Semantis

Information Builders GmbH

Advanced Adaptive Diagnosis with the Knowledge Based

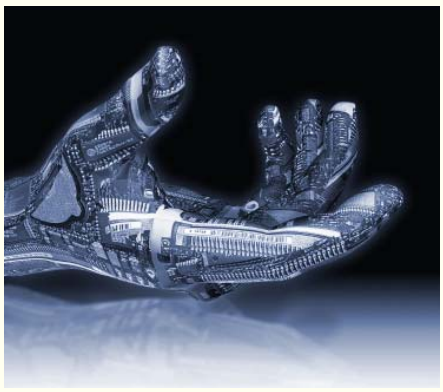
Raptor Diagnostic Suite

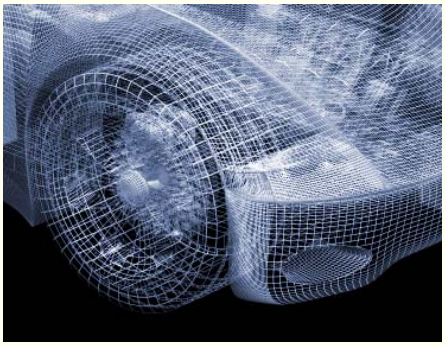
Semantis Information Builders GmbH
Obere Zeil 2
D-61440 Oberursel
Germany

Phone: +49 · 6171 · 88799-0
Fax: +49 · 6171 · 88799-22
Web: www.semantis-ib.de
E-mail: info@semantis-ib.de

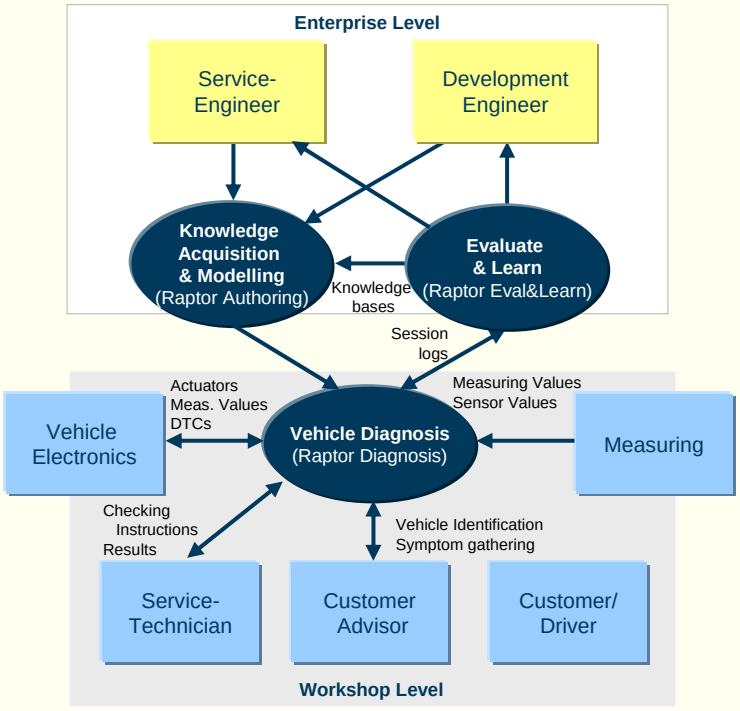
The Raptor – Designed for Advanced Adaptive Diagnosis

- Modern high-tech products such as airplanes, vehicles, laser systems etc. have to meet high availability requirements while causing a minimum of maintenance costs. The Raptor Diagnostic Suite is designed and built for the advanced diagnosis of such products with high complexity. It combines the strengths of a knowledge based approach with the power of modern computational statistics.
- The Raptor Diagnostic Suite gets rid of old fashioned features like pure guided diagnosis. Broad experience shows that such systems are not really accepted in the field. Instead, due to its very nature the Raptor offers a wide spectrum of user interaction means ranging from guided diagnosis to a full user driven diagnostic process assisted by multiple smart agents. Therefore, the Raptor adopts a rich set of knowledge representation forms and diagnostic strategies. It also includes comprehensive means to generate diagnostic applications from e.g. circuits.
- Furthermore, the Raptor learns automatically from field data and optimizes its diagnostic capabilities continuously. Also the smart agents use the learned information to expand and boost their diagnostic power.





Use the Raptor to Optimize Your Diagnostic Processes



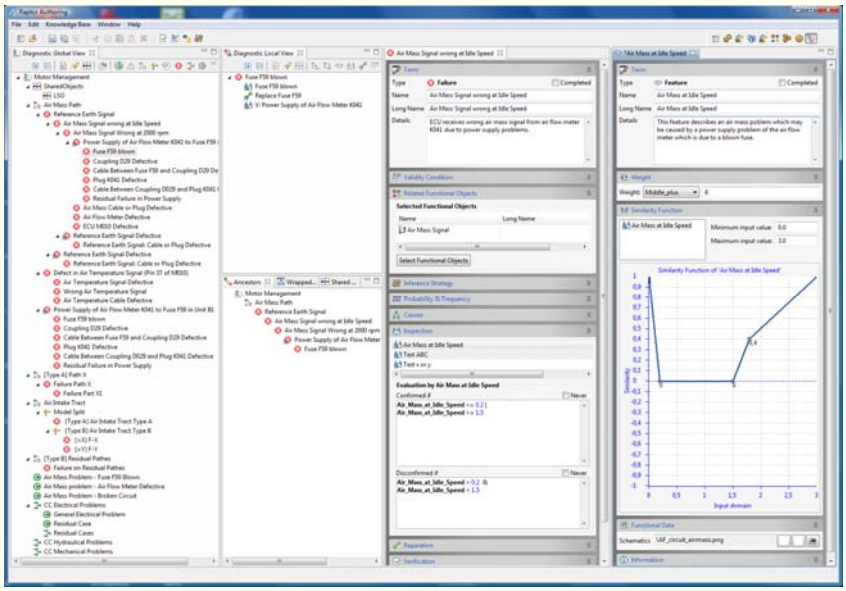
Closing the Loop
Raptor's Model-Run-Eval-Learn-Cycle

- Raptor Eval&Learn, the evaluation and learning system, is responsible for compiling the information collected locally. It analyses the diagnostic records according to various criteria and extracts information and statistics relevant for both service and development engineers. The built-in learning functions optimize the diagnostic applications automatically.
- Using the Raptor Diagnostic Suite will definitely help you master your maintenance and diagnostic problems. The Raptor Authoring environment provides all means of an intuitive and highly efficient authoring workbench. It supports multiple diagnostic strategies to enable the author to apply the best-suited diagnostic approach.
- As a consequence, the effort to build a diagnostic application is reduced to a minimum. An author is enabled to model the troubleshooting process down to the smallest replaceable units. There is no longer a need for a bad compromise with regard to depth and granularity of diagnosis.
- The runtime system Raptor Diagnosis guides the service technician through the entire process of diagnosis, repair and verification. Furthermore, due to its knowledge based nature it may act as an intelligent diagnosic assistant providing high degrees of freedom to the technicians without ignoring their expertise. Thus it makes even experienced specialists find the correct diagnosis more quickly.

Raptor Authoring – The Authoring Environment

- A Raptor knowledge base (i.e. a diagnostic application) is not programmed but modeled graphically using convenient editors which allow quick and easy knowledge acquisition. This modeling does not require any programming expertise. The Raptor “speaks” the language of authors and users.
- The Raptor is a hybrid diagnostic suite, combining and integrating
  - symptom based diagnostics,
  - failure network strategies,
  - decision tree techniques,
  - case based reasoning,
  - statistical reasoning as well as
  - model oriented reasoning concepts,

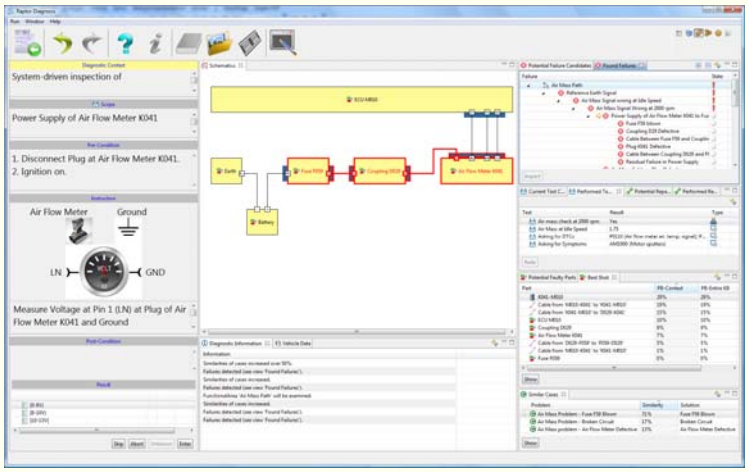
  which are carefully adjusted.
- It is up to the author to decide which representation and reasoning concepts to use at best. The author may also mix different concepts in a completely transparent manner. The strict separation between knowledge representation and inference allows inherently for smart diagnostic agents to come up at runtime for immediate support and assistance. Additionally, the abilities of these agents are boosted by Raptor’s advanced learning capabilities.
- Furthermore, knowledge acquisition is automated to a high degree. Diagnostic models are derived automatically from technical models as e.g. circuits. The derived diagnostic models can be supplemented and enriched as required. Thus, the effort to build new applications is reduced to a minimum.
- The derivational algorithms are equipped with technical and diagnostic knowledge as well as with expertise about adequate test strategies and best practices. They analyze the overall structure of a system (e.g. a circuit) and separate them into substructures.
- They also take into account knowledge from maintainable generic part and pattern libraries which contain technical and diagnostic knowledge on parts, part groups and diagnostic patterns.
- Knowledge bases can be built into any depth and degree of granularity down to the level of smallest structural components.
- External information sources such as pictures and graphics, videos, documents, wiring diagrams etc. can easily be linked with the knowledge bases. Thus these information units are available at runtime automatically or upon request.
- The management of text strings is simplified significantly. Instead of using or writing textual instructions, graphical instruction patterns are used. Hence, not only authoring becomes quicker and easier, also the runtime system is easier to use and more intuitive. Additionally, translating effort is reduced to a minimum.
- A vehicle knowledge base has a modular structure – like a vehicle. It is automatically configured from knowledge base modules per subsystem (e.g. ABS) at runtime.



- The Raptor contains a rich set of concepts to master the great variety of system types and variants. Therefore, it contains an embedded conditioning system.
- A fully integrated simulation environment allows to test a diagnostic application in runtime/workshop mode. It is possible to toggle between modeling and simulation at any time. There is no need for any compilation step.
- The authoring environment also contains a full ODX/MCD interface for easy modeling and simulation of communication with vehicle electronics.

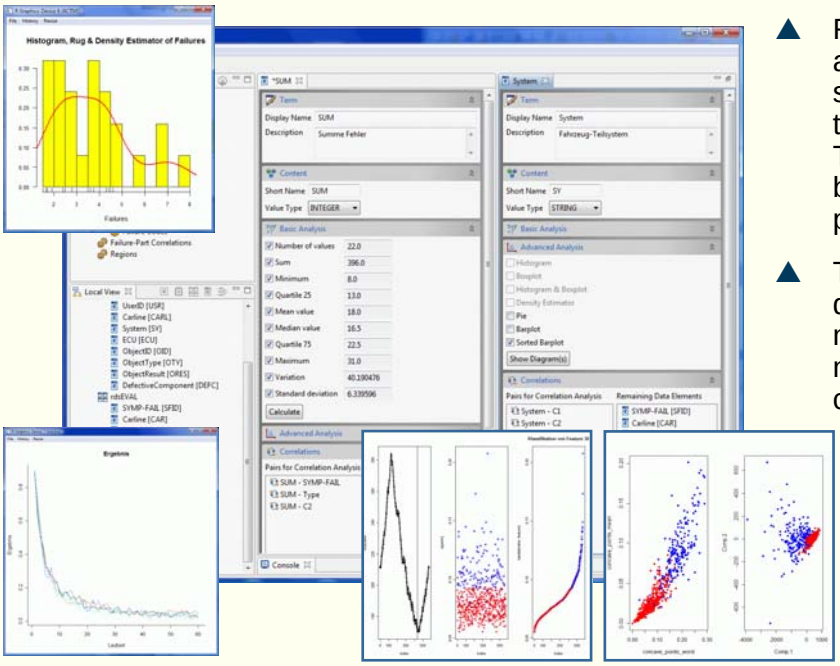
Raptor Diagnosis – The Runtime System

- Raptor Diagnosis, the runtime component, guides the technician more quickly through the process of diagnosis, repair and verification on the highest level of quality.
- It supports a detailed and structured symptom analysis and a vehicle short test. So its gets the entire symptom-/failure picture as starting point of the diagnostic process. It communicates with the vehicle electronics via an MCD-3D server.
- Furthermore, the Raptor supports users with various degrees of competence. While novices are guided through the entire diagnostic process, experienced users can take the initiative and structure the diagnostic process on their own. The Raptor then behaves as an intelligent diagnostic assistant.
- Active and clickable images dynamically visualize the diagnostic process. Graphical instructions make usage again a great deal easier.



- At each single step within the diagnostic process smart assistants provide diagnostic candidates for immediate inspection, such as the most probable failures, the most similar cases, the most probable defective parts etc. This ability is due to the very nature of the Raptor as an adaptive and knowledge based system.
- Automatically or via button all relevant information units are available. The Raptor outputs extensive graphical information and provides comprehensive explanations.

Raptor Eval & Learn – Evaluate, Learn & Optimize



- Raptor Eval & Learn, the evaluation and learning components, are responsible for the feedback of field data into the development and service units. They provide valuable information for both optimizing vehicle systems and processes.
- The Raptor learns with every single diagnostic session. By its built-in learning capabilities it increases its diagnostic capabilities automatically and continuously.
- A great variety of evaluations and reports is available such as
  - ➲ part histograms
  - ➲ failure histograms
  - ➲ symptom-part-correlations
  - ➲ weak spots of vehicle systems etc.

Consulting, Services & Support

- Semantis provides extensive consulting and development services and support to help you with the design, development, integration and introduction of innovative diagnostic solutions.
- Semantis covers the entire range from consulting, training services and the development of diagnostic solutions to the integration of complete turnkey solutions.