Abstracts

"Semantic Structures of Chemical
Data for Problem Solving Systems"
Yuzuru Fujiwara and Jianghong An
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There are diversified semantic relation-ships such as equivalence, inclusion, causal-ity, and relativity in chemical data. Chemical problem solving systems depend on whether the semantic relationships among chemical concepts can be sufficiently represented and effectively processed.

The semantic structures represent the se-mantic relationships in an easily understand-able way for both users and computers. In order to construct this huge and complicated semantic structures, a self organizing approach, i.e., an automatic method is necessary. The information model for semantic representa-tion, method of self organization of concep-tual structures of compounds (a kind of se-mantic structures), and experimental results are described. The functions of the prob-lem solving systems include similarity mea-surement of compounds, analogical reasoning of reactions, naming of molecular structures and generating molecular structures from names, as well as substructure search of compounds.

"Computer-Assisted Thermal Analy-sis System Based on Case-Based Rea-soning"
Koichi Tanaka, Yuko Nishimoto, and
Takashi Nakayama
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An prototype system which supports ther-mal analysis by reasoning measuring condi-tions for a given sample material is described. The process of thermal analysis consists of three steps: (1) setting up measuring con-ditions, (2) measurement, and (3) analyzing the measuring result. The system supports the first step of the process. The system is implemented as an expert system based on case-based reasoning, which gives a so-lution to a problem by retrieving a similar case already solved and modifying the case to adapt the problem. The representation of thermal analysis cases is given from the two viewpoints, that is, sample information as a material and the purpose of measurement. Accordingly, the similarity between cases is also defined from the two viewpoints. A the-saurus and a concept dictionary are provided to handle the meanings of terms used for de-scribing cases. Adaptations are performed by rules which are classified according to the levels of abstraction of their descriptions. As a result, it is possible to give some advices even when only cases of insufficient similarity are retrieved. In practice, the information for measuring conditions is not provided as well-formed structures, and the experts supplies the conditions by using empirical and/or do-main knowledge, so it seems appropriate to employ case-based reasoning as a scheme of of an expert system for this problem, rather than simple rule-based or memory-based rea-soning.

"Development of Scheduling System
using Dual Neural Networks"
Teruaki Ito
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A project scheduling is becoming the more important with the increasing diversity of products which are required to put on the markets within a short lead-time. The paper presents a new approach using dual neural networks to support these project scheduling. The first network is designed to make opti-mization of overall weights in each procedure. The second one is to determine scheduling which meets the required condition and to provide a scheduling proposal. A final sched-ule is determined through an interaction with the system based on the proposal. We have developed a neural scheduling system for a project type of product development using our approach. The paper presents the method-ology of our approach and describes an appli-cation to exterior products development pro-cesses to show the validity of our approach.

"GA-based Design Tool for Piping
Route Path Planning"

Teruaki Ito

A genetic algorithm (GA) approach to
support collaborative and interactive plan-
ning of a piping route path in plant layout de-
sign is presented. To present this approach,
the paper mainly describes the basic ideas
used in the methodology, which include the
definition of genes to deal with pipe routes,
the concept of spatial potential energy, the
method of generating initial individuals for
GA optimization, the zone concept in route
generation using GAs, the evaluation of crossover
methods, and definition and application of
fitness functions. In order to apply the method
to actual problems and to solve them in a
practical manner, the study employs vari-
ous heuristics, which are concept of direction,
generation of initial individuals using inter-
mediate point, extended two-points crossover,
and dynamic selection. Those heuristics are
also described and their effectiveness in the
method is discussed. Then, the paper presents
a prototype system that has been developed
based on the methodology as a GA-based
design tool for piping route path planning,
and discusses the validity of the proposed
method.