

PRODUCT APPLICATION

Technology Announcement - SPARbahn for the Railroad Industry Sector

Introduction

Clockwork group has created SPARbahn with the capability to model a complete national railroad system. SPARbahn provides the railroad company with the means to calculate precisely the economic consequences of varying maintenance and replacement scenarios on a personal computer. Other important features of SPARbahn include the facility to allow for easy and rapid modification of parameters such as traffic growth, costs, rates of failures of individual elements, and ageing limitations. In addition, SPARbahn contributes greatly to savings in maintenance and to safety by providing an accurate snapshot of the state of the system at any moment in time.

Optimization of Maintenance and Modernization Policies

Railroad networks can comprise millions of interrelated components with a multitude of parameters. From a systems engineering point of view, modeling such networks for maintenance optimization is a very tedious, time-consuming, and expensive activity.

Proper maintenance and modernization of the network require the ability to consider the relationships between components, including ageing, replacement, cost, and availability. Until now, it hasn't been possible to capture the system's behavior accurately for such a large network in a comprehensive mathematical representation.

SPAR™ Technology

Clockwork Group created SPAR™ technology to apply system engineering and simulation capabilities to maximize asset productivity, prolong asset life, increase availability, and reduce ownership cost, while meeting system performance objectives. SPAR™ is used in a variety of industries including aviation, military, power, and process manufacturing.

SPARbahn adds rail industry-specific capabilities to SPAR™ that enable the analysis of railroad networks. By integrating SPAR™'s simulation capabilities with other Clockwork analytical techniques, modelers can create highly accurate and complete models and analyses of immense railroad networks.

Such models can run on personal computers with turn-around times that enable users to try different maintenance and modernization scenarios, and to obtain accurate availability, safety, and cost graphs and information.

Defining a maintenance policy and calculating its economic consequences is a highly complex problem due to the tremendous volume of parameters to consider, and a very complicated unavailability cost calculation. If we were to model the entire network, we would have literally hundreds of millions of components. Clockwork has devised a method that allows the collapse of a multitude of components into a few. Using a combination of SPAR™ and Clockwork's analytical techniques, we have the ability to model the entire system accurately.



The modeling process combines several tools into a complete, seamless, and comprehensive computer application. The user is able to assess the most profitable maintenance policies of the whole network.

A SPARbahn project involves an investment in data collection and analysis, and work on the model for 4-6 months. Clockwork provides the customer with the working model in the form of a complete application and training. The customer's paybacks begin immediately upon use of the model and are enormous compared to the outlay for the project.

Project Brief

Below is a brief case study in the use of SPARbahn for a national railroad system.

The client's ultimate goal is to update and modernize a 100 year-old network comprising tens of thousands of kilometers of railway, which has been maintained with no real comprehensive, system-wide policy. The equipment replacement process is crucial because the client will have to provide a reliable, homogeneous, and stable network for international competition. In the long-term, the client has no way of gauging the effectiveness of age-old practices nor of their costs.

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The network is described by over 2000 segments organized into 12 tonnage groups. A different policy may be chosen for each of these groups, so the model can handle a mix of different policies involving different criteria.



SPARbahn provides the client with the following features:

- Data handling abilities include filtering, sorting, management, and organization of multiple large databases, as well as construction of new and significant databases for input.
- SPAR™ provides the foundation of the calculation by giving us simulations of the basic elements performance.
- SPARbahn automatically constructs the network on a segment-by-segment basis using the distributions obtained from SPAR™.
- A graphical user interface (GUI) allows the user to modify the parameters of the model:
 - by changing the traffic evolution by type (intercity lines, regional lines, freight) and by segment.
 - by changing the parameters concerning cost evaluations.
 - by changing the policy of replacement with respect to: the rate of failed elements on the segment, the maximum age reached by an element on a segment, and the renewal of an element associated with the renewal of another element on the segment.

Users may make modifications to the model and thereby change the characteristic behavior of classes of elements. In this case, SPAR™ will run automatically and SPARbahn will use the new distributions for the affected segments obtained from the simulation and the built-in logic.

The customer can examine the state of the system on a monthly basis over a hundred years, and make maintenance and update decisions. Thanks to SPARbahn, the user has very precise views of economic consequences of each kind of policy.

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