Virtual Prototyping of Automotive Systems: Towards Multi-level Design Space Exploration

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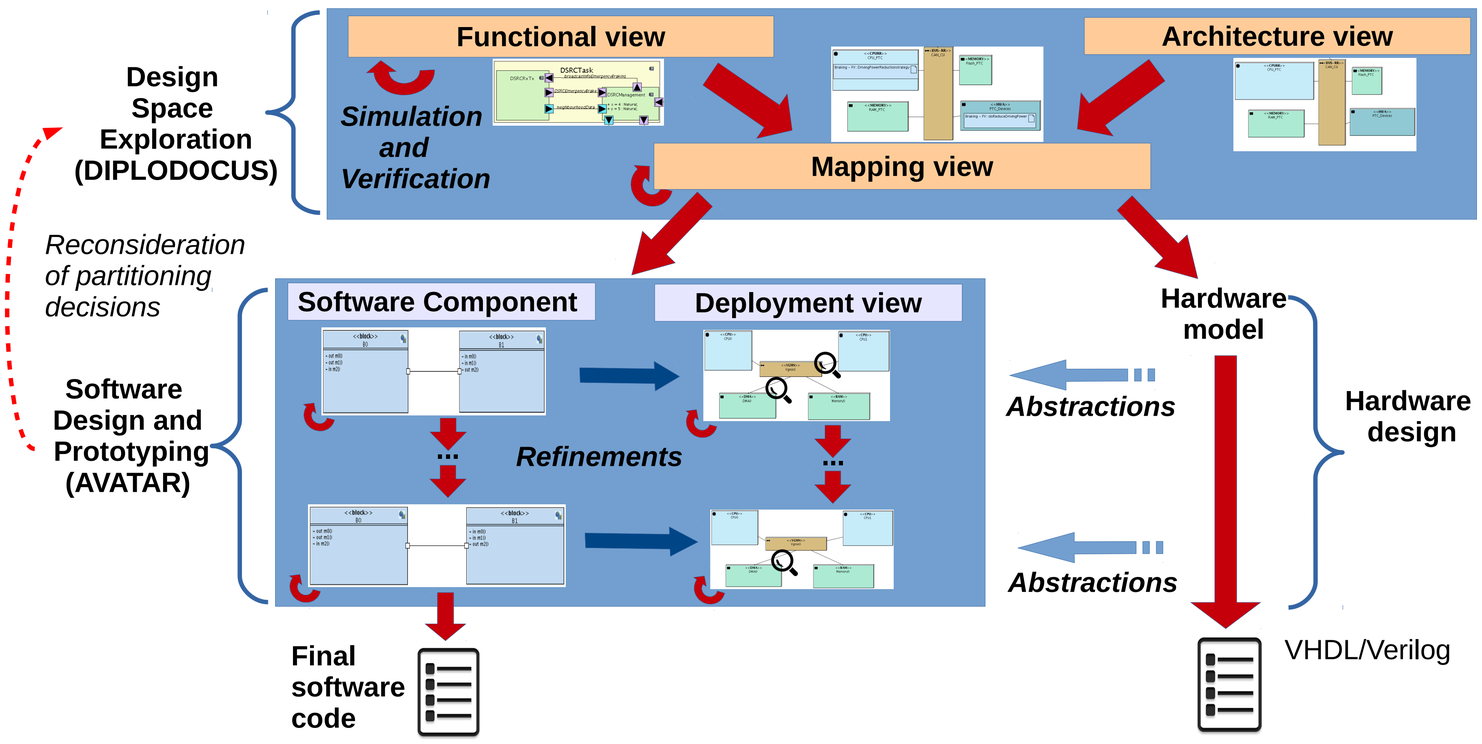
Methodology

- Design Space Exploration integrated with software development
- Supporting toolkit TTool
- Formal verification and simulation at the push of a button

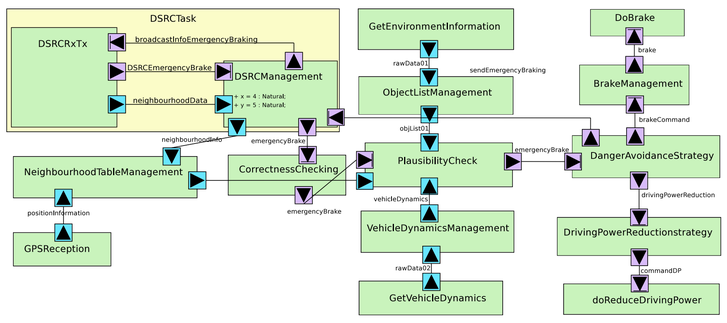
[1]D. Knorreck, L. Apvrille, and R. Pacalet. Formal System-level Design Space Exploration. Concurrency and Computation: Practice and Experience, 25(2): 250–264, 2013.

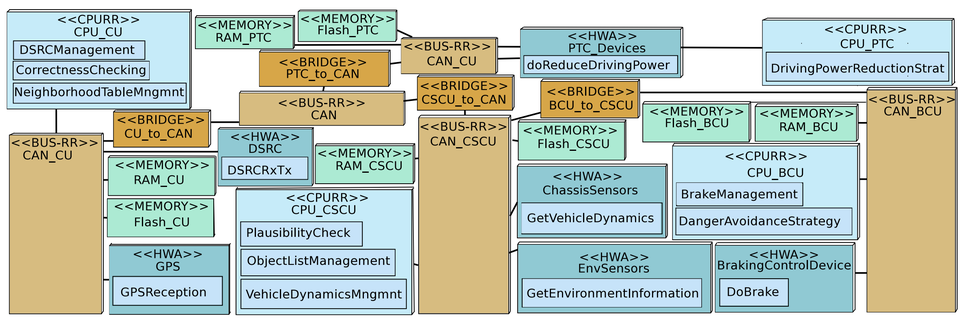
[2]D. Genius and L. Apvrille. Virtual yet precise prototyping: An automotive case study. In ERTSS'2016, Toulouse, Jan. 2016.



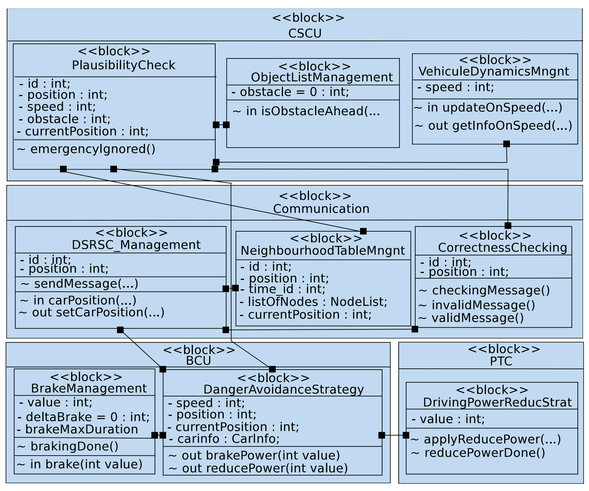
Automatic Braking Model

Design Space Exploration: Modeling of function and architecture separately

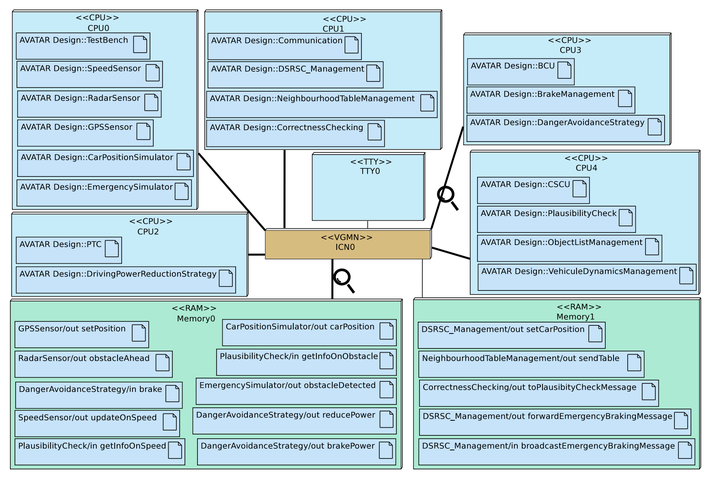




Software Design: SysML Block Diagrams with support for automatic conversion to formal verification, simulation, and C language

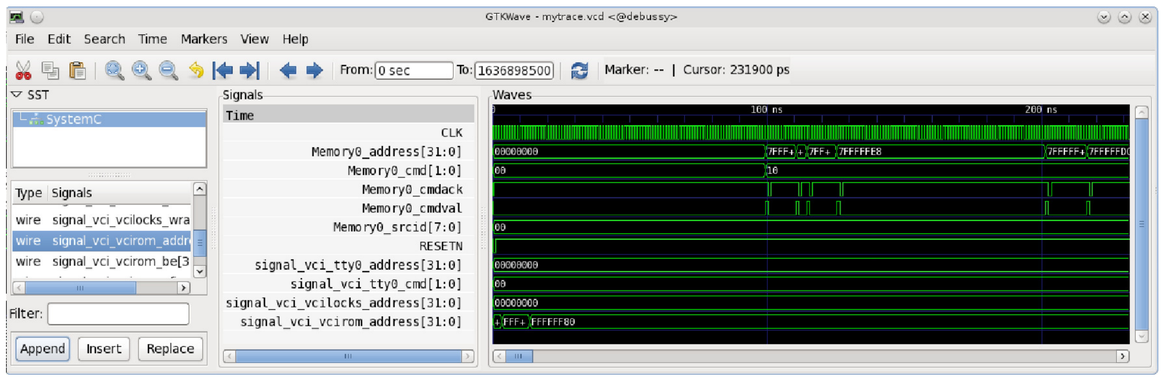


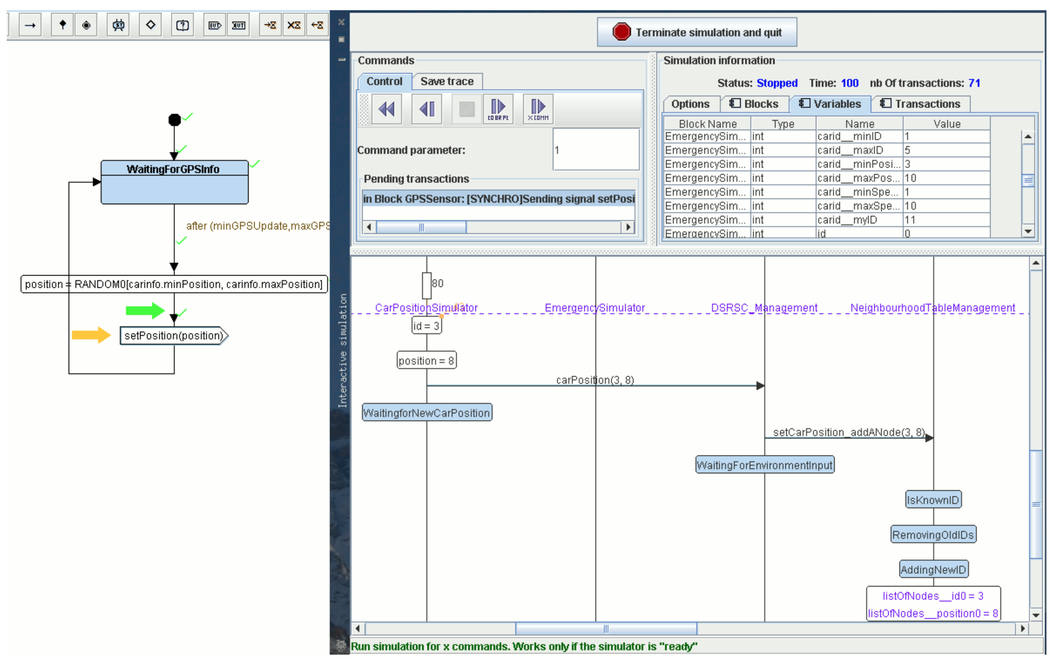
Prototyping: Software model on destination platform with AVATAR deployment diagram



Cycle-Accurate Simulation at Prototyping Level

- An **executable implementation** of the application is **automatically generated** for rapid prototyping on a cycle accurate bit-accurate simulator of the real hardware (SoCLib)
- Memory allocation indicated in the Deployment Diagram
- Data-block addresses automatically calculated





Conclusion

- Integration of system-level design space exploration and prototyping in the same toolkit
- Push-button approach to verification and simulation
- Deployment diagram : (in)validation of partitioning choices

Future Work

- Detailed performance profiles (cache misses, buffer fill state etc.) can be determined
- Full Design Space Exploration, with automatically suggested modifications

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