ArchitectECA2030

SC 4 Demo 4.2 Key Card

Lifetime Drift Model for Discrete Electrical Parameters

Main aim

- Statistical lifetime drift model for discrete parameters.
- Calculation of guard bands based on quality targets for lifetime drift effects.
- Calculation of remaining useful life (RUL) based on a bit-flip count provided by IFAG.

Partner	*IFAG, IFAT*
ECS value chain	*Semiconductor*

State-of-the-art	Beyond SotA / Innovation	Targeted TRL
• Statistical lifetime drift model for continuous parameters • Various models available	• Statistical lifetime drift model for discrete parameters	TRL 4 – technology validated in lab

Link to project objectives

Objective	*Addressed (Y/N)*	*How*
O1 – Continuous robust design optimization for each part in the ECS value chain	*N*	
O2 – Framework for safety validation of ECS value chain	*Y*	*Ensure compliance of semiconductor devices over lifetime.*
O3 – Identification & management of residual risks over the entire ECS value chain	*Y*	*Guard band lifetime drift of semiconductor and further devices.*
O4 – End-user acceptance by trustworthy ECS value chain	*Y*	*Ensure datasheet compliance over lifetime.*
O5 – Zero emissions, zero crashes, zero congestions by ECA2030-car	*N*	

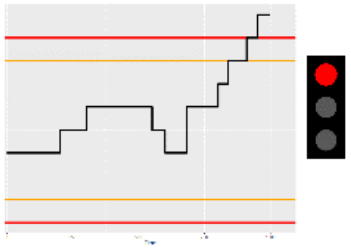
Joint demonstrator (JDEM1)

DEM1.2	DEM1.3	DEM4.1	DEM4.2	DEM4.4

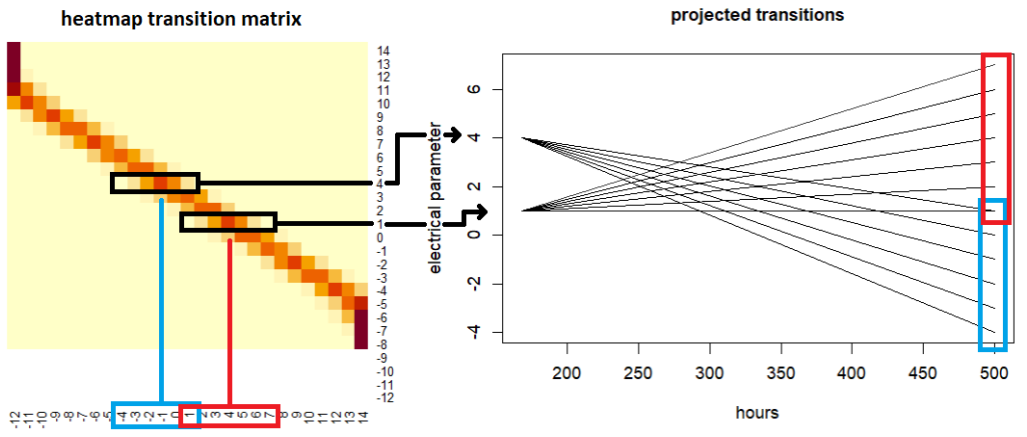
Linked supply chains (Y/N)		Considered MonDev layers (Y/N)	
SC1	N	System (S)	N
SC2	N	*Subsystem (SS)*	N
SC3	N	*Component (C)*	N
SC4	Y	*Subcomponent (SC)*	Y

Setup

- Longitudinal data
- highly censored
- small sample sizes



➢ Semi-parametric Markov transistion model based on empirical estimations of transition distributions



Benchmark scenario/mission/etc.

Benchmark: Lifetime drift model for continuous parameters by Lewitschnig and Sommeregger – https://www.sciencedirect.com/science/article/pii/S0026271422003006

KPIs (related to requirements)	Baseline
• Continuity in time • Elimination of measurement errors • Remaining useful life	• KPIs are categorial variables (yes/no)

Evaluation

- Simulation study in R
- Validation on real data
- Comparison with adapted state-of-the-art methods

Current status/demonstration	Next steps (timeline)
• Model development finished. • Verification via Monte-Carlo-simulation done.	• Scientific publication

• Application of this drift model at bit-flip counter (SC4 – Demonstrator 4.1)	

Impact	
• Enabling of PHM (prognostics and health management) for discrete parameters. • Drift modelling for discrete parameters at qualification tests possible. • Optimized guard bands for discrete parameters.	
Used standards	**Future standardization potentials**
• n.a.	• Drift criteria in AEC automotive standards.

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