



Maintenance

On Board Condition Analyzer

Knowledge bases Intelligent Fault Classification on board or railway vehicles

Integration of information is key for further growth of railway transport volume. Decision makers will be able to make better decisions once they have the right information at hand about their own processes and about the processes of their partners in business. InteGRail is the project that developed the enablers. Technology enabling universal access to existing information systems, e.g. databases, monitoring systems or existing user applications. For this purpose InteGRail defined a standard approach for architecture and communication. Using this standard approach a number of example applications were developed. One of them is the Symptom Agent and On Board Condition Analyzer, an embedded SW solution allowing inference of new (and non-trivial) knowledge about mission critical conditions on the vehicle, extending and empowering the capabilities of the existing on board diagnostics.



What is the On Board Condition Analyzer?

The On Board Condition Analyser is an embedded SW application classifying faults according to their priority, their impact on the train mission and/or possible implications for safety analyzing the conditions of critical subsystems by interfacing with the vehicle field bus(es) and by storing the information corresponding to relevant process and event data.

In this role, it cooperates with and complements the Symptom Agent (see related Fact Sheet).

The system leverages an ontology model to represent the structure of the vehicle, the context in which the vehicle is operated and the relationships between observed data, symptoms and faults.

The ontology model is loaded in a semantic database engine wherein specialized software agents populate the ontology with individuals representing specific measures, as well as observations, symptoms and faults. Faults are then classified using a Description Logic reasoner, i.e. a tool processing ontology concepts and their relationships to infer new (and non-trivial) knowledge about the condition of the system.

Who can benefit?

Diagnostics and maintenance can achieve intelligent fault and critical conditions detection taking advantage of the state-of-the-art knowledge based technologies for the first time available as embedded solutions for hostile environment. This impacts on most of the railways stakeholders, starting from the operator and the maintainer to the infrastructure manager, as advanced condition analysis allows preservation of the train mission or effective just in time management of events mining it.

How is the benefit realised?

Faults and criticalities for the train mission can be detected and managed in real-time, or even in a preventive way, allowing immediate and efficient sharing of information in a standard format between on board and the on ground distributed applications.

Present status, availability and future possibilities

To be able to demonstrate the classification capabilities of the On Board Condition Analyzer, two locomotives of a Trenitalia intercity train in passenger service in Italy are equipped with the embedded device hosting the On Board Condition Analyzer. It is worth noting that just a plug & play intelligent box is added to the existing Communication and Control system, without impacting on the original hardware and software configuration of the vehicle.

The On Board Condition Analyzer is subject of Demonstration Scenario 3 of the InteGRail project in Autumn 2008.

Other results of InteGRail

Architecture definition of integrated information systems: IGRIS

Semantic data structure of the railway domain, the InteGRail ontology

Example user applications: ODSS for on-line operational decision support, IAC for on-line infrastructure availability, IDT for on-line vehicle maintenance information

Description of interdependence of performance of railway processes: the railway KPI tree, and a tool to assess and visualise performance

InteGRail - Facts and Figures

InteGRail started on 1/1/2005 and ends on 31/12/2008

Total project budget:
20 million Euros

EC funding : 11 million Euros

Total effort over 125 person-years

39 partners from 11 countries

Partners of InteGRail:

UNIFE • Alstom Transport • AnsaldoBreda • Bombardier Transportation • Siemens Mobility • UIC • Trenitalia • D'Appolonia • TSB-FAV • DeltaRail • ATSF • CAF • Nortel Networks • Laboratori Guglielmo Marconi • FAR Systems • MER MEC • Italcertifer • ATOC • České dráhy • MAV • UNICONTROLS • Strukton Railinfra • Deuta-Werke • Heriot-Watt University • IMEC • OFFIS • Televic • Seebyte • Kontron • University of Chile • INRETS • Wireless Future • University of Birmingham • ADiF • RFF • ARGE Corridor X • Network Rail • ProRail • SNCF

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