
Assurance of
Autonomous Systems
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Jan 2019

Semi-autonomous vs. Autonomous Cars

Semi-autonomous Car

- observes road and traffic
- looks at speed limit sign
- horizontal control
- lateral control
- observes if the driver is he/she attending the steering wheel
- *gives up* some of the time

Human Driver

- monitors the computer actions
- failure detection
- can take over control at any instant

Inputs to the Mental Model of a Driver--*Stigmergic*

- **Vision**: see the road and the traffic
- **Acousitic**: hear the approaching ambulance

- **Haptic**: Feel the bumps on the road
- **Olfactory**: smell the overheated brake

Personal Experience

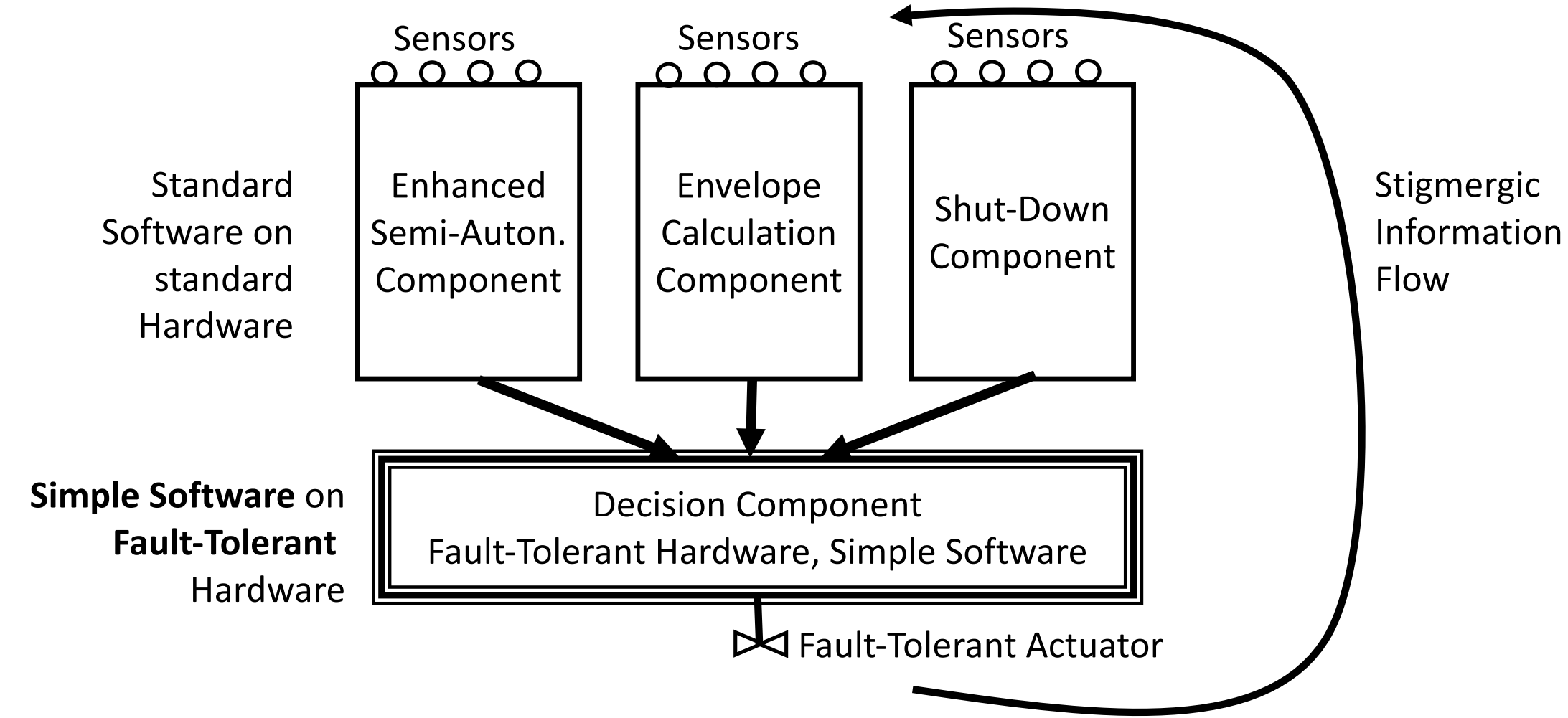
Experience with a semiautonomous car (about 90 000 km)

- works fine most of the time
- shows a car ahead of you on the dashboard, even if you don't see it due to fog.
- If you fall asleep, the car stays in its lane
- more relaxed driving—would never get a car without these functions

But

- *gives up* about once in 10000 km (twice *wrong behavior*)
- other cars take advantage of the safe distance to the car ahead
- difficulties with edge-case detection and handling
- traffic sign recognition unreliable
- sensors fail sometimes in snowy condition

Architecture for full Autonomy

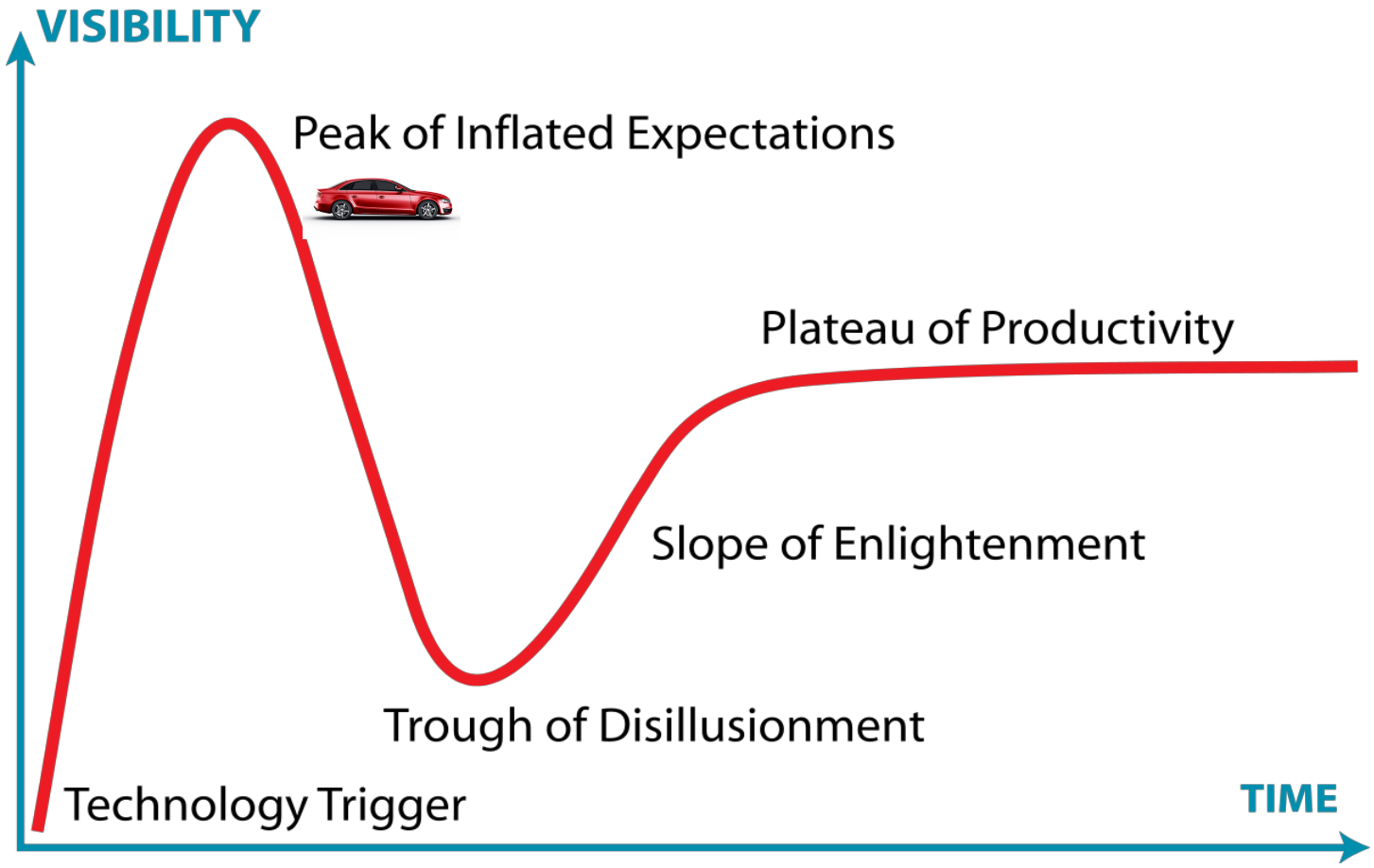


The Big Challenge

How to bring the *tacit knowledge* that humans have in their intuitive system into a cyber model for scenario classification and failure detection?

- The ***tacit*** intuitive knowledge base is built up during the lifetime of a person by *nature* and *nurture* (experience).
- It consists of unidirectional associations—the *cause* of an *effect* is unknown.
- Classification of a scenario by intuitive knowledge is fast without cognitive load and results in a *feeling* about the scenario.

Fully-Autonomous Driving-- Gartner's Hype Cycle




THANK YOU