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Building the foundations of mechatronic and robotic systems for SOLEIL II automation

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The SOLEIL multidisciplinary environment involves a broad variety of scientific techniques, methods and instruments. This diversity claims a wider perspective in the design of the control system and automation, moving beyond collection of single-loop (axis-based) controllers to manage complex system(s) with multiple interdependent variables and axis to control. To address this challenge, SOLEIL has begun integrating new technical "bricks" or modular components in both software and hardware and advanced control design methodologies into its process automation framework.
Examples of these "bricks" include, robotic arms used to automate common synchrotron tasks such as detector positioning and sample handling [1], a TANGO device developed for configurable image processing. Indeed, this device allows the implementation of sequences of classic image processing algorithms and Deep Neural Network (DNN) models can be included in the sequence. These two bricks enable automatic sample positioning and self-centring of the sample.
On the other hand, SOLEIL is adopting a control engineering-approach: including model-based design, estimation (sensor fusion), simulation and visualization. Using this approach one application has been prototyped, which is the synchronization between the monochromator and insertion device, and some additional laboratory applications are currently under development. Thus, this poster summarizes some of the results of these developments and implementations.

Footnotes

[1] Abiven, Y. M.,et al (2021). SOLEIL'S Process Automation Improvement Using Industrial Robots. Synchrotron Radiation News, 34(4), 10–17. https://doi.org/10.1080/08940886.2021.1968268

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