed a **new concept**: PROACTIVE REGULATORS, which would represent the next step in the field of process regulators. It is the step after the adaptive regulators, in real times. By adding data about the adaptive regulators and collaborating with the microelectronics fields developments (DSP, FPGA, ASIC) and the development in the numerical algorithms field- we can anticipate the apparition of a new class of regulators which can be named proactive in order to highlight their main characteristic. The proactive regulators will be based **on process model**, on data regarding the medium and also, current data within the medium and process and they will pre-synthesize the command or will anticipate the regulation control.

So the changes due to significant noises, which appear in the process outputs from the functioning area, and because of the strong non-linearity, can be anticipated. The pre-synthesized command will suffer minor corrections in the current regulation step, depending on concrete data.

Biliography

Octavian Capatina CONMEC etapa 4, Algoritmi evoluati de control in structura sistemelor mecatronice