

Smart Planning

Austin Tate

Artificial Intelligence Applications Institute
The University of Edinburgh
80 South Bridge, Edinburgh EH1 1HN, UK
a.tate@ed.ac.uk

Modern military operations in the United States involve defensive, policing and humanitarian missions within the continental US or in far-flung regions of the world. Many missions are conducted as part of a joint force with other nations to achieve objectives set by the international community. In these missions there is a need for agility, responsiveness and effectiveness in the use of limited resources to achieve complex and multiple objectives. There are frequent changes of requirements and the situation is often fluid. Effective means to clearly define and relay the mission objectives through to planning and logistics support staff and then on to the personnel in the field are essential.

Technological superiority, through the use of smart weapons or weapons platforms to augment highly trained personnel, has become a decisive factor in many engagements. Recently, the ability of the US forces to use more flexible and capable planning and logistics support aids has also contributed to their effectiveness. The availability of advanced planning and coordination technologies is becoming an important factor in these missions.

A recent US Department of Commerce Report¹ on the impact of artificial intelligence (AI) and knowledge-based systems (KBS) technologies on the US economy and government stated that the deployment of a single logistics support aid called DART during the Desert Shield/Desert Storm Campaign paid back all US government investment on AI/KBS research over a 30 year period. The DART system was a result of using advanced planning technologies and representations that have emerged from the research community whose work is represented in this volume. DART was the first of a series of integrated feasibility demonstrators (IFDs) created within the Planning Initiative – a joint research and demonstration program of the Advanced Research Projects Agency and the US Air Force Rome Laboratory into knowledge-based planning and scheduling technologies.

The ARPA/Rome Laboratory Planning Initiative (ARPI) involves three phases of research projects over a period from 1989 through to 1998. A total of some \$66 million of research funds have been committed to this program over the three phases. ARPI is in its third phase now. ARPI was formed following extensive discussions between the research community and government representatives on the application challenges that could be met using the latest advances in the field. It has been a unique experiment in bringing researchers in universities, government agencies and companies together with operational staff in the military. The aim is to build relevant demonstrations of advanced concepts for planning and scheduling to respond to crises requiring military intervention – crisis action planning.

The program has also concerned itself with the use of the emerging technologies in other applications and sectors. Applications pursued by the participants include civil emergency responses to fires and oil spills, search and rescue, equipment assembly and test, and manufacturing.

This volume presents the range of technological results which have been achieved within the ARPI. Many of these results are having a fundamental impact on research and applications well beyond the scope of ARPI itself. Five lead articles introduce the program and its structure. They explain how the more mature results of individual projects are transferred through technology integration experiments (TIEs), then integrated feasibility demonstrations (IFDs), through to fielded applications. The main body of this volume then comprises one paper from each group or project within the ARPI. Each paper seeks to introduce the technological contribution of the group's work and provides a pointer to other work of that group. A specific technical contribution that has been made by the ARPI work of that group is usually described.

We hope you find the papers in this volume informative and useful, whether you are a researcher sharing this exciting field with us, or whether you are someone who can find productive use of the methods for your own organization, nation or mankind's benefit.

¹Critical Technology Assessment of the U.S. Artificial Intelligence Sector, U.S. Department of Commerce, Washington DC, August 1994, National Technical Information Service Ref. PB93-192409.