



Design of Automotive Systems with Uncertainties

Institut für
Computertechnik

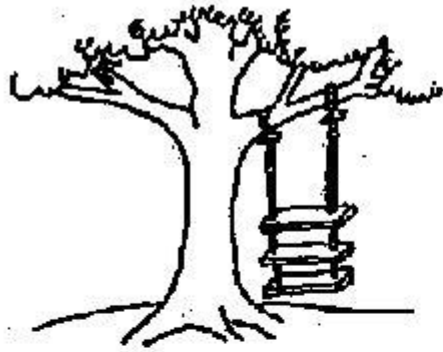
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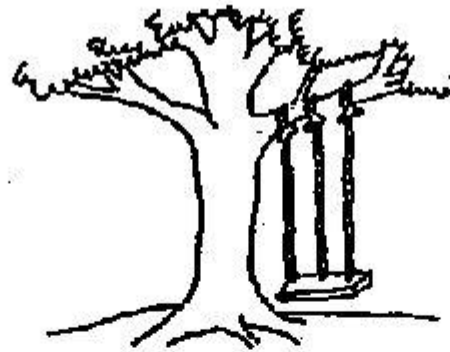
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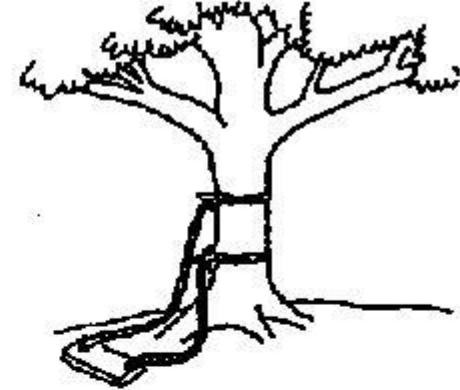
AutoSUN: Why we need more accurate communication of specifications



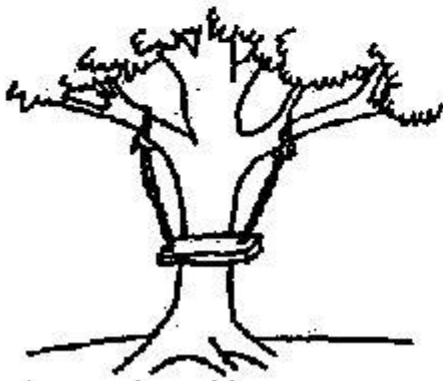
As proposed by the project sponsor.



As specified in the project request.



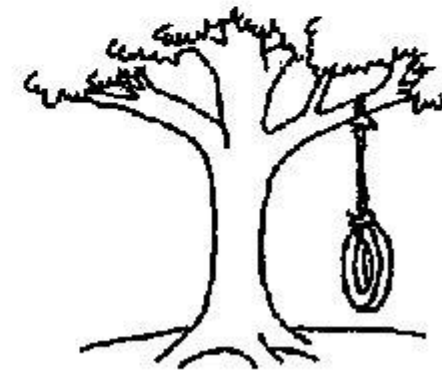
As designed by the senior analyst.



As produced by the programmers.



As installed at the user's site.



What the user wanted.

Communication of specifications

■ Good/best practice today

- Executable specification, virtual prototype
 - e.g. using Matlab or SystemC
- **Only** covers **functional** behavior

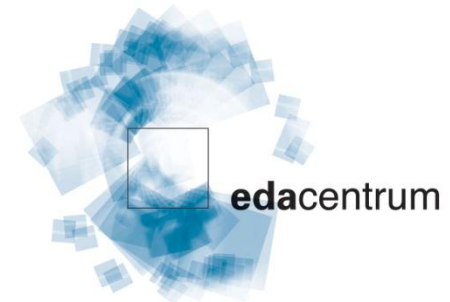
■ Open issues

- Specification of „**deviations**“ of all kind
- Analog functionality interwoven with HW/SW systems not possible with Matlab or SystemC

Deviations from „ideal“ behavior

Communication of specification in V diagram between different tiers

- **Variations** – deviations process variations, drift, ...
- **Uncertainties** – not covered by (formal) model, difference „reality“ – model/specification
- **Tolerances** – specifies allowed deviations and uncertainties



- German BMBF funded project
Design of Automotive Systems with Uncertainties
- Companies:
Continental Automotive, Daimler, Infineon, ZMD
- Subcontractors:
Fraunhofer IIS/EAS Dresden, TU Wien, Uni Hannover

Work packages AutoSUN

- SystemC AMS based executable specification
- Methods for verification of executable spec, virtual prototype
- Common development of specification under consideration of IP protection

- SystemC AMS extensions
 - + ability to model deviations by e.g. Monte Carlo/Corner Case simulation
- Presentation: Karsten Einwich / FhG-IIS

More systematic verification approaches

- Presentation Achim Graupner, ZMD
- TU Wien, Uni Hannover
 - Formally show that implementation is subset of all possible simulation runs
 - Approach: Semi-symbolic simulation with Affine Arithmetic

(e.g. Grimm, Heupke, Waldschmidt, “Refinement of Mixed-Signal Systems with SystemC”, *DATE '03*)