IMET2AL

Genomic Model Predictive Control Tools for Evolutionary Plants

Duration	Start date	Total budget	Funding
16 months	January 2014	312.500 €	182.228 €

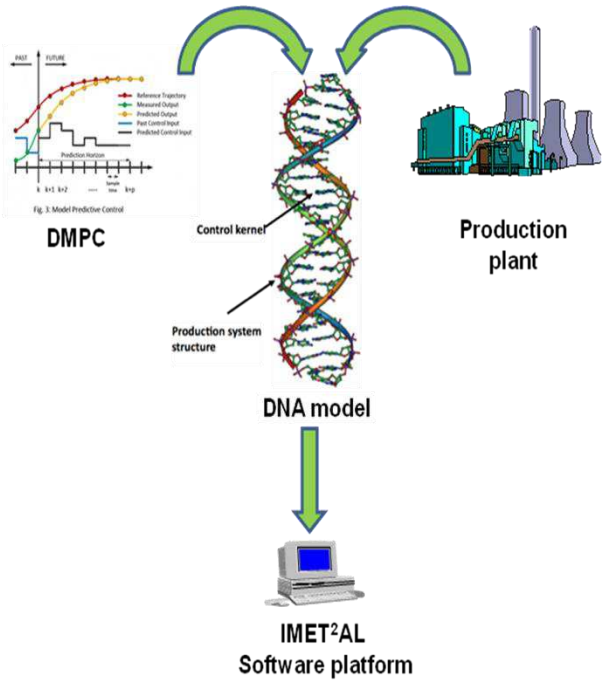
Scientific/Industrial objective

The project proposes a **genomic Model Predictive Control (MPC) based software prototype tool** that supports industrial engineers to study and design control system configurations for automated factory production systems characterized by a **fast evolutionary behavior**.

The obtained control solutions are optimized on the base of key performance indexes like flow production, peak of the absorbed electrical power and the total energy consumed by the plant and they are able to impress to the production system the desired functional behavior.

Ideas and solutions

- The tool is structured in two layers. At the lower layer, **distributed MPC algorithms** control individual equipment of the factory production system. At the upper layer an **MPC coordinator** takes full advantage of the most recent advances in hybrid control theory, dynamic programming, mixed-integer optimization, and game theory.
- Sharing and development among project partners of knowledge on **advanced model predictive control** techniques, and their application to manufacturing industrial plants. These methodologies are not yet widely used in manufacturing and enable the manufacturing industry to new scenarios characterized by **optimized and highly efficient** performance.
- Development of a **prototype software platform tool** to support industrial production system engineers in designing the plant automation system so as to characterize the whole automated factory production system according to its **evolutionary behavior**.



Follow up

- Further progress with respect to the state of the art can be expected for what concerns **flexible control kernels execution**, whose range of application will probably extend well beyond the scope of the project. The execution and communication environment to be developed in the project can profitably be adopted whenever **flexible, configurable, and platform-independent** deployment of real-time and best-effort software modules is needed, within the context of a complex industrial plant.

- The benefits brought by the IMET2AL project has been **demonstrated by means of specific tests** carried out on a hybrid simulation model of a re-manufacturing plant, for what concerns the upper level of the prototype software platform. Regarding the lower level, a specific operating machine (automated reworking machine) belonging to a re-manufacturing plant has been considered and then modelled in order to test the control kernels.

- Virtualization techniques are already very common in office automation and data centers. In the context of the IMET2AL project, the ability to host and execute control kernels within virtual machines allows the designer to think about the control system in terms of its high-level features and functions, rather than how they will be practically deployed and realized at run time. In turn, project outcomes will likely further **facilitate the adoption of virtualization techniques** for industrial control applications.

Partnership

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