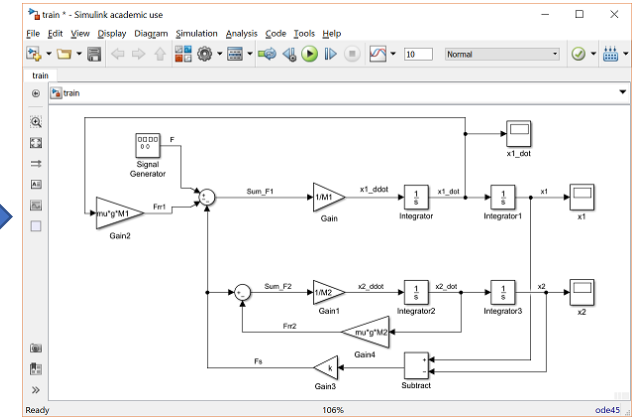# Variability Modelling

Simon Van Mierlo

Why?

Product Families

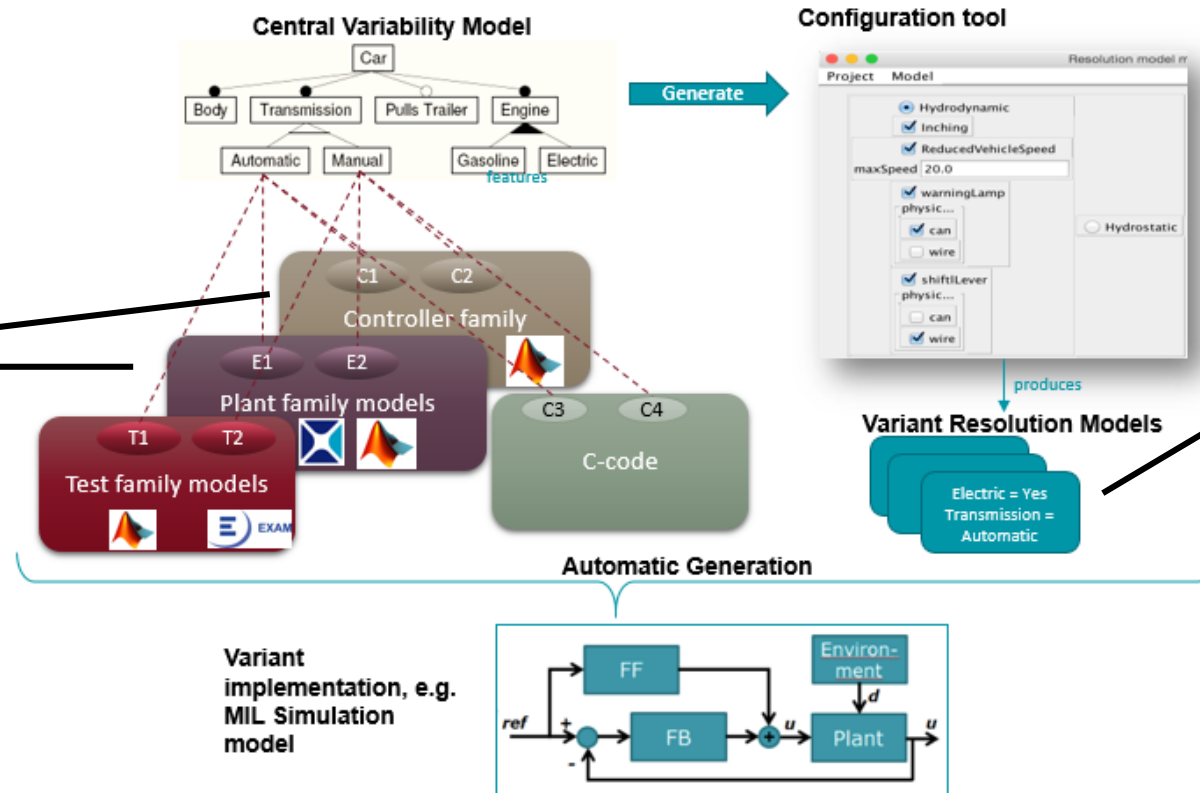**Design, V&V (Ad-Hoc)**

Manufacturing (Reconfigure)

Ultimately: lot-size one
(at cost of series production)

What?

Central Variability Model

Car
Body | Transmission | Pulls Trailer | Engine
Automatic | Manual
Gasoline | Electric
features

Configuration tool

Generate

Resolution model

Project Model

- Hydrodynamic
- Inching
- ReducedVehicleSpeed
maxSpeed 20.0
- warningLamp
physic....
- can
- wire
- shiftlLever
physic....
- can
- wire

Hydrostatic

produces

Variant Resolution Models

Electric = Yes
Transmission = Automatic

C1 C2
Controller family

E1 E2
Plant family models

T1 T2
Test family models
EXAM

C3 C4
C-code

Automatic Generation

- Languages:
  Causal vs. Acausal
- Tools

Binding Times:
- Model Generation
- Code Generation
- Compilation
- Startup

Variant implementation, e.g. MIL Simulation model

FF | Environ-ment
ref | + | FB | u | Plant | u
-
d

How?

- Specifying Variability:
  - Family modelling tool (BVR, pure::variants)
- Variation Points:
  - Language primitives
  - External
  - Traceability between variation points and features
- Link to:
  - Deployment (HiL)
  - Testing

Roadmap

- Low-Hanging Fruit:
  - Language primitives in acausal languages (Modelica, Simscape, Amesim)
  - Model transformation for model generation binding time
- Next:
  - Link to testing
  - Deployment (HiL)
  - Automatic manufacturing configuration per product