Verifying the On-Line Help System of SIEMENS MR Tomographs using SAT

Carsten Sinz and Wolfgang Küchlin
WSI for Computer Science
Modular Products

• Lots of variations; adaptation to customer’s needs (e.g. PCs, cars, software, telecommunication equipment,...)

• Dependencies and restrictions between components

[Configuration is an area of AI research since the 60s]
SIEMENS MR Tomographs

```
Rx4 = X2
Type
Main
Satellite
System
Harmony
Concerto
MPCU
Receiver
Rx4
Table
SAR
MHW
300 Mhz
R-2
X1
Open
IEC
MHW
R-4
X2
```
Modular Help System

- Automatic selection of appropriate packages to build a complete individual documentation for each product

Help packages

Dependency (matching conf.)

Help package content (e.g. HTML)
Consistency

• No missing help packages?
• No overlaps (two or more help packages for same configuration)?

⇒ Transform to SAT problem!
SAT Formalization

Consistency corresponds to validity of:

\[
\text{HelpReq} \land \text{ValidConf} \Rightarrow \bigvee_{p \in \text{HelpPackages}} \text{HelpProv}(p)
\]

\[
\text{HelpReq} \land \text{ValidConf} \Rightarrow \neg (\text{HelpProv}(p_1) \land \text{HelpProv}(p_2))
\]
Relevance & Conclusion

• Similar “cross-checks” occur frequently in Product Configuration:
  – Consistency of parts list
  – Coordination of several configuration systems
• Use of CSP methods for config. is common

Configuration allows for a natural formulation as a SAT problem!