Managing variability in software systems

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Origin of variability

- Variation in function
- Variation in data
- Variation in technology
- Variation in environment

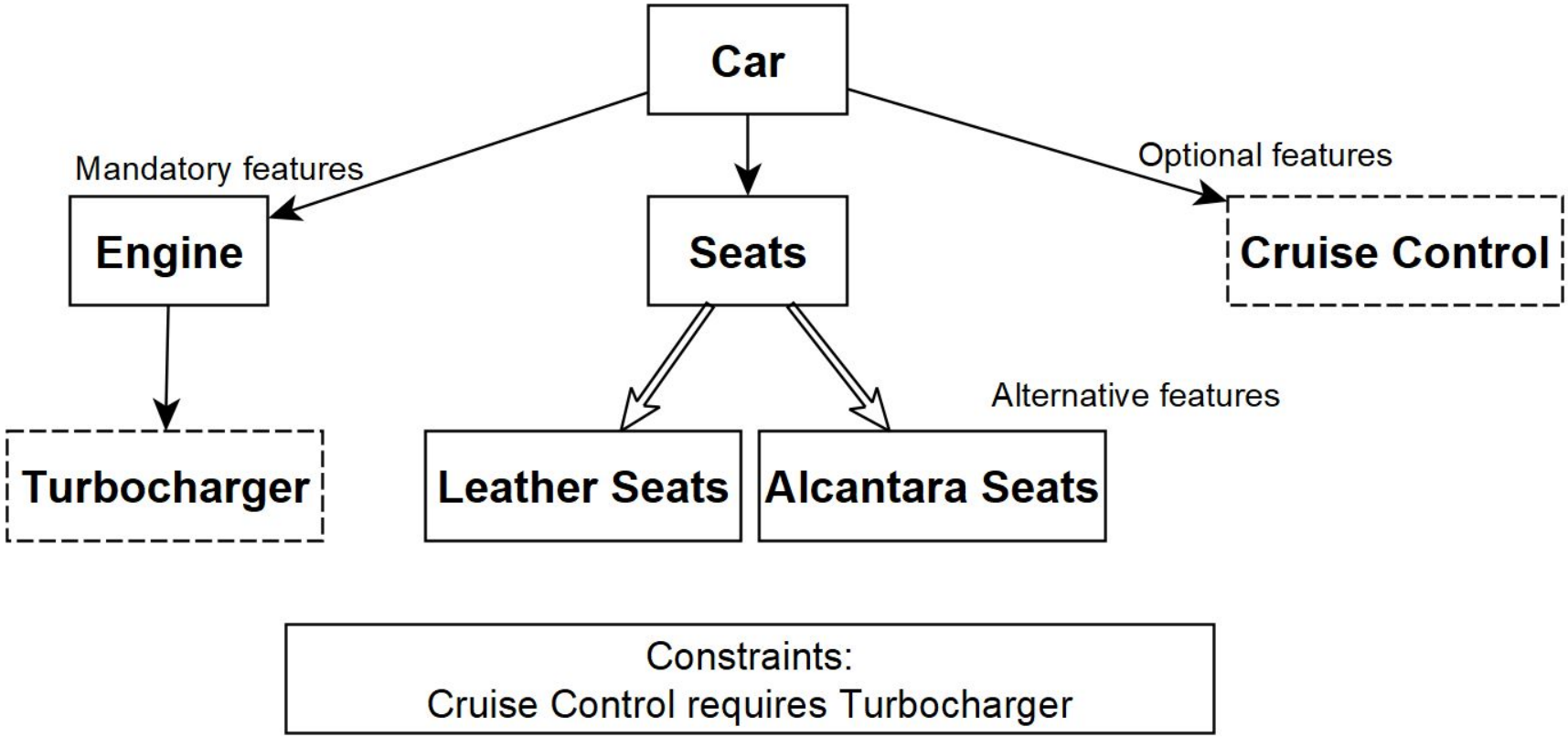
Variability modeling

- Feature model
- Decision model

Feature model

- mandatory
- optional
- alternative

- cross-tree constraints


Car
Mandatory features
Optional features
Engine
Seats
Cruise Control
Alternative features
Turbocharger
Leather Seats
Alcantara Seats
Constraints:
Cruise Control requires Turbocharger

Decision model

- feature = decision
- commonalities of systems cannot be modeled
- hierarchy is a secondary aspect

- more intuitive for software devs.

Car

#	Decision	Rules
1	add Engine	
2	add Turbocharger	
3	add Leather Seats	not available with 4
4	add Alcantara Seats	not available with 3
5	add Cruise Control	only chooseable with 2

Variability patterns

- Binding times
  - Product architecture derivation
  - Compilation
  - Linking
  - Startup
  - Adaptation to runtime environment

- Patterns
  - Variant entity
  - Optional entity
  - Multiple coexisting entities

Related work

2000-2008: constant rise in published papers per year

2008-2010: stabilized at 20-30 papers per year

Challenges

- Guaranteed correctness and consistency
- Performance overheads
- Runtime upgradability
- Lack of support for security needs
- Poor user-friendliness

Questions & Discussion