Title
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Planning Within a Virtual Environment

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Pending goals are intentions that are postponed by a planner because they do not fit into the current ongoing goal pursuit. Recognizing later opportunities to achieve pending goals is important because it allows one to defer work on a goal until in a better position to achieve it. Patalano, Seifert and Hammond (1993) show that predictive encoding -- predicting at the time of suspension what resources are needed to solve a pending goal -- serves to facilitate later recognition of opportunities. Moreover, by encoding a functional description of the plan rather than a more specific one, people may maximize the likelihood that they will retrieve a particular goal when a cue relevant to its resolution appears (Patalano & Seifert, 1996). For example, to hang up a poster, one might generate either "stick up with adhesive" or "stick up with glue" as a plan. The former plan may be more likely to induce goal retrieval in the presence of tape, chewing gum, glue, etc., while the latter may miss these opportunities for bringing the goal to mind.

The studies by Patalano & Seifert (1996) used a series of written test cues to examine memory for pending goals, and also presented written descriptions of the goals. To test the effects of predictive encoding on later recognition of opportunities to achieve pending goals in a richer environment, a general-purpose computer-based graphical environment management system (GEMS) was developed. The goal of this project was to allow subjects to navigate around an interactive three dimensional environment in which they might visually encounter problems or situations that encourage them to set up pending goals. More importantly, we wanted an environment whereby subjects could visually notice opportunities to achieve their pending goals and have the capability to try out candidate solutions based on these opportunities. The resulting software is a combination of two programs. The "room editor" allows the specification of the environment (constituent rooms and their appearance), objects within the environment, goals to be completed, potential solutions and their effects, and various output options. A separate program combines these elements into a graphical environment and allows the subject to navigate and interact with objects in the environment.

Each environment is represented by a series of full-screen color photographs. For each potential room or view in the environment, a picture of a corresponding real environment is photographed and digitally scanned into the computer. With the editor, each picture is defined as a "room." Any region within a room's picture (e.g. a door or entryway) can be defined as a "portal" to another room's picture by selecting the appropriate region in the editor. After the relationship has been established between a region on one room's picture and another room's picture, the subjects can 'enter' the target room simple by clicking on the corresponding region with the mouse. For example, clicking on the door to the kitchen from the hallway causes the computer screen to exchange the hallway's picture for the kitchen's picture. Because portals are not limited to between-room navigation, other relationships can be assigned; for example, the designer may allow the subject to click on a distant desktop that is a *portal* to a close-up of the desktop. Also, special symbols may be drawn onto the photograph (e.g. arrows) that allow turning around or returning to a previous room or view. These functions allow the creation of unlimited correspondences between the still photographs for designing virtual environments.

When a collection of pictures has been related in this manner, the subject is able to navigate around the environment by pointing and clicking on the natural portals. Since the pictures can be photographs of real environments, the visual effect lacks the artificiality of computer-generated 3D environments. In the same way that *portals* are defined, regions can be defined as *objects*. Objects can be defined as goal objects (e.g. a poster on the floor) and as solution objects (e.g. a roll of tape). Subjects use one object on another by dragging and dropping with the mouse. When a solution object is used on the appropriate goal object, associated actions can be executed in the environment and appear visually on the image.. This is accomplished by "hiding" and "uncovering" of object regions. For example, if the tape is used on the fallen poster, the designer might specify that the fallen poster then be hidden and that a hung poster is uncovered whenever that action occurs. In this manner, subjects can see their solutions work (or fail) before their eyes wile pursuing suspended goals.

Actions and response times relative to navigation and object manipulation, including which goals were solved and how, are saved to a text file for later analysis. The software was developed with Microsoft Visual Basic 4 for Windows.

The tasks subjects perform in GEMS – navigating around the environment and using objects in service of their goals – are much more realistic than the cued recall paradigm used previously. This more rich environment may help in examining people's ability to notice and respond to opportunities that arise in the course of planning.

References

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