# – CODECSYS –
# Contract-Based Design of Cyber-Physical Systems

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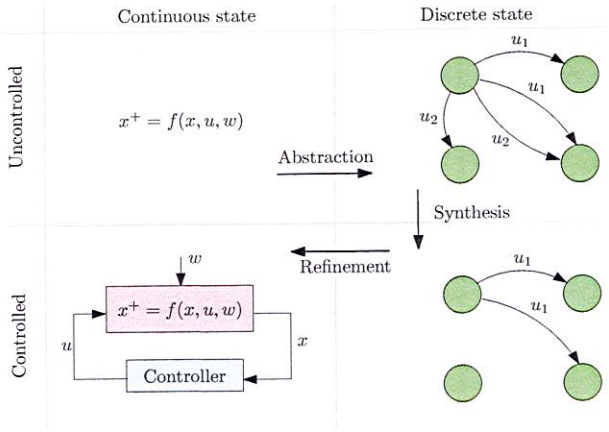
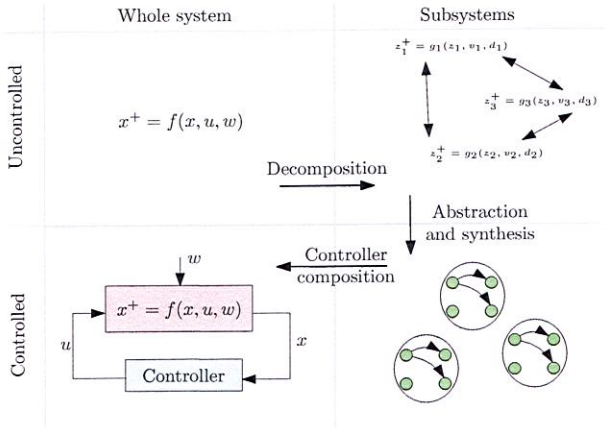
# Abstraction-based controller synthesis*,**




* *Approximately bisimilar symbolic models for incrementally stable switched systems*, Girard, Pola and Tabuada, TAC 2010

** *Finite controlled invariants for sampled switched systems*, Fribourg, Khüne and Soulat, FMSD 2014

# Compositional abstraction-based synthesis*,**




* *Safety control with performance guarantees of cooperative systems using compositional abstractions*, Meyer, Girard and Witrant, ADHS 2015

** *Game-based synthesis of distributed controllers for sampled switched systems*, Fribourg, Khüne and Markey, SynCoP 2015

## Compositional abstraction-based controller synthesis

- Decomposition of various specifications into parametric contracts :
  - Safety, reachability, stability, etc. ;
  - Relation to control-theoretic approaches (small-gain theorems*).
- Algorithms for controller synthesis under assume/guarantee contracts
  - Suitable abstractions of components :
    - under contract assumptions ;
    - and architectural constraints (e.g. information flow, shared resources).
- Case studies : intelligent building, cooperative autonomous vehicles, etc.

* *On compositional symbolic controller synthesis inspired by small-gain theorems*, Dallal and Tabuada, CDC 2015

## Partnership

The project members gather the necessary expertises in systems & control, specifications and formal methods :

- Laboratoire des Signaux et Systèmes (L2S)
  - Antoine Girard (PI, DR CNRS)
    *Hybrid systems, interface control/computer science*
  - Luca Greco (MCF U. Paris Sud)
    *Resource aware control, stochastic hybrid systems*
  - Mohammad Al Khatib (2nd year PhD Student)
    *Stability analysis of embedded control systems under timing contracts*
- Laboratoire de Spécification et Vérification (LSV)
  - Laurent Fribourg (DR CNRS)
    *Formal methods, hybrid systems*

## Requested support

- PhD thesis : *Compositional controller synthesis for hybrid systems*
  - Supervisors : A. Girard, L. Fribourg
  - Host research team : L2S
- Postdoctoral position (2 years) : *Parametric contracts for CPS design*
  - Supervisor : A. Girard
  - Host research team : L2S
- Postdoctoral position (1 year) : *Robustness in contract-based design of CPS*
  - Supervisors : L Fribourg, A. Girard
  - Host research team : LSV
- Postdoctoral position (1 year) : *Implementation and scheduling of controllers*
  - Supervisors : A. Girard, L. Greco
  - Host research team : L2S
  - *Partial funding by L2S (6 months, 24 kEuros)*
- Operating costs (60 kEuros) : *conferences, travels, computers, workshop, etc.*