Goal Formation and the Unselected Window Problem

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ABSTRACT

A user selects a new display window, takes some action there, then begins typing information intended for the original window without first reselecting it. A similar error may occur when the user takes a break from working alternately on two tasks on a workstation and returns with a fresh idea: the user may fail to select the appropriate window before typing. We analyze these errors as a failure to form, maintain, or sufficiently activate the "select-window" subgoal. The analysis suggests that changes to the behavior of either the original or the alternate window could alleviate the problem.

INTRODUCTION

We analyze both scenarios in terms of the formation and activation of goals. If the user is to take an action with the interface, the goal for that action must be formed, and it must be maintained with sufficient activation as compared with competing goals that are also currently present [1,2]. For users of display-based interfaces, there are three main factors influencing goal formation and initial activation: (1) the current state of the task, (2) the perceived state of the interface, and (3) practiced skills.

Once formed, a goal's activation may decay for a number of reasons, including satisfaction of the goal itself, satisfaction and decay of a higher-level goal, lack of obvious support from the interface, and extended working memory loads related to other goals.

Although we refer to "higher-level goals" and "subgoals," we conceive of these as reflecting the hierarchical nature of the task, not a rigid cognitive structure. As such, when the interface does not help to form and maintain a goal in its appropriate place in the hierarchy, the goal, even if formed through practiced skills, may be ineffective.

In both scenarios, the task and the state of the interface are unlikely to cause the "select-window" goal to arise. The goal may arise from an experienced user's practiced skills, but it may not be maintained with sufficient activation to affect the user's action.

MAIN SCENARIO: FAILURE TO RE-SELECT

Users will begin this interaction by forming a single, "driving" goal: "Get information from Window B." The interaction between that goal and the changing display will then cause a series of subgoals to arise, which step through the required actions with the interface. Most of the subgoals are highly active when formed, because they derive their activation from the immediate higher goal, combined with clearly visible state of the interface.

Details of Goal Formation and Behavior

We assume that Window B is on screen, but the relevant information is not currently visible. The user has the driving goal of "Get information from Window B," which is expanded by practiced skill to form the subgoal of "Look at Window B." This subgoal is satisfied by moving the eyes. But the information is not visible, so the user forms the subgoal of "Move information into Window B." This, along with the user's interface knowledge, causes an interface-specific sub-subgoal to form, such as "Scroll Window B."

Action on the sub-subgoal is blocked, because scroll bars of an unselected window are not visible. (If they were, we would expect the user to try to scroll the window without selecting it.) So the user forms the sub-sub-subgoal of "Select Window B." This is satisfied by clicking on the window. The sub-subgoal of scrolling the window is then satisfied by additional mouse clicks, which also satisfy the subgoal of making the information visible. The visible information, along with the driving goal of getting the information, causes the subgoal of "Read Information" to be formed and highly activated, and this action is taken.

Once the user reads the information from Window B, the driving goal itself is satisfied, and it will lose activation. The main-window goal structure that was in place when the scenario began is still active, and its activation will be strengthened by the now-available information from Window B. Note that this original goal structure assumes that Window A is already selected.

In the special case of a very experienced user, a more detailed plan of goals and subgoals might be formed when the need for timetable information is first recognized. These goals could include the final subgoal of reselecting Window A. But even for this user, reading the information from Window B satisfies the driving goal. The final subgoal derives its activation largely from the driving goal, so it may now be too weak to have an effect.

At this point, then, both average and experienced users will form and act on the subgoal of "Look at the text insertion point in Window A." This subgoal arises from the interactive user's extensive practice in looking at the interface as he or she

works with it, along with the active goal of working in the main window.

When the user's focus of attention returns to the insertion point in Window A, there is only a weak cue from the interface indicating the need to reselect the window: specifically, the cursor is not visible. This cue is weak because it involves the absence, not presence, of a very small screen object. The interface may also provide a cue in the form of a special border for unselected windows, but the window border is outside the focus of attention. Nor does the user's practiced behavior help to form or activate the reselect subgoal, because typing can usually start and stop without explicitly checking for the presence of the cursor. (Anecdotal evidence suggests that even experienced users may pause to think while working in a document, then focus visual attention at a new point and begin typing, without first moving the cursor.)

To summarize: failure to reselect the main window occurs because the current driving goal and the interface do not interact to cause the appropriate subgoal to be formed, and because the subgoal is not required in the typical situation for which the user has highly practiced skills.

Possible solutions for the Main Scenario

Possible solutions address the critical points of the story. One approach is to change the interface so that a goal of "reselect" is formed and activated by features in the unselected window. This might be done by leaving the cursor visible in the unselected window but altering its shape, or by changing the background or text color of the unselected window. As a forcing function, it could be done by graying out the contents of the unselected window or otherwise making them unreadable. Any solution must affect the very small area of visual attention around the cursor.

A second approach is to alter Window B so that it suggests or forces the subgoal of reselecting Window A. Window B could be replaced by a modal dialog box (which must be Okayed or Cancelled before working with Window A), or Window B could be expanded to completely cover Window A.

Probably the weakest solution is ensure that the final "reselect" subgoal is initially posted and strongly activated. This is only likely to work when the task in Window B is brief and performed frequently, so the entire interaction can be proceduralized by an experienced user.

The more radical solutions raise the question of whether the unselected window scenario describes a problem that always needs to be addressed. Effective solutions, such as making unselected windows unreadable, may be more disruptive than the current problem.

ALTERNATE SCENARIO: FAILURE TO SELECT

In this scenario, the user returns to the interface with the high-level goal of entering additional text into the mail message (Window B). As in the main scenario, a series of subgoals will be formed and acted on: focus visual attention on the insertion point, move the hands to the keyboard, recall and compose the new ideas, and begin typing.

The first subgoal (look at the insertion point) is not strongly cued by the interface, but it is part of the highly practiced behavior of most interactive computer users. The subgoals of recalling and composing the ideas, moving the hands to the keyboard, and typing are directly derived from the driving goal, coupled with the practiced user's knowledge that this is always the way to enter text.

But the subgoal of selecting the window (and the related goal of moving the cursor to the insertion point) is not highly practiced. Text can usually be entered without forming and acting on either of these subgoals, and they are not strongly cued by the interface. With no strong support from the driving goal, from practice, or from the interface, the "select" subgoal fails to form.

Possible Solutions for Alternative Scenario

Solutions here include the techniques suggested for making the unselected window more salient in Scenario 1: cursor shape, background color, and readability. A forcing function would also be possible: the system's screen saver could de-select all windows after a certain time, forcing the user to re-establish the correct context on return.

SUMMARY DISCUSSION

Both scenarios describe situations in which the user's current goal, the user's practiced skills, and the interface all fail to create a necessary subgoal. It may sometimes be the case that such subgoals do arise out of the practiced skills of more expert users, but even then they may be too weakly activated to compete with the strongly activated goal of doing "real work" in the

window.

The goals and subgoals we describe are similar to those described in the Soar approach, but we consider the additional issue of "activation." There may be competition among several goals, including subgoals and higher-level goals, and there may be several sources of activation. The most strongly activated goal will be selected for immediate action or further subgoaling.

The immediate "fix" that we suggest is to make the unselected nature of the window more salient. It may also be possible to force the user to select the correct window. The cost of either solution may outweigh the benefit.

References

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