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<b>Research Area</b>	SPL
<b>Project Title</b>	Reliability and Safety of Embedded Automotive Software

## Software Testing in Automotive

- Automotive software development process typically revolves around hardware/software/system-in-the-loop practices.
  - Heavily relying on simulation.
- Testing based in models of the system and preference for automated test strategies.
- Model-based testing is well established in the automotive.
  - Reliant on specification based functional models of the system.
  - Model typically built from specification in a black-box fashion.
  - Preference for automatically generated executable test cases.
- Complexity of automotive software not matched by development and test processes for automotive embedded software.
  - Need for sophisticated automated on-line model-based testing methodologies which capture reactive behaviour.

## Selected Related Work:

- Classification Tree Method for Embedded Systems ( $CTM_{EMB}$ ) (Conrad, 2006):
  - deals with the design methodology of tests and test automation, does not handle test strategies which are reactive to the system's outputs.

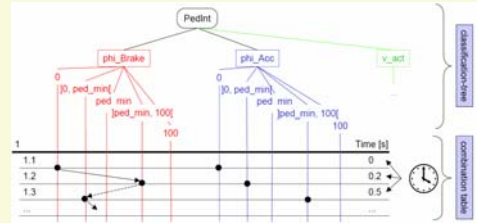


Fig 1: Defining Test Sequences (Conrad, 2005)

- Automotive Validation Functions (AVFs) approach (Zander-Nowicka, Schieferdecker and Perez, 2007):
  - deals with test evaluation design, does not deal with reactive behaviour.
  - test evaluation and test data generation share the same data.

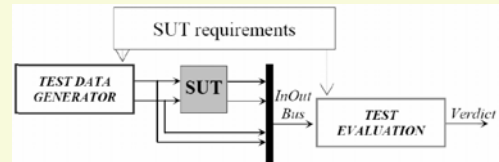


Fig 2: AVFs Approach Test Architecture (Zander-Nowicka et al, 2007)

## Solution Approach:

- Enhance the AVFs approach to cater for reactive behaviour and merge it with the  $CTM_{EMB}$  methodology for test data design/generation.

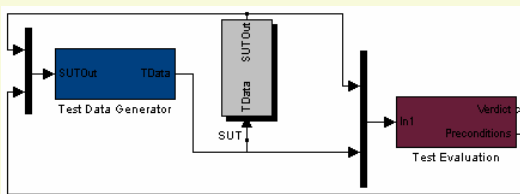


Fig 3: Suggested Test Architecture

- From functional requirements to test data generation:

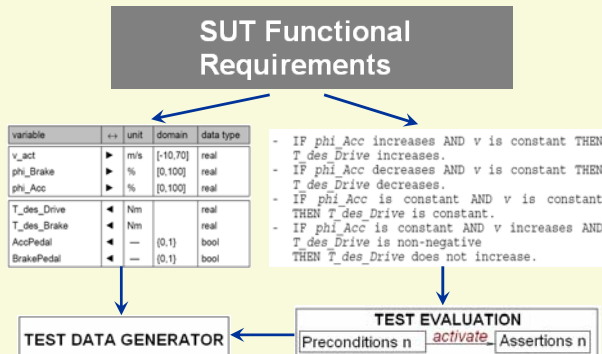


Fig 4: Suggested Test Data Generation Architecture

## Results to Date:

- AUTOSAR analysis (including journal paper, internal report, co-authored report for the European Space Agency).
- Analysis of capabilities of  $CTM_{EMB}$ .
- Analysis of capabilities of Testing & Test Control Notation (TTCN-3) regarding reactive behaviour.
- Analysis of capability of relevant toolsets.
- Preliminary results.

## Next Steps:

- Complete model-based testing methodology.
- Validate methodology in cooperation with company working on embedded software.
  - Agreement with company already in place.
- Continued publication of work on peer reviewed conferences and journals.