Method and tools for safe and secure cyber-physical systems

VALIDATION

- Verification, validation, certification
- Model checking
- Abstract interpretation
- Decision procedures
- Automated proofs
- Interactive proofs
- Security
- Detection of vulnerabilities
- Side-channel attack detection
- Quantitative properties, timing analysis, performance evaluation
- Run-time verification, monitoring
- Automatic testing

MODELING

- Language: modeling, programming, and specification
- Synchronous and asynchronous
- Efficient simulation, virtual prototyping
- Functional and extra-functional properties
- Discrete, continuous
- High-level design
- Model-driven implementation
- Mixed criticality
- Compilation
- Scheduling, optimization, synthesis
- Distributed algorithms, self-stabilization
- Reconfigurable systems
- Implementation on multi-core architectures, distributed systems

DESIGN and IMPLEMENTATION

- STATOR: ERC project on static analysis of programs, lead by David Monniaux (2013-2017)
- Argosim: start-up company developing the requirements-analysis tool Stimulus (2013)
- Turing award to Joseph Sifakis, shared with Ed Clarke and Alan Emerson (2007)
- Scade/Lustre: industrial development environment for critical embedded software, used worldwide (commercialized by Ansys)

MAIN TOOLS

- SpaceEX: analysis tool for systems combining continuous and discrete semantics
- BIP: component-based design framework
- Lustre toolbox
- VPL: certifying library of polyhedral operations

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