TEMPLate Extension through Knowledge Acquisition (TEMPLE): The next 100 days

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Summary: *Over the next 100 days we plan to extend our existing knowledge acquisition technology to the SOF domain and integrate our tools with Knoblock's Active Template jumpstart planner.*

Because each operation and situation is different, users need to adapt the default knowledge in their planning tools. In the case of AcT tools for SOF, users will need to extend the initial suite of standard operating procedures captured in templates with additional constraints such as the specific commander's guidance, ROEs, and other operation-specific constraints that they would like the tools to take into account as planning proceeds. They may also want to add new templates to the system to capture their experience during an operation in terms of a new procedure that they have learned.

Our approach in the Expect project is to provide knowledge acquisition (KA) tools that enable the user to modify and extend the knowledge used by the Active Template toolset. Our previous research, funded under the ARPI, JFACC, and HPKB programs among others, explores three main themes: (1) the use of **ontologies and background knowledge** about general planning principles that give the KA tool a context to understand how new knowledge fits, (2) **KA scripts** to guide the user through changes that have multiple steps, and (3) **dependency analysis** to help make sure that the added knowledge is consistent with existing knowledge. An important concern in designing KA tools is usability by domain experts. We conducted an evaluation last year (as part of the HPKB KA evaluation CCE), where Army officers with no programming background extended a knowledge base for course of action evaluation.

One application area that we have focussed on has been plan critiquing and evaluation tools. Military plans are often large and complex, and it is hard for people to keep track of all the constraints that need to be taken into account. In the air campaign planning domain, we developed *plan critiquing tools* that detect problems in a plan by checking it against constraints and commonly occurring errors. We have also developed *plan evaluation tools* that analyze tradeoffs in a plan according to a suite of evaluation criteria, such as use of resources or estimates of plan duration. These tools help human planners by highlighting potential problems that they may not notice otherwise. These critiques and evaluation criteria often need to be customized for each operation, and our knowledge acquisition tools enable users to do that.

For Active Templates, we plan to build on our work on *PSMTool*, which is designed to acquire from users the knowledge used by a plan critiquing tool. When a user adds a new critique with PSMTool, it uses background knowledge about general categories of critiques to ask questions to the user. These questions are organized using KA Scripts. The user adds detailed knowledge about the critique by editing automatically-generated English paraphrases of the background knowledge about that type of critique.

In the next 100 days we plan to 1) extend PSMTool towards the SOF domain and 2) integrate it with Knoblock's Active Template jumpstart planner. We will extend PSMTool to acquire *sentinels* for critiques, which will watch for new information that becomes available or old information that changes in order to alert users if important facts about the plan have changed. We will also broaden the range of information that users can specify. For example, the same approach used in PSMTool to acquire critiques may be readily extended to acquire *"requests for information"* (RFIs), that specify needed information in a form that can be automatically processed. This can be done using background knowledge of general categories of RFIs and associated KA Scripts, with detailed knowledge modified through the English-based editor.

We will also integrate our tools with Knoblock's jumpstart planner, so that users can add or customize critiques on plans. As part of this effort we will contribute to the definition of the InterAcT plan language that will be used by a number of participants to allow our tools to communicate plan-related information.

In the longer term, we also plan to support the user in extending the template library itself and in organizing new templates.