# A Modelica Library for Industrial Control Systems

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In many simulation studies, control plays a relevant role. Sometimes this is because the study is precisely aimed at setting up the control system for the plant at hand, but in many other situations, even if control synthesis is not the main goal of the study, the behaviour itself of the modelled object depends significantly on the operation of some controls. As such, quite often the representation of the control system deserves substantially the same accuracy as the representation of the physical plant (in the broad sense of the term).

At present, numerous Modelica libraries are available to represent plants with a virtually arbitrarily accuracy, but the same is not true – at least, to the best of the authors' knowledge – for controllers. To appreciate that, the interested reader could for example throw a glance at the PID block as provided by any control environment, be it targeted to a PLC, a DCS, or whatever. Apparently, such blocks are more articulated than for example the PID of the Modelica Standard Library (MSL)—as by the way real-life control systems do exhibit a number of peculiarities that are not accounted for in "textbook" representation, see e.g. [1].

The remarks just made are in no sense meant to be a criticism, it is worth stating; nonetheless they evidence that for the simple controller representations of the MSL (or analogous ones) to be adequate, some conditions are necessary. Summarising, and sticking to the PID example,

- the specific form of the controller (let alone the detailed operation of the control algorithm) must not be relevant for the problem,
- and the operation of typical elements of industrial controllers, such as tracking and locks, must not be of concern either.

If this is the case, MSL-like representations are perfectly adequate. If on the contrary either this is not the case in the simulation *scenarii* to be considered, or one wants to describe the control system so as to be capable of simulating the controlled plant in its entire set of operating modes, the same representations cannot serve the desired purpose.

For the reasons above, and after several years during which the authors and their group have been developing *ad hoc* solutions for individual cases, the decision was recently taken to put all of that knowledge and Modelica code together in a structured manner.

## References

[1] F.G. Shinskey. Process control: as tought versus as practiced. *Industrial & Engineering Chemistry Research*, 41(16):3745–3750, 2002.