Getting Intelligence into an Intelligent User Interface: Intent-Based Policy for Automated Resource Allocation

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In order to behave intelligently, Intelligent User Interfaces (IUIs) must obtain and use a substantial quantity of knowledge. 'Traditional' approaches to IUIs involve building that knowledge into the IUI at design time. Some innovative recent systems (Langley, 1997; Horvitz, 1999) permit the system itself to learn as it goes so that some of the knowledge it needs is acquired or modified at the time of use. Recent work (Miller, Hannen & Guerlain, 1999) has convinced us that there are substantial advantages, in both system performance and user acceptance, to letting the end user of an IUI provide some of that knowledge him- or herself. The key to such user-adaptable systems, as opposed to the more 'traditional' auto-adaptive IUIs, is to permit user adaptation with a minimum of human workload.

We have been exploring one approach to such user-instructed systems that we call 'policy'. A policy represents an a priori statement of user intentions or values for the behavior of an intelligent system. It defines what counts as good or bad to the user and, therefore, what the system should strive to optimize or what it should present to the user as significant. Since the policy is separate from the control or display algorithm, it can be modified easily and frequently without substantial change to the underlying system operations. Most importantly, the user can specify a policy before system 'run time' and modify it as situations or the user's desires change. As such, it requires four components: (list from invention disclosure***).

One recent application of our Policy concept has been in the domain of battlefield communications resource prioritization. As digital battlefield communications technologies become more complex, a growing problem is the overhead costs and complexity associated with deciding how to allocate information resources in an environment where human decision and guidance resources are already overstressed. Automation can help, but it must be responsive to ever-changing, extremely critical and occasionally vague and conflicting goals of the commander.

In this domain, policy consists of a series of statements, called policy elements, about what kinds of information the commander values, for himself and for his various subordinates, and to what degree. A simple, initial representation for policy elements in this domain consists of a description of a type of information exchange, followed by a numerical value assigned to that exchange. The commander develops a set of such policy elements during battle planning and, when information requests later come in, they are matched against his 'policy' to determine the priority they should be given (cf. Figure 1).

Such bundles of policy statements can be time varying or conditional. They can also be linked directly to a task representation and inherited for free from a task-based battle plan to facilitate ease of set up and modification. One of the challenges of working in the military command, control and communications domain is that, in fact, there are multiple commanders each of whom has a different notion of the value of a specific type of communication. We have addressed this problem by developing techniques for

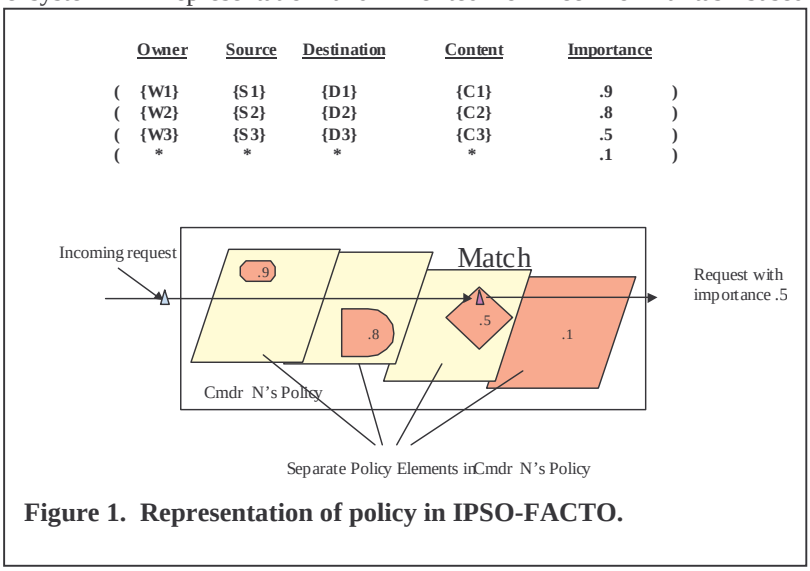

Figure 1. Representation of policy in IPSO-FACTO.

resolving conflicts over a communication's value within a command hierarchy.

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