1 Tasks and Requirements
2 Model-based Solutions
3 Applications 1: On-board Diagnosis
4 Applications 2: FMEA
5 Applications 3: Workshop Diagnosis
6 Applications 4: Authoring Systems
7 Research Topics
Diagnosis Manuals

- Information and guidance for diagnosis/testing/repair in the workshop
- Core: test plans, starting from
  - customer complaints
  - trouble codes
- Text-based authoring system
  - DB with 100,000 text building blocks
- Translation: more than 20 languages
- Distributed on CD-ROM
  - Future: Internet
- Variant problem
  - different manufacturers
  - different models/variations

Coolant temperature sensor
Trouble code: 020A
Sensored value: coolant temperature

* Ignition off, plug open
* measure resistance at sensor
Nominal value 15..30°C:
  1.5..3.3 kOhm
Nominal value ca. 50°C:
  180..360 Ohm

Check wires and contacts
ECU pin 42 to sensor pin 3
ECU pin 17 to sensor pin 1
### Coolant Temperature Sensor

**Trouble Code:** 020A

**Sensored Value:** Coolant Temperature

- Ignition off
- Plug open
- Measure resistance at pin 1 and pin 3

Nominal value 15 ... 30 °C: 1,45 ... 3,3 kOhm
Nominal Value 80 °C: 280 ... 360 Ohm

Check wires and contacts
- ECU pin 42 to sensor pin 3
- ECU pin 17 to sensor pin 1
Documents and Knowledge Representation

Document + meaning
- chapters
- test plan (Text)
- test plan structure

Knowledge Representation
- test plan structure
- system structure
- components
- parameters

Vehicle data
- components
- schema
- data

Pedalwertgeber
U_{12} = 5V
R_{12} = 300 \Omega
A Change in the Authoring Process

Author

Document + meaning
- chapters
- test plan (Text)
- test plan structure

Knowledge Representation
- test plan structure
- system structure
- components
- parameters

Vehicle data
- components
- schema
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A Change in the Authoring Process

Knowledge Representation
- test plan structure
- system structure
- components
- parameters

A Change in the Authoring Process

Knowledge Representation
- test plan structure
- system structure
- components
- parameters
Automatic Generation of Test Plans

- Document + meaning
  - chapters
  - test plan (Text)
  - test plan structure

- Vehicle data
  - components
  - schema
  - data

- Knowledge Representation
  - test plan structure
  - system structure
  - components
  - parameters

- Test Plan Generation
  - System behavior model
  - Model Library
Coolant Temperature Sensor

Trouble Code: 020A

Sensored Value:
Coolant Temperature

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Nominal value 15 ... 30 °C:
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Nominal Value 80 °C:
280 ... 360 Ohm

Check wires and contacts
ECU pin 42 to sensor pin 3
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Benefits

Knowledge Representation:
- Decreased number of textblocks
- Increased reuse of textblocks
- Increased uniformity
- Faster and coherent adaptation
- Decreased translation costs
- J2008 support
- Retrieval support
- Import of design data

Model-based Generation:
- Solution to variant problem
- Faster production
- Complete and correct test plans
Model-based Systems

- An alternative, efficient way to create diagnoses

- Efficiency: work process
  - Tools for the developer of on-board diagnostics, diagnosis manuals, FME-Analyses, ...
  - Re-use of models and software components

- Efficiency: application systems
  - High-performance diagnosis algorithms
  - Qualitative, compiled models
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Diagnosis as a Work Process

- Generation of Diagnostic Hypotheses
  - Planning
  - Reasoning
- Manipulating
- Observing
- Acting

- Actions
- People
- Equipment
- Costs

OCC'M Software

Autor XXXStruss Auto 6 – 11
Automated Modeling

- Generate a (qualitative) model that is appropriate for a particular device and task