European Network of Excellence in AI Planning

http://www.planet-noe.org
General Information

PLANET is a co-ordinating organisation for European research and development in the field of Artificial Intelligence Planning and Scheduling. It aims to stimulate innovation and to promote the transfer of this leading-edge technology into European industry. PLANET is a Network of Excellence funded by the European Union's Information Technologies Programme.

The network provides a co-ordinated framework and an elaborate information and communication infrastructure. It supports training, exchange, and technology transfer as well as a close co-operation between academia and industry in both the co-ordination of future research and development and the implementation of appropriate working programmes.

Work in PLANET is concentrating on certain areas of particular interest. These include key application areas of the technology, namely • electronic work, e-commerce, and other web-based applications • workflow management • intelligent manufacturing • robot control • aerospace applications • as well as important technological cross-section topics like • online scheduling • knowledge engineering for planning and scheduling •

PLANET exists since 1998 and currently consists of
about 60 nodes from 15 European countries. They represent leading universities, research centres, and industrial companies.

PLANET is an open network and welcomes participants from all over Europe. For applications and further information please contact the network co-ordinator:

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PLANET is focusing on several areas of particular interest. Work in these areas is organised through so-called Technical Coordination Units:

- Planning and Scheduling in Intelligent Manufacturing
- Robot Planning
- On-Line Planning and Scheduling
- Planning and Scheduling in Workflow Management
- Knowledge Engineering for Planning
- Aerospace Applications for Planning and Scheduling
- Planning and Scheduling for the Web

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Aerospace Applications

Aerospace Applications are under extreme cost pressure to remain competitive. In the airline sector, reduction in aircraft maintenance time directly results in lower operating costs and increased revenues. In the space sector similar economic pressures are rising in the context of both institutional and commercial space-systems. AI planning and scheduling has a particularly large application potential in these areas. The realisation of a variety of tasks during the development, operation, and maintenance of aircraft, satellites, and other space-systems could considerably be improved by a consequent exploitation of planning and scheduling techniques.

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On-Line Scheduling

This TCU aims at identifying the requirements and the available techniques to answer questions that arise when planning/scheduling (P&S) is no more an off-line batch process but becomes an on-line process that runs concurrently with execution.

The Planet II „On-Line Planning and Scheduling“ TCU extends the scope and carries on with the work of the Planet I „Dynamic Scheduling“ TCU, the main results of which are a characterisation of the requirements resulting from the
on-line nature of the process, among them:

• the existence of various reasoning horizons, each one being associated with a specific precision level;

• the dynamic nature of the resulting P&S problem;

• the presence of plan/schedule robustness requirements facing foreseeable events and of plan/schedule stability requirements between two calls to the P&S module;

• the existence of hard and soft temporal constraints on the reasoning performed by the P&S module and the resulting need for controlling temporally this reasoning;

• the need for taking into account inside the P&S reasoning the time at which the plan/schedule will be provided and executed.

Starting from this acquired knowledge, the main objective of this TCU is to identify and to promote the techniques and tools, either present or future, that could best meet these requirements.

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Workflow Management

The purpose of this TCU is to promote the effective application of AI Planning and Scheduling (AI P&S) techniques to Workflow Management. Current Workflow Management
systems (WfMS) essentially automate the routing of documents between workers or teams according to pre-defined process definitions. At the same time, they also handle the sets of tasks to be performed by the workers. WfMS and AI P&S are two disciplines with many parallels, which have largely been pursued by disjoint communities. During phase I of PLANET, this TCU produced a roadmap in which the commonalities were identified and described in some detail. The main conclusion is that they deal with common problems, so that AI P&S can greatly help on the automation of processes within organisations. In the second phase of PLANET, this TCU aims at establishing direct contact with WfMS developers and users to foster the integration and application of AI P&S techniques with the current software tools.

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**Knowledge Engineering for Planning**

Knowledge Engineering (KE) in AI Planning can be characterised as the process that involves (i) the acquisition, validation and verification, and maintenance of planning domain models (ii) the selection of appropriate planning machinery and its integration with the domain model to make up a planning application. As such, it is an area that concerns all potential applications of planning technology. In contrast to the classification
or diagnosis tasks common in knowledge-based systems, the ultimate use of a planning system is the synthetic task of plan construction.

Despite this, we feel that the planning community needs to be better informed about and able to adopt tools and techniques from the existing research areas of knowledge acquisition, and knowledge and software engineering.

We have produced the first version of a roadmap which examines several topics fundamental to these areas, including roles in the KE process, KE Tools, Machine Learning, and Formal Methods. We plan to hold several workshops to explore the role of KE in other TCU’s, and to investigate formalisms and methods to be used in the KE process of planning applications.

**Robot Planning**

Robot planning is a research area that addresses a wide spectrum of planning problems ranging from motion and manipulation, to perception and communication. Therefore, a variety of planning tasks has to be integrated dynamically to robust actions in changing and partially observable environments. This TCU also addresses the issue of distributed planning and interaction for man-robot and multi-robot co-ordination. Finally, it draws on the development of adequate and powerful knowledge representations for handling geometry, kinematics and sensor
models, for dealing with uncertainty, time and resources, including computational resources for on-line planning and acting.

Robot planning is a fertile technology development field for numerous applications where the environment cannot be precisely engineered. It is also essential in non-robotic applications where sensors and actuators have to be integrated in a machine with some level of autonomy and high level control, e.g. autonomous satellites.

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Planning and Scheduling for the Web

This TCU focuses on the application of Planning and Scheduling (P&S) technologies to the Web. Starting from the main topic of e-commerce it aims to investigate the specific roles and to promote the use of P&S in electronic, mobile and collaborative works and activities which take place over the Web. The assumption is that P&S can be effectively used to realise reliability, flexibility, adaptation and automation of activities in the unpredictable, dynamical and time-bound Web environment.

Examples of existing and potential applications include: P&S of Web transactions, monitoring/recognition of Web tasks, automatic synthesis and maintenance of Web sites, virtual Web environments, (e.g. auctioning, stock markets,
supply chain management), e-learning and distance education, mixed-initiative Web interfaces, and scheduling for task intensive Web servers.

New directions for P&S in the Web environment are expected to arise from the PLANET member nodes’ contribution to the TCU road-map definition. The expected activities will range from technology transfer issues, such as identifying Web-application niches where current off-the-shelf P&S can be effectively used, to more advanced topics such as investigating innovative knowledge representation issues for implementing P&S online services.

Intelligent Manufacturing

This TCU concentrates on aspects of AI planning and scheduling relevant to the design of manufacturing systems, the planning and monitoring of their operation procedures, and the evaluation of their technical performance using simulation techniques.

In particular, this TCU deals with the aspects of planning in the framework of concurrent engineering, distributed project development, and virtual enterprises, where industries are joined together for the needs of a specific project or goal or where industries act together within a supply chain.

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**PLANET Workshops**

The TCUs of **PLANET** are organising workshops in their areas regularly. In addition to that, **PLANET** supports general workshops within its domain. It particularly encourages proposals to organise cross-disciplinary ones or those investigating new application areas.

**Training**

The *International Summer School on AI Planning* is a major training event of **PLANET**, where courses are given by experts of international standing, from both within and outside Europe. The second Summer School will be held September 16-22, 2002.

The presenters at *Gap-bridging Seminars* will be academic researchers and technical managers and developers in industry and national organisations, who will present descriptions of planning and scheduling problems, established and emerging techniques, and the problems that lie just beyond current technology.

**Industrial Information Days**

**PLANET** initiated Information Days in which a range of speakers presents successful applications of Planning and Scheduling technology. The purpose in holding these meetings is to increase awareness of the technology, to support early adopters, and to provide further links into the end user community.
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Homepage:
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