

O-Plan: a Web-based AI Planning Agent

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Abstract

In these demonstrations we show O-Plan, an AI planning agent working over the WWW. There are a number of demonstrations ranging from a simple “single shot” generation of Unix systems administration scripts through to comprehensive use of AI technologies across the whole planning lifecycle in military and civilian crisis situations. The applications are derived from actual user requirements and domain knowledge. The AI planning technologies demonstrated include:

- Domain knowledge elicitation
- Rich plan representation and use
- Hierarchical Task Network Planning
- Detailed constraint management
- Goal structure-based plan monitoring
- Dynamic issue handling
- Plan repair in low and high tempo situations
- Interfaces for users with different roles
- Management of planning and execution workflow

The featured demonstrations, and others, are available at <http://www.aiai.ed.ac.uk/~oplan/isd/>

Introduction

O-Plan (Currie and Tate, 1991; Tate et. al., 1998; Tate et.al, 2000) is shown running as a planning agent on the world wide web. Other AI planning technologies used include a planning domain editor and knowledge acquisition methodology (Polyak, 1998; Tate et.al. 1998), execution monitoring support (Reece and Tate, 1994), plan repair methods (Drabble et. al, 1996), planning workflow and process management panels (Tate et.al., 1999). These are used in a range of progressively more challenging situations in the featured demonstrations. The O-Plan system employs an underlying representation of plans termed <I-N-OVA> which expresses plans as a set of constraints on behaviour (Tate, 1996a).

In the later demonstrations, the work provides a rare example of a comprehensive use of AI technologies across the whole planning lifecycle, set in a realistic application in which the actual user community set the requirements and provided the domain knowledge employed.

The demonstrations are available on-line at <http://www.aiai.ed.ac.uk/~oplan/isd/> where full details, sample scenarios, maps, demonstration scripts, and access to a copy of the code of the system itself are available for educational and further research purposes. A password is required to run some of the longer demonstrations. This is available on request to oplan@ed.ac.uk

Unix Systems Administration Scripts

We recommend you start with a simple demonstration such as the Unix Systems Administrators Script writing aid (a very simple packaged use of planning technology accessible over the web). Fill in the form for your requirements on mapping physical to logical Unix disk volumes, and it writes the script for you. The maintenance of such scripts in Unix was proving problematic for a Unix system vendor to maintain. The demonstration shows how AI planning can be used in such cases where the basic ingredients used are not very numerous, but the way they can be combined varies.

Pacifica Non-combatant Evacuation Operations (NEO)

After that, try a simple prepackaged disaster relief planning aid. You select the number of people to be evacuated from various places around the island of Pacifica and the local circumstances (for example stormy weather will prevent helicopters from being used). O-Plan will then generate one plan that may be suitable. This example introduces one of the domains that we use in our later more comprehensive demonstrations, but in a very simple form.

Pacifica Disaster Relief using COA/Evaluation Matrix Interface

In the next demonstration we provide a Course of Action (COA)/Evaluation Matrix interface to enable the user to develop a number of options or alternatives using different

initial conditions or differing objectives and guidance. We recommend that you start with a simple matrix interface demonstration for Pacifica Disaster Relief. It does not need a password. This demonstration introduces the type of COA/Evaluation Matrix interface we use in most of our work (ate et.al., 1999), but in a simple single user role form. You just list the types of problem to be addressed, give some information about the local circumstances and time available, then generate a plan in a one shot exercise (without interacting with the planner in a mixed initiative mode) and view the results. You can move on and generate other options with different initial conditions and different objectives if you wish.

Pacifica Disaster Relief using Multi-user Role COA/Evaluation Matrix Interface

If you feel comfortable with the earlier demonstrations and have a little more time available (15 minutes is suggested), then move on to one of the demonstrations needing a password. The COA/Evaluation matrix interface in this more comprehensive Pacifica Island Disaster Recovery demonstration allows for multiple users with different roles to work together with automated planning agent in a mixed initiative fashion. User roles can be as commander/task assigner or planner. The Planning Process Panel (Tate et.al. 1999) interface supports the coordination of the planning process between users and the automated planning agent in the development of multiple options at various stages of generation and evaluation.

You do not need to type in a session name unless several users want to engage in collaborative development of the options (in which case they should select different user roles from those available in the pull down menu, and type in a session name which they have agreed).

US Army Small Unit Operations using Multi-user Role COA/Evaluation Matrix Interface

In this final demonstration, we have identified the stages in the overall Small Unit Operations (SUO) command, planning and execution process at US Army company level from receipt of mission through to a successful outcome and after-action activities (US Army, 1999). Within this process there are opportunities for a range of planning and decision aids, all facilitated by a common approach to representing the objectives and plans involved.

The demonstration (Tate et. al., 2000) addresses all the phases of the operation. It uses O-Plan and its associated planning technology to address the whole lifecycle of the generation and use of plans:

- Domain and initial plan representation
- Deliberative initial planning and generation of multiple options

- Plan execution monitoring and dynamic repair of plans
- Tailored interfaces for various user roles including planning process workflow support

Further information of the technology employed in these demonstrations is available in the references below or at the O-Plan Home Page (<http://www.aiai.ed.ac.uk/~oplan/>).

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