Planning Meets User Interface Design: Affordances, Ibots, and PUMs

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Close, beneficial ties have traditionally held between research in artificial intelligence and human-computer interaction. AI-related research drove some of the earliest rigorous examinations of user behavior, providing insight and guidance in areas such as the effects of practice on performance, rational decision-making, and expert problem-solving in the user interface. Conversely, HCI has given AI researchers challenging problems in realistic domains and environments, in which solutions have useful theoretical and practical implications. In some research efforts, the distinction between HCI research and AI research has blurred almost to the point of disappearing.

The mutual relationship between these two fields has arisen for more than historical reasons. As a surrogate for the real world, the user interface provides a simplified, more tractable environment in which interesting problems can still be posed and solved. In fact, the properties of a tractable environment for most planning agents correspond strikingly with the properties of graphical user interfaces. AI research, especially planning, has been strongly influenced by Newell and Simon's view of human problem solving as search through a problem space. Problem spaces traditionally abstract away continuous, non-deterministic, dynamic, and unobservable properties of an environment, such that it becomes discrete, deterministic, static, and accessible—properties associated with broad classes of modern graphical user interfaces.

This is not a novel discovery, but we believe that the ties between AI and HCI representational assumptions have been insufficiently exploited in research on intelligent user interfaces and intelligent agents. In our recent work we have explored the relationship between user interface design issues and AI planning, with interesting results in three areas. First, we have identified similarities between planning research and user interface design concerns, taking steps toward building theoretical foundations for interface agents (as opposed to agents existing in more abstract or general environments) [St. Amant, 1999]. Seconod, we have developed a novel type of interface softbot, which we call an ibot, that can interact with off-the-shelf software by performing visual processing of the interface [Zettlemoyer and St. Amant, 1999]. Ibot effectiveness relies heavily on planning assumptions. Third, we have begun to explore the possibility of building programmable user models (PUMs), or engineering models of users, to give cognitive modelers a more effective means of evaluating the ecological validity of their models [St. Amant *et al.*, 1999].

Our interests currently focus on how a user's interaction can be influenced by implicit and explicit planning structure in an interface, and how agents can facilitate problem-solving in the interface by changes to this visual and procedural structure.

References

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