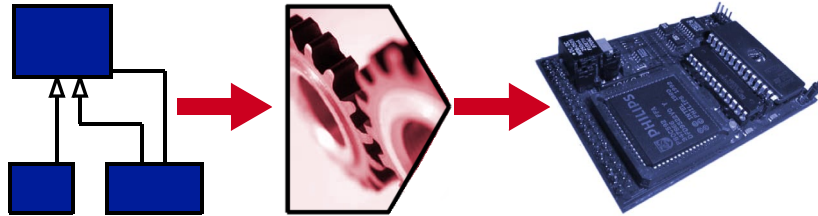


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# Requirements Engineering by Generator-Based Prototyping



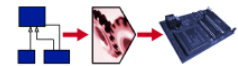
**Andreas Metzger**

(Subproject D1)

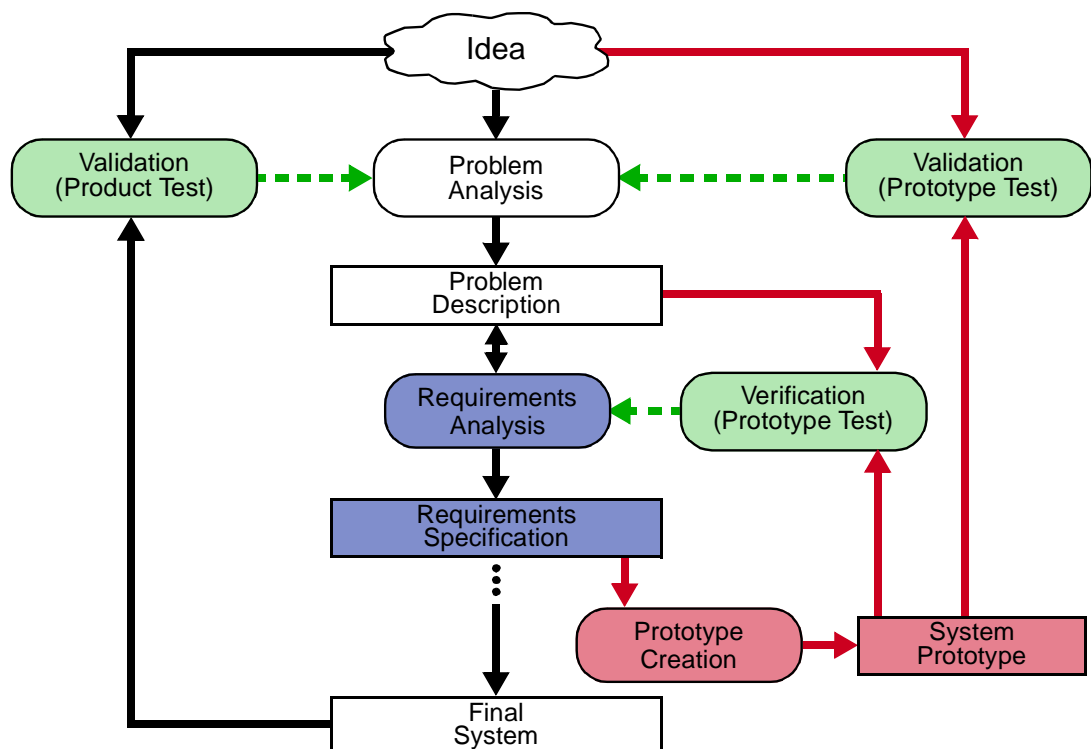
Department of Computer Science  
University of Kaiserslautern, Germany

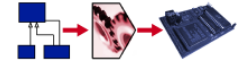
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## Motivation

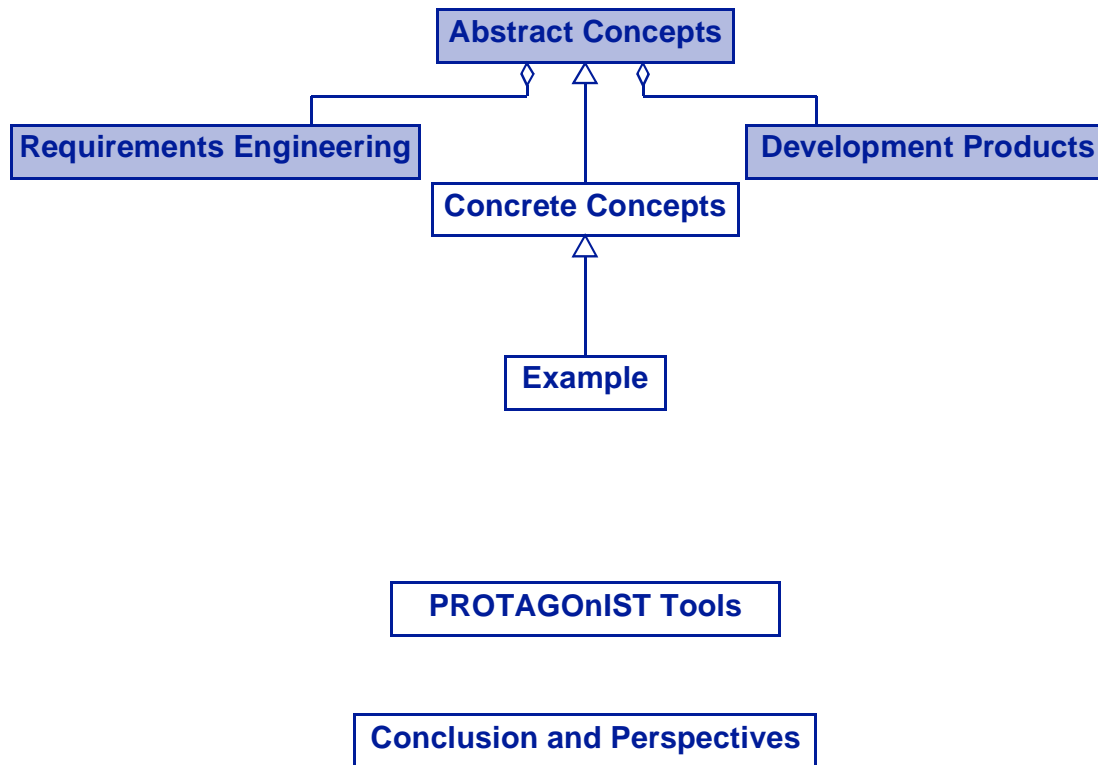
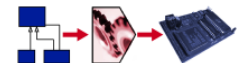
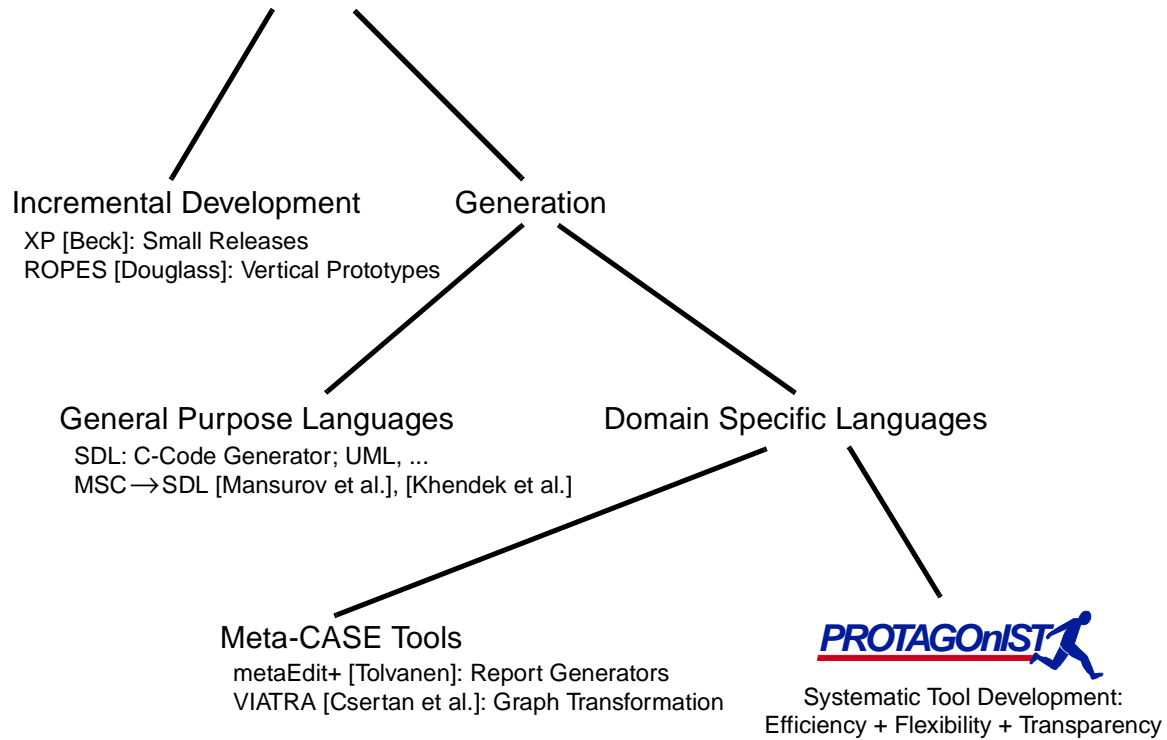


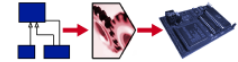
## Application of Prototyping



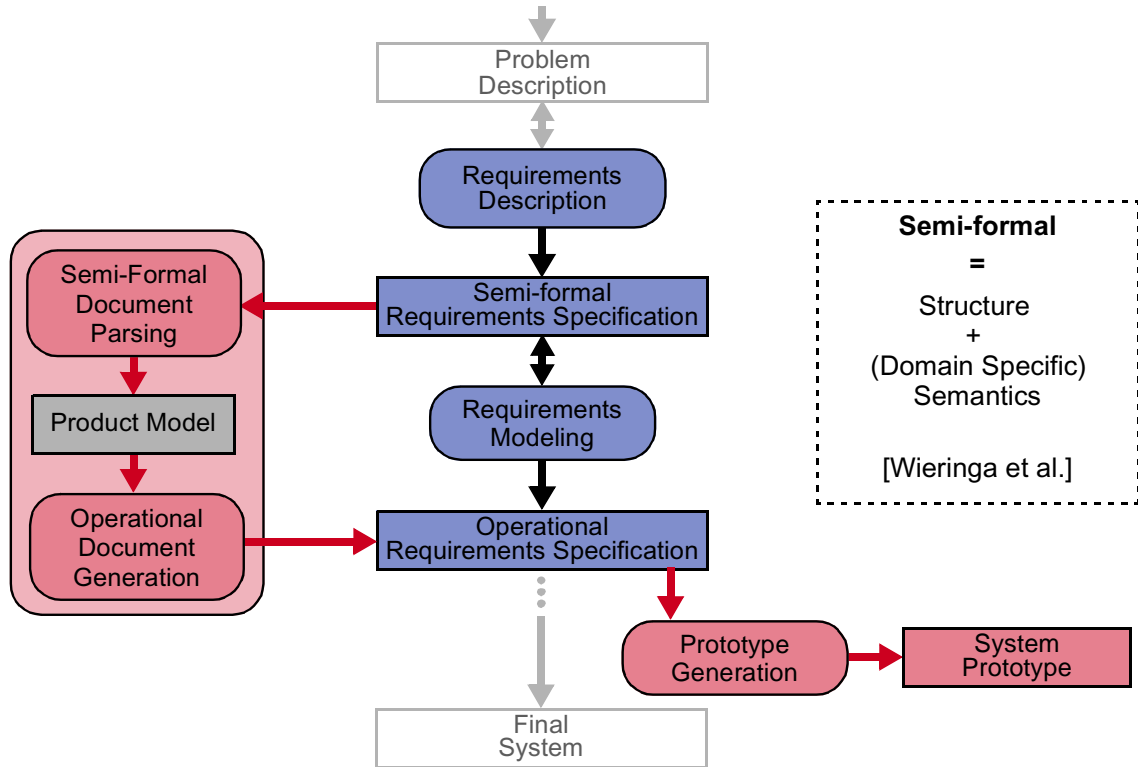


### Solutions for Early Prototyping (Related Work)



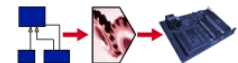


Sub-Activities of the Transformation

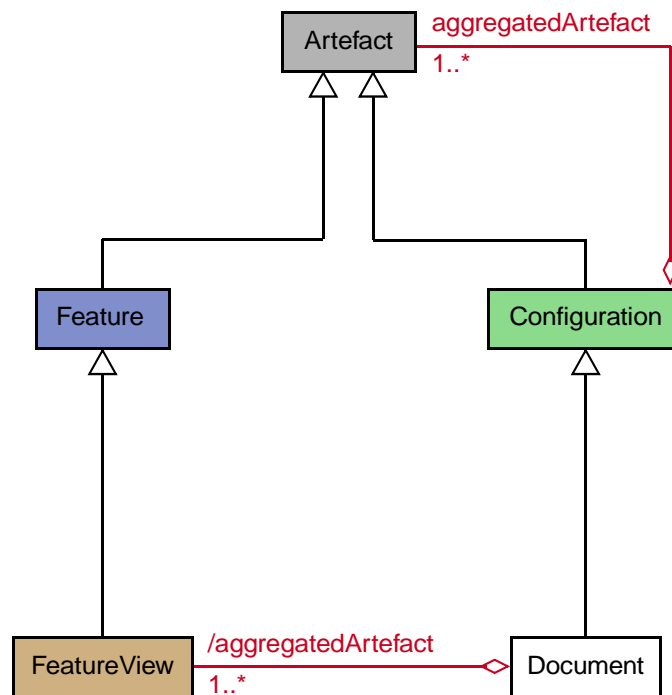


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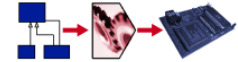
Development Products



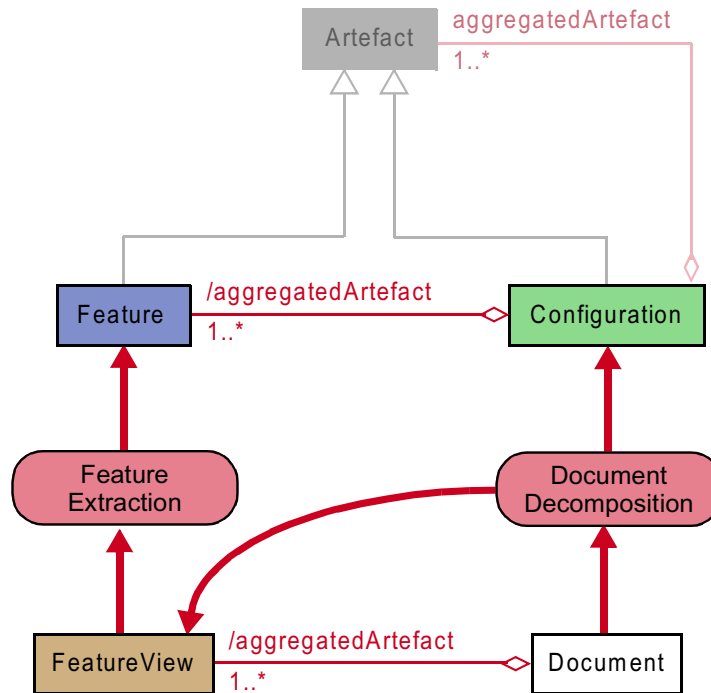
Classification of Product Model Entities



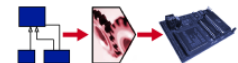
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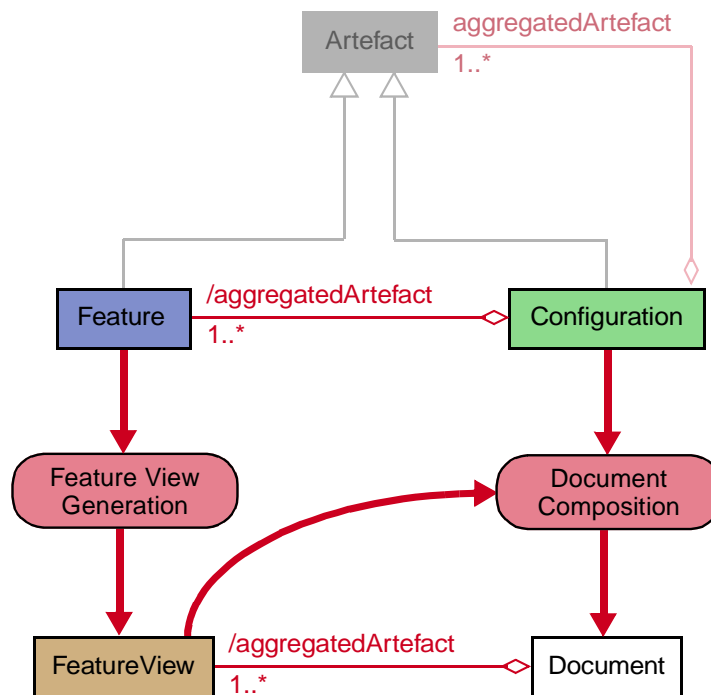
Sub-Activity: Document Parsing



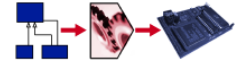
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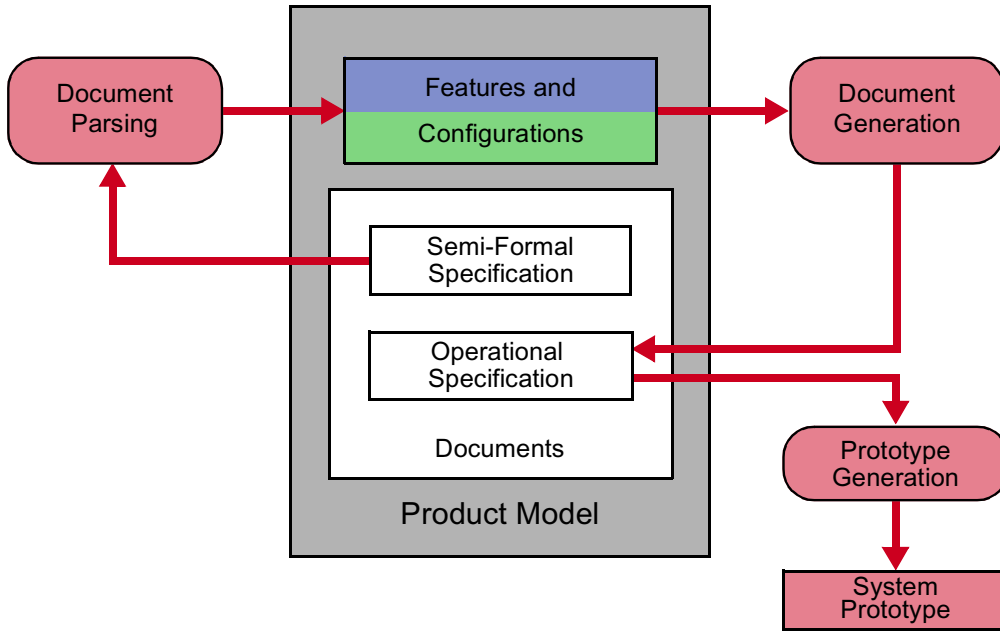
Sub-Activity: Document Generation



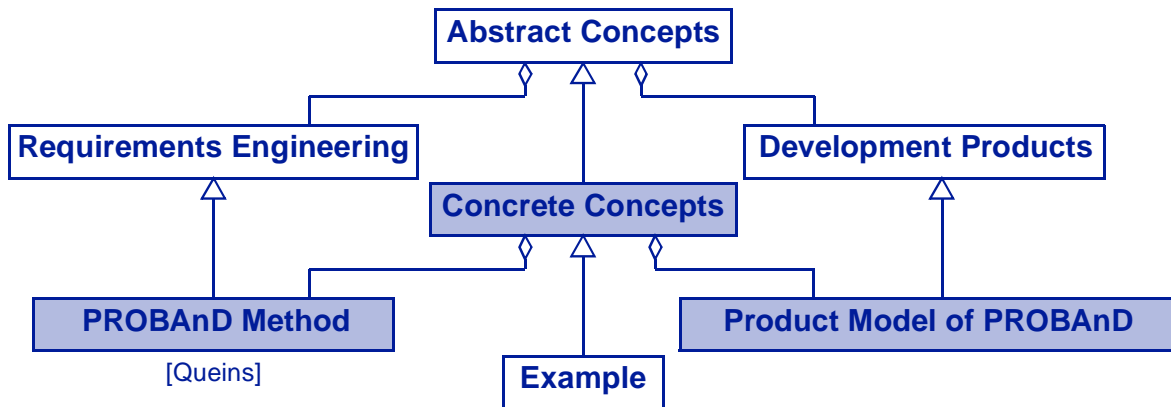
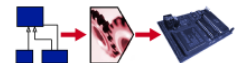
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Specification Transformation



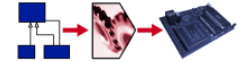
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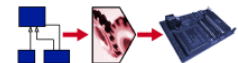
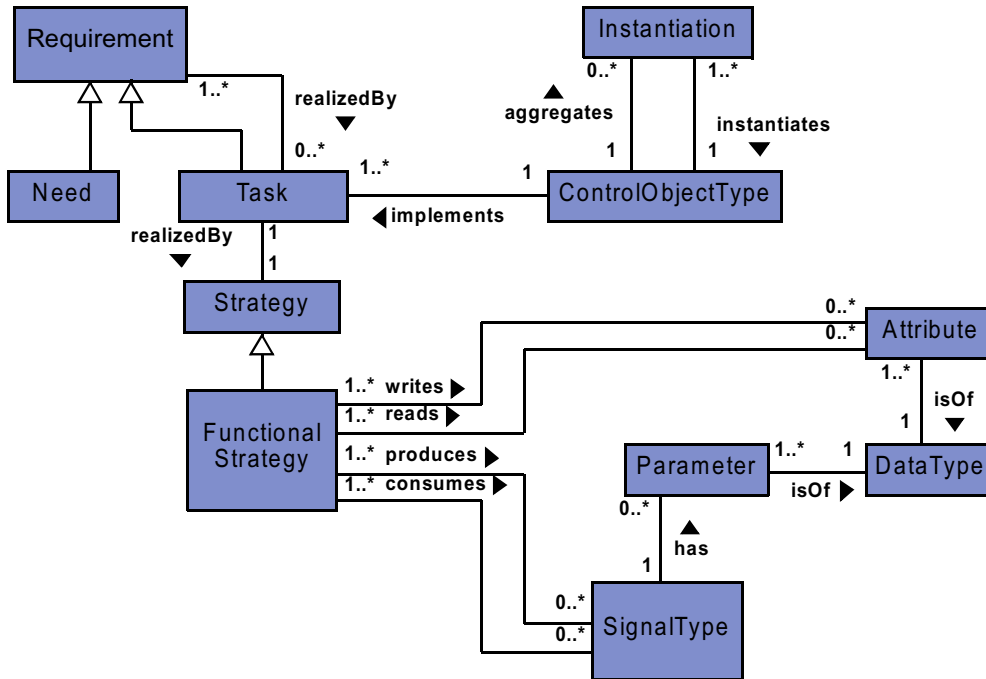
PROTAGOnIST Tools

Conclusion and Perspectives

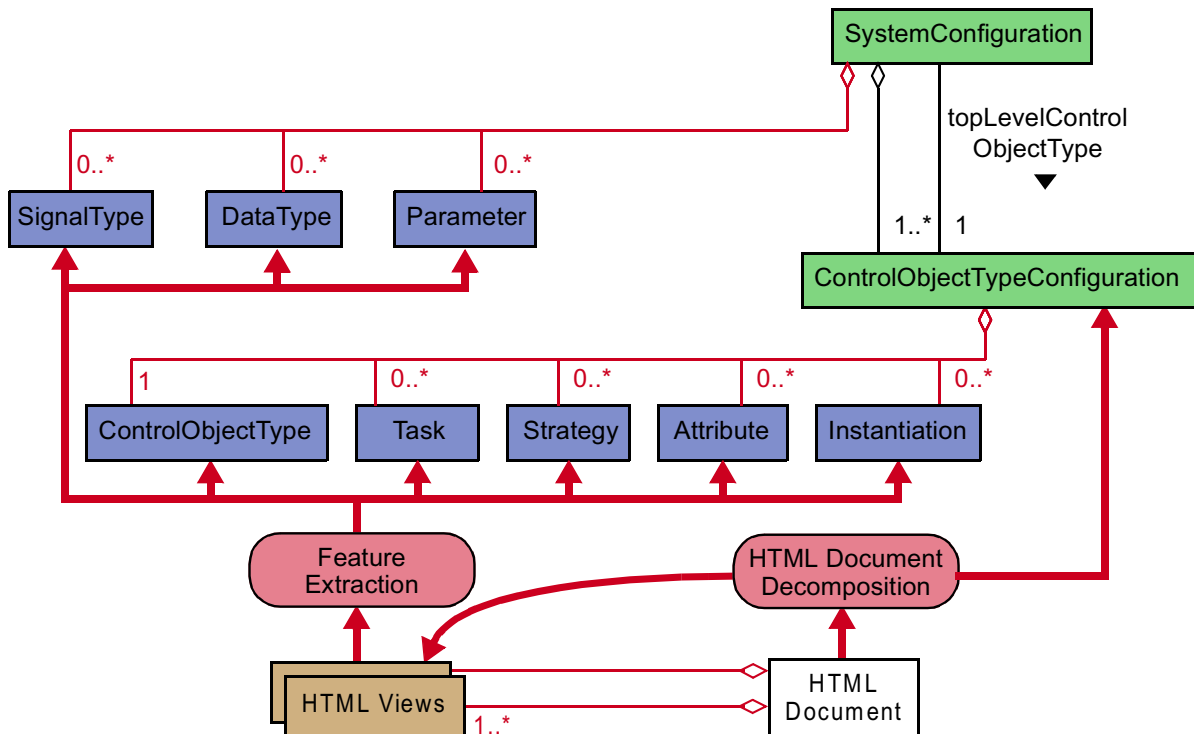
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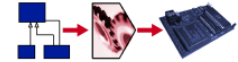


Types of Features (Excerpt)

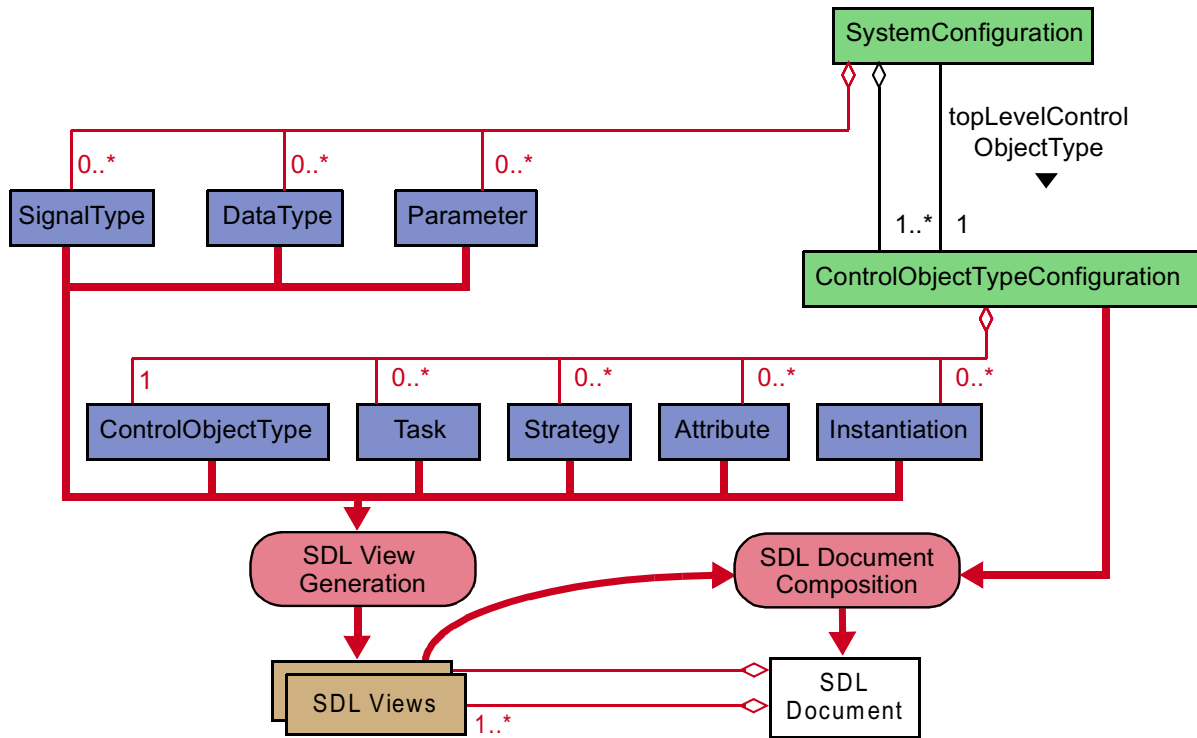


HTML Document Pasing

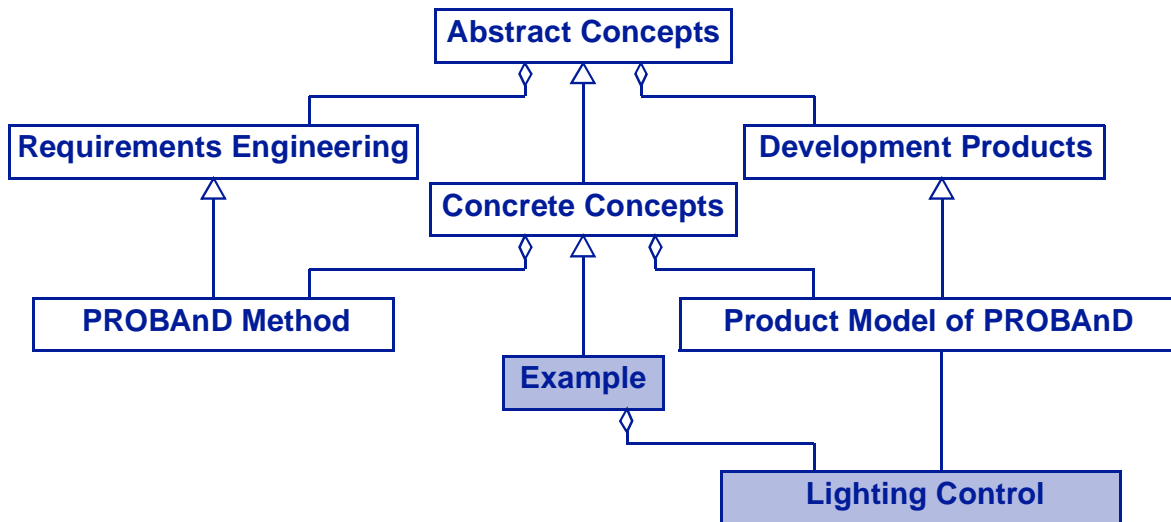
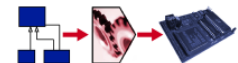




SDL Document Generation



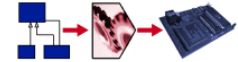
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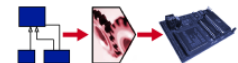
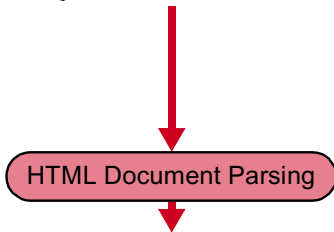
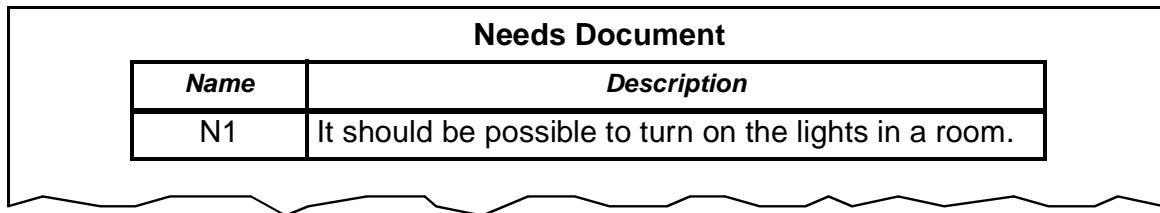
PROTAGOnIST Tools

Conclusion and Perspectives

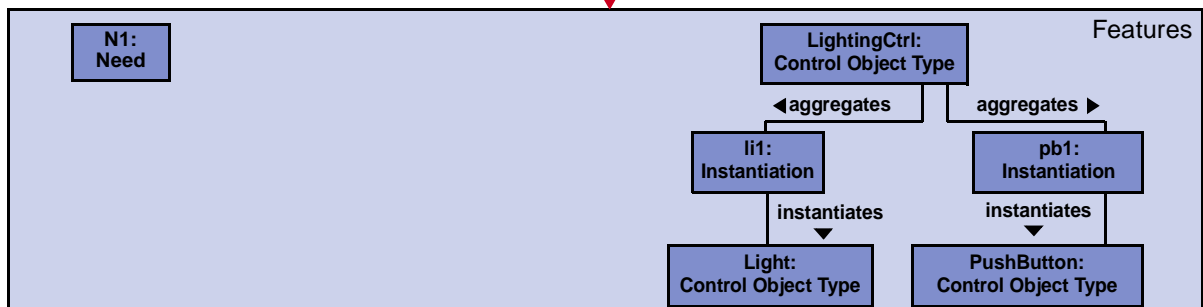
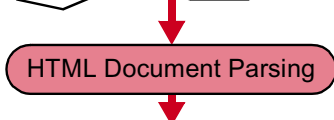
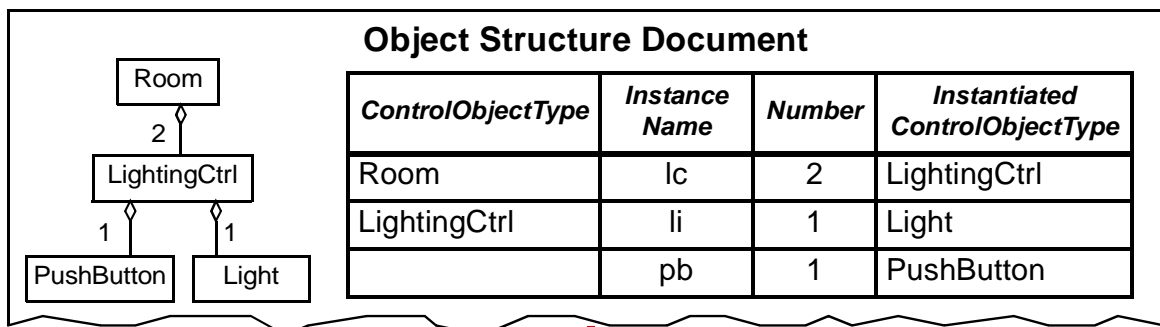
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### HTML Document Parsing

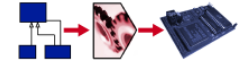


### HTML Document Parsing



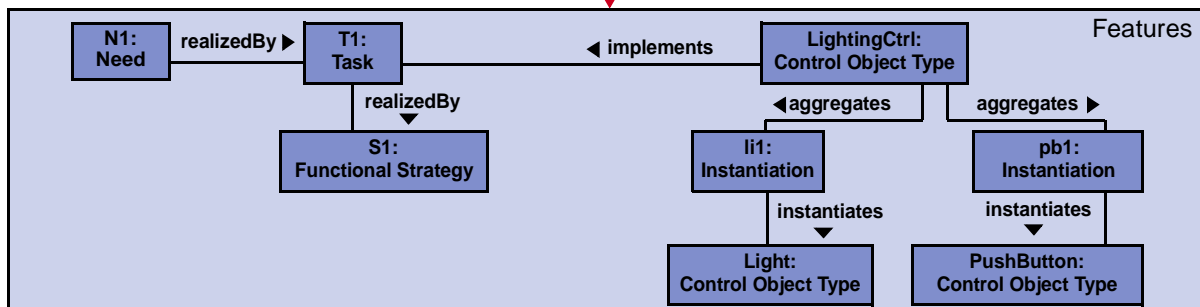
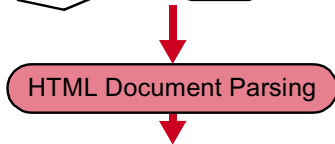


Example: "Simple Lighting Control System"



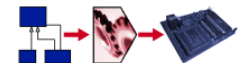
HTML Document Parsing

Model Name	Description	StrategyDescription	Realized Requirement
T1	Turn on light if push-button is pressed.	If the signal <i>newPushButton</i> is received, send the signal <i>setLight(on)</i> to turn on the light.	N1



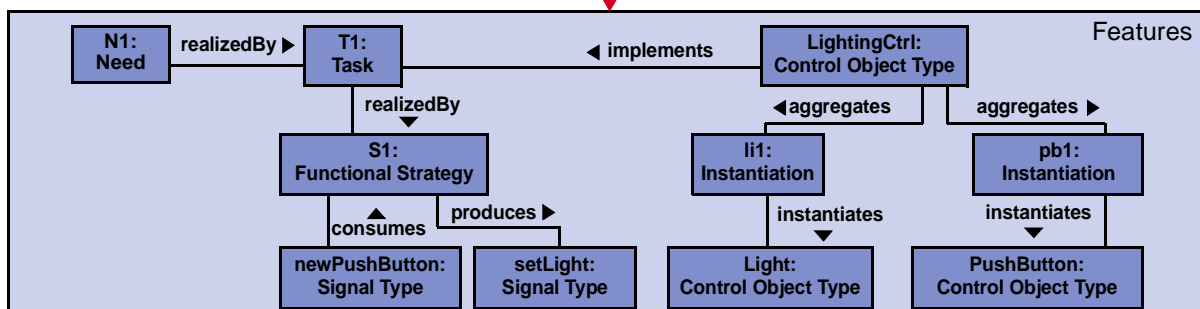
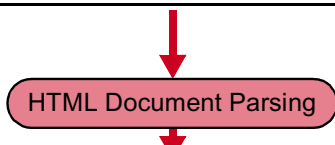
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Example: "Simple Lighting Control System"

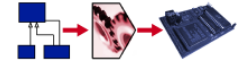


HTML Document Parsing

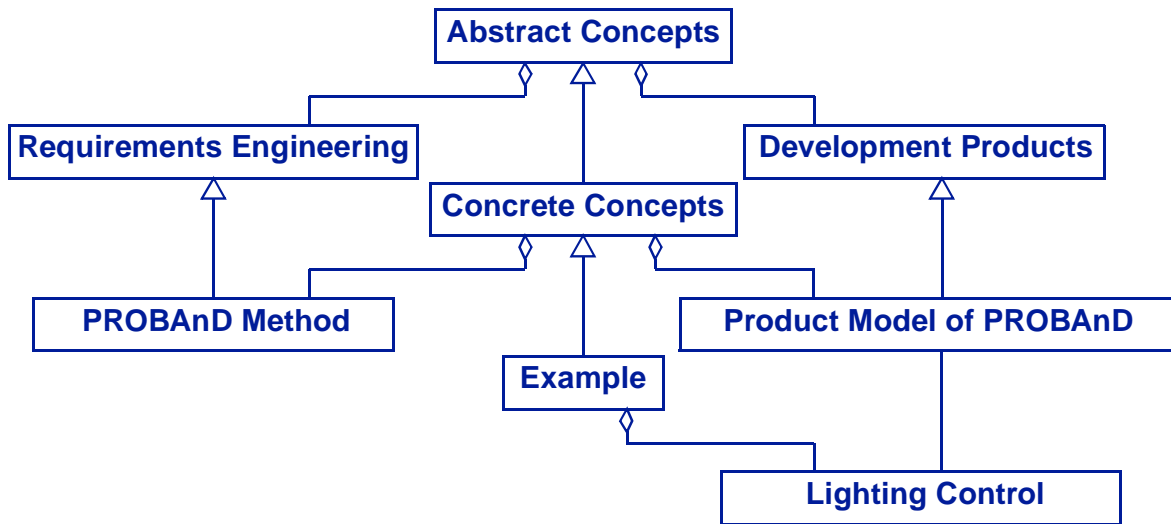
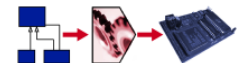
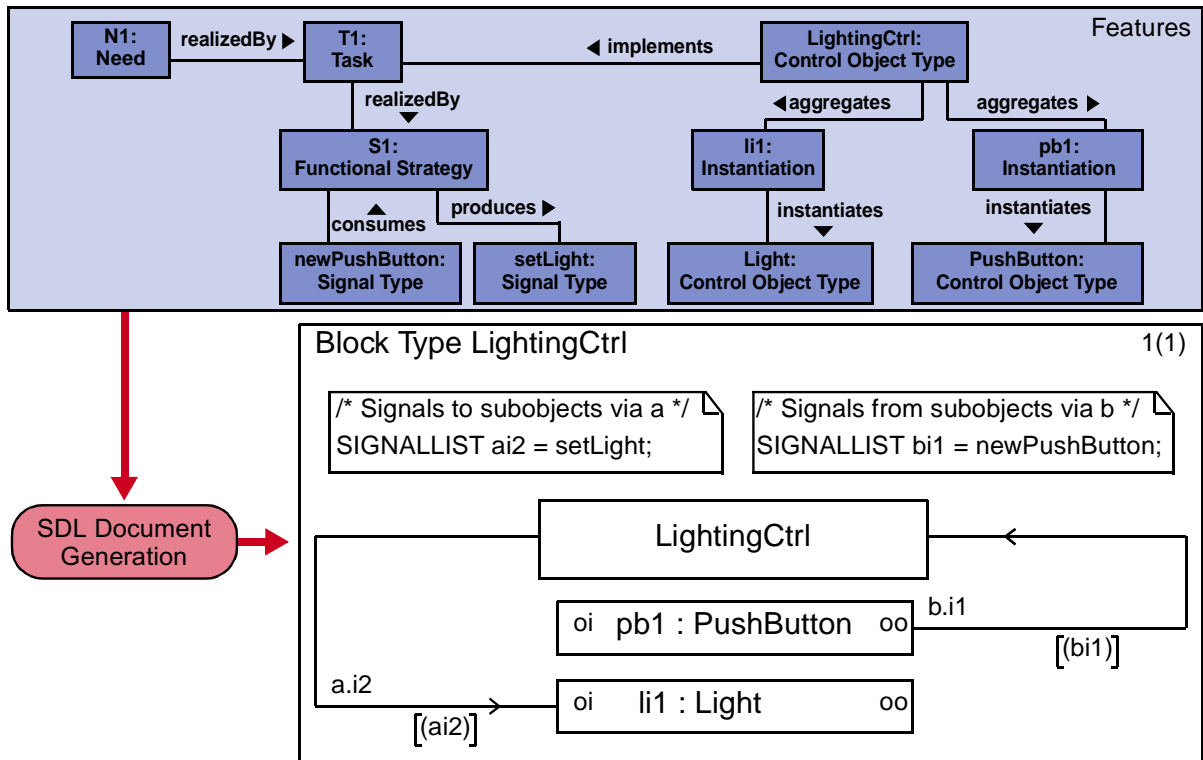
ModelName	Parameters	Tasks	Usage
<i>newPushButton</i>		T1	consumed
<i>setLight</i>	boolean	T1	produced



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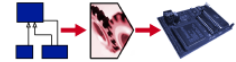


SDL Document Generation

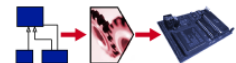
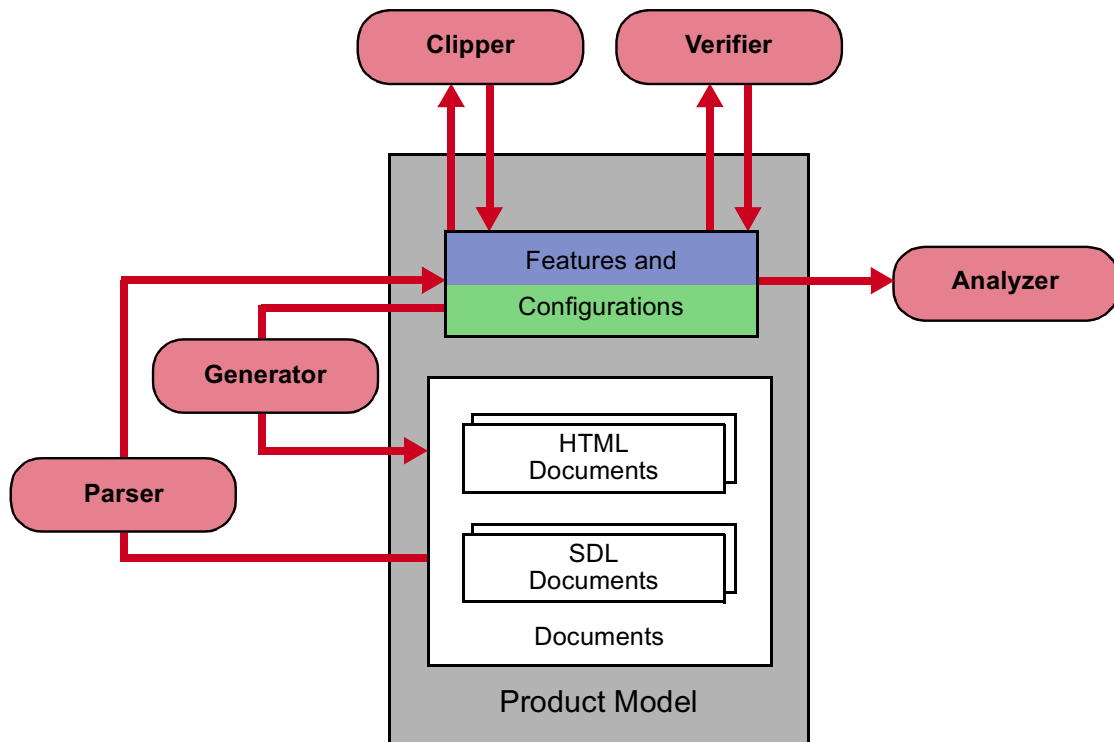


PROTAGOnIST Tools

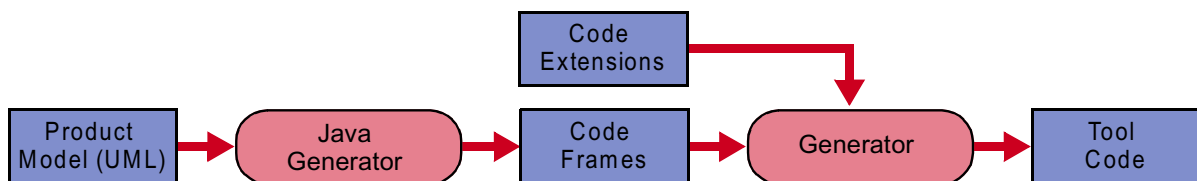
Conclusion and Perspectives



Overview

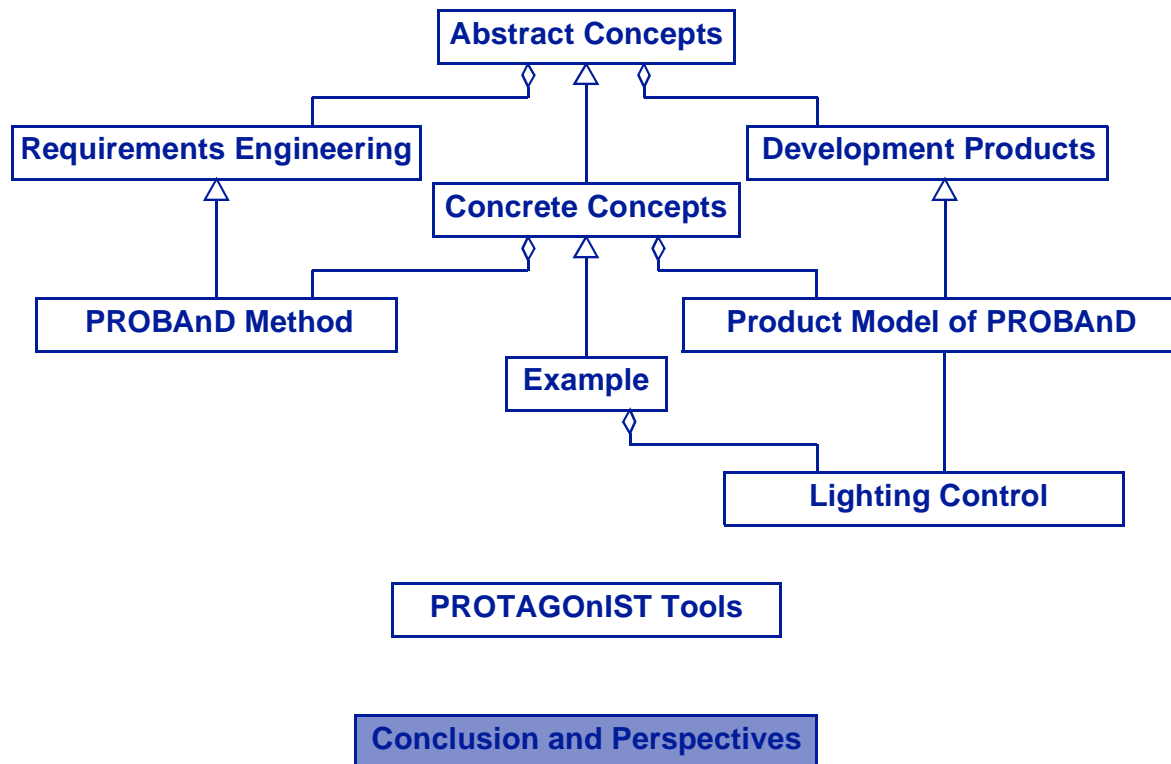
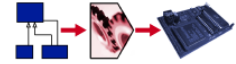


Tool Creation



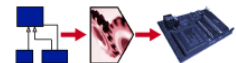
Effort

Tool	Lines Of Code
Code Frames	4700
Parser (HTML)	+ 4100
Generator (HTML + SDL)	+ 5300
Clipper	+ 800
Analyzer	+ 1900



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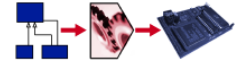
## Perspectives



- Iterative Development
  - HTML/SDL → HTML/SDL
- Refinement of Product Model
  - Behavior: “Partial” (E)FSMs
  - further Domain Specialization: e. g., Actuator/Sensor-ControlObjectTypes
- Case Studies: Quantification of Gain of Efficiency
  - Effort of Code-Generation vs. Effort of Manual Modeling Activities
- Automation of Additional Development Activities
  - e. g., Reuse (i. e., Merge Product Model Instances)
- **“Efficient Modeling through Programming”**

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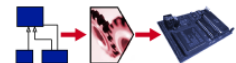
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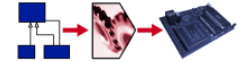
*Andreas Metzger – International Colloquium of the SFB 501 – Kaiserslautern – March, 2003*



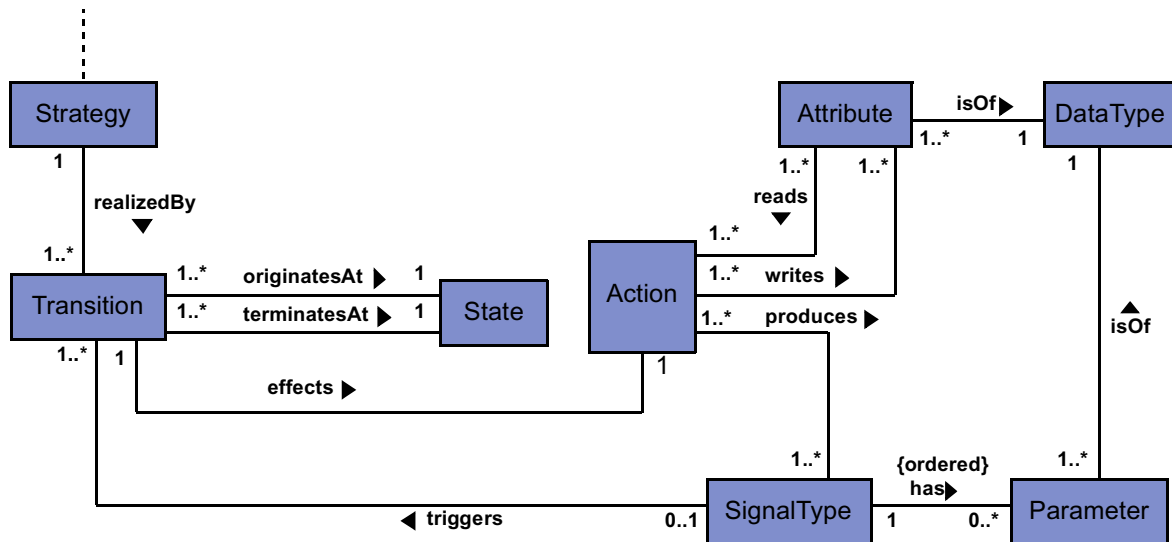
— Additional Slides —

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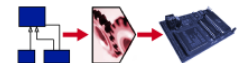


“Partial” (E)FSMs

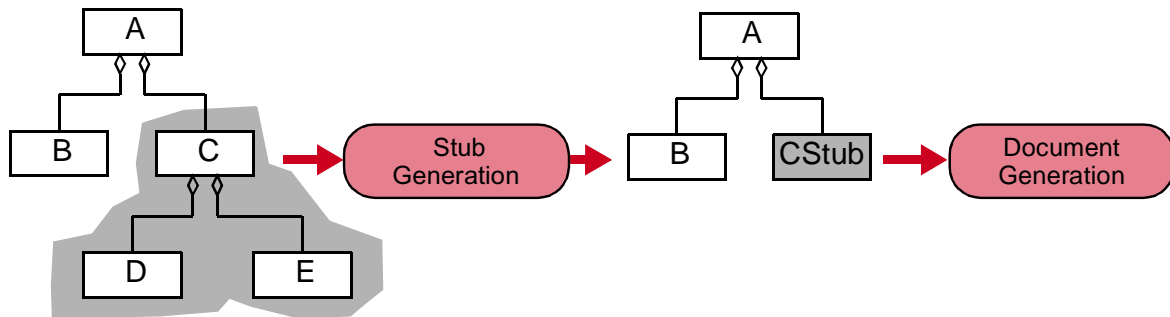


- additionally:
  - Guards?
  - Loops?
  - ...

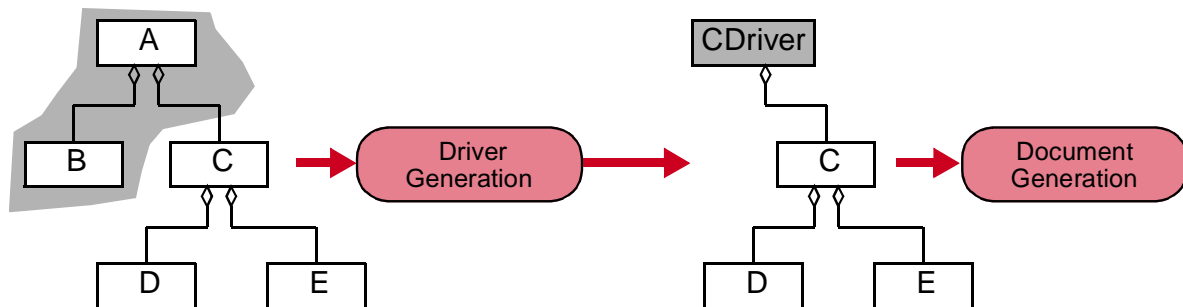
Partial Prototypes



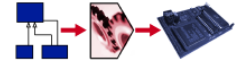
Missing Sub-Tree



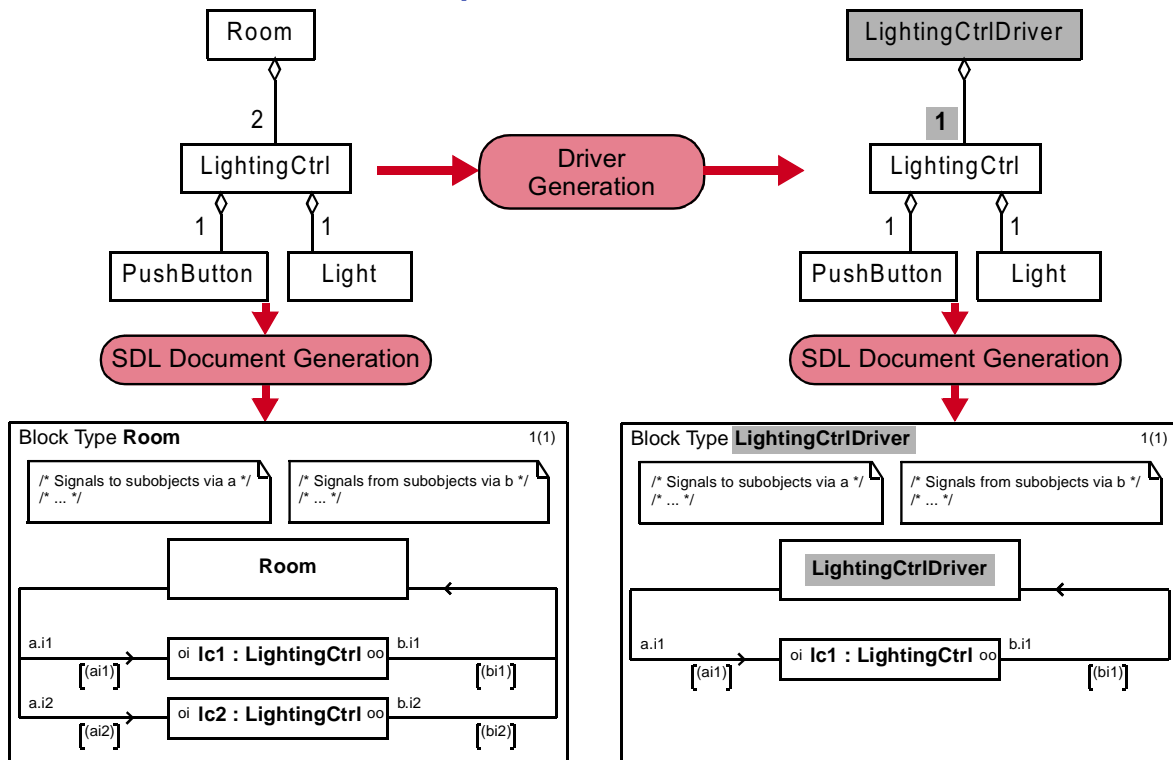
Missing Super-Tree



## Partial Prototypes

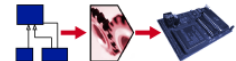


### Example: Driver Generation

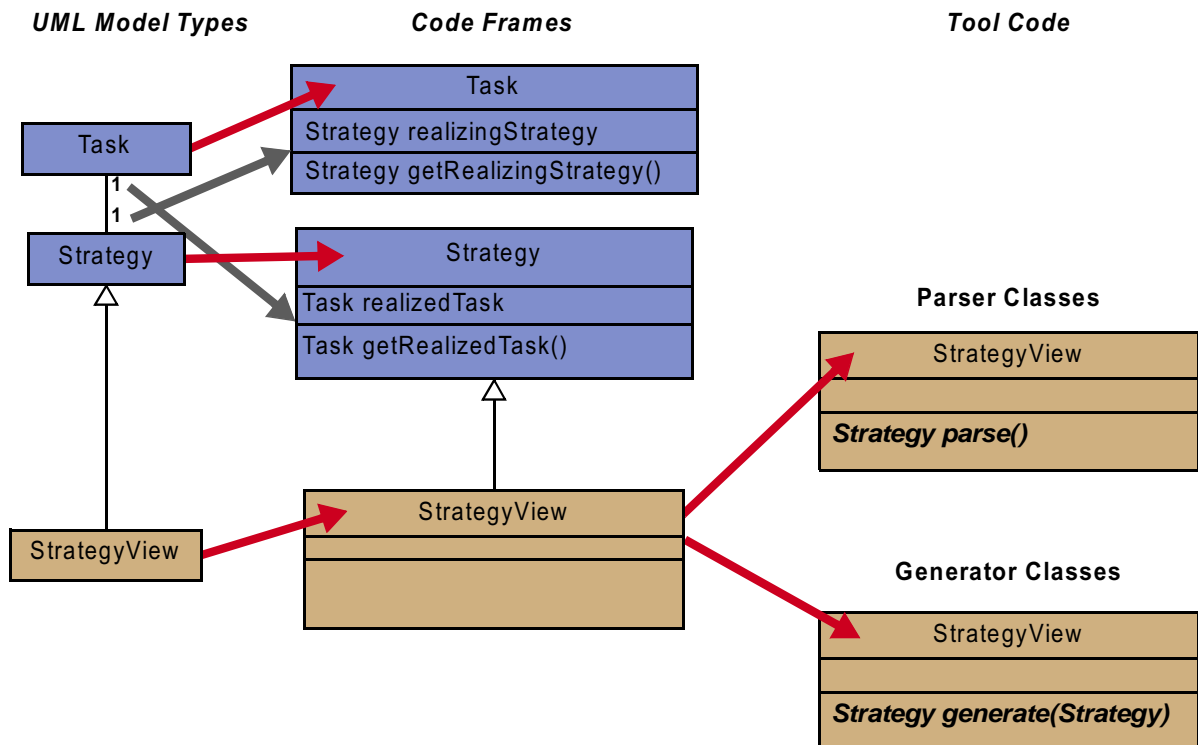


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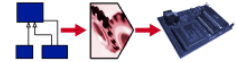
## PROTAGONIST Tools



### Tool Creation

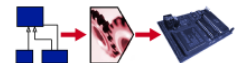
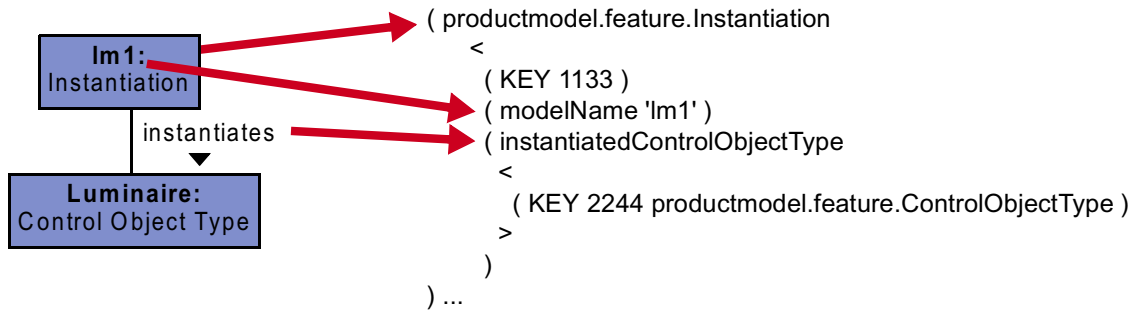


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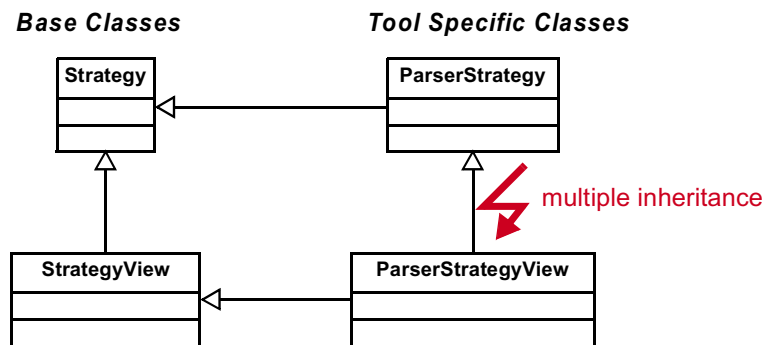
Base Classes

- common data repository for all tools
- allow interchange of instantiation information between tools
  - similar to UML model interchange (XMI)
  - **Marshalling:** instantiation information → file
  - **Unmarshalling:** file → instantiation of classes
  - file format: SLANG (similar to XML)



Tool Specific Classes

- problem: cannot use Java inheritance for extending model classes



- solution: separation in model and user files + merging
  - **model files** contain code of base classes (**code frames**)
  - **user files** contain tool specific code extensions (e.g. parse() method) (**code extensions**)
  - **merged files** contain tool specific classes (**tool code**)
- merged files are always of the base type