RETRIEVING MEMORIES OF PERSONAL EXPERIENCES

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An important aspect of both comprehension and learning is the utilization of one's own past experiences to understand a current situation. In fact, being reminded of an experience often occurs in the process of retrieving generalizations from memory, suggesting that memories of personal experiences should be encoded in terms of the generic knowledge structures that are utilized in comprehension. Retrieval of these memories should therefore reflect the organization of generic knowledge (Schank, 1982). This paper explores the use of one such knowledge structure in the recall of past experiences.

Schank (1982) proposed that *Memory Organization Packets* (MOPs) represent knowledge about common activities. A MOP is represented as a sequence of *generalized scenes*, each of which consists of actions to accomplish a subgoal of the activity. For example, the RESTAURANT MOP would contain the scenes *Being-seated*, *Ordering*, *Eating*, and *Paying*. Generalized scenes can be referenced by more than one MOP. The generalized *Paying* scene contains the information that is true of paying in general, regardless of context. Each MOP consists of the generalized scenes that occur in that context, augmented by *context-specific* knowledge, a specification of how those scenes are modified (*colored*) for the particular situation. Each of the MOPs that refer to the *Paying* scene (e.g., MOVIE, GROCERY-STORE, RESTAURANT) must contain the information necessary to construct a specific colored version of that scene.

An experience typically contains many differences from the generalizations stored in generic knowledge structures. Schank (1982) argued that these deviations connect the contextualizing knowledge structure and memory for the individual experience. The connection serves as a *retrieval index* for the experience (Kolodner, 1980; Schank, 1982).

We propose that retrieval of an experience involves two types of processing: *(1) Establishing the context:* The context necessary for retrieval will be provided by the specific knowledge structures that were utilized to guide behavior in the experience. *(2) Finding an index:* A retrieval index describing the deviation from the generic structure provides a link to an individual experience. For example, the concept *restaurant* plus the index *I ate too much lasagna and felt sick* might retrieve a particular restaurant experience.

The importance of a search context has been suggested by previous researchers (Norman & Bobrow, 1979; Williams & Hollan, 1981), but is necessary to examine whether there are any functional differences between classes of knowledge structures in memory retrieval (Reiser & Black, 1982). Our hypothesis is that establishment of a MOP as the context will figure more importantly in the search process than other types of structures, such as generalized scenes. The unique aspects of adults' experiences are more likely to be deviations from context-specific knowledge (specified by a MOP), than from the more abstract knowledge represented in generalized scenes. Furthermore, retrieval of even those experiences which are stored as scene-deviations will require the utilization of a MOP to reconstruct the context-specific aspects of the experience. For example, one might remember not being able to find the right credit card while paying at a cash register, but initially fail to recall where the incident occurred, what was being paid for, etc. If a context such as DEPARTMENT-STORE or RESTAURANT could be retrieved, it would provide cues for reconstructing other aspects of the experience. Our view may be contrasted with the position that experiences are stored as arbitrary associations between concepts in networks, with *no* functional differences between different types of concepts in memory retrieval.

We examined the roles of MOPs and generalized scenes in memory retrieval in two autobiographical memory experiments. If it is generally necessary to retrieve a MOP structure to access a memory, then retrieval cues which do not specify a MOP should be inferior. If one is asked to remember a *restaurant-paying* experience, retrieval would be more efficient if the processing begins with the RESTAURANT MOP, rather than the generalized *Paying* scene. In addition, specification of the MOP containing a scene should lead to faster retrieval than specification solely of the scene.

Experiment 1

Subjects saw a pair of phrases separated by a 5 second delay, then recalled a personal experience that fit the two phrases. One of the phrases named a MOP, and the other phrase referred to a scene; the order of presentation of the phrases was varied. The MOP cue named a common activity (*took a ride on a train, went out drinking*). The scene cue described an action sequence that could occur in a number of different contexts. Two types of Scene phrases were used. Regular Scene cues described actions that are a normative component of an activity (*picked out what you wanted, paid at the cash register*), while Failure Scene cues described the failure of some goal of a scene (*didn't get what you asked for, couldn't find a seat*). All scene cues were carefully worded so as not to reveal any particular context.

Forty MOP and scene combinations were constructed

from twenty MOP, ten Failure Scene, and ten Regular Scene phrases. Each MOP was paired with both a Regular Scene and a Failure Scene cue; and each scene was paired with two MOPs:

1a. MOP + Failure Scene:	went out drinking; didn't get what you asked for
1b. MOP + Regular Scene:	went out drinking; paid at the cash register
2a. MOP + Failure Scene:	had your hair cut; didn't get what you asked for
2b. MOP + Regular Scene:	had your hair cut; paid at the cash register

Each subject received ten combinations involving each type of scene cue, so that the MOP phrase was presented first for half of the trials for each type of combination. Each MOP and scene were used only once for a given subject. (For example, a subject received items 1a and 2b, or items 1b and 2a.)

Subjects were instructed to recall an experience that fit the combination of the two phrases presented on each trial, and indicate whether they could remember such an experience by pressing either the *Yes* or *No* key. We emphasized that the memory be a *specific* experience, but that it was not necessary to recall all of the details of the experience before responding. After each *Yes* response, subjects wrote a brief description of the experience. Retrieval times were measured from the presentation of the second phrase until the button press.

Table 1 presents the mean retrieval times for the *Yes* responses for 32 Yale undergraduates. Subjects recalled experiences more quickly when the MOP cue appeared first [$min\ F'(1,44) = 7.98$, $p < .01$]. Secondly, Regular Scene trials yielded faster retrieval times than Failure Scene trials [$min\ F'(1,45) = 6.48$, $p < .05$]. The order of presentation equally affected the two scene types [interaction $F < 1$].

	MOP First	Scene First	Mean
MOP + Regular Scene	4.203	6.492	5.348
MOP + Failure Scene	5.986	8.394	7.120
Mean	5.094	7.443	6.269

Table 1: Retrieval Times (in seconds) for Exp. 1

The faster retrieval times when the MOP cue was presented first confirm the prediction that a MOP structure provides the context necessary to retrieve an experience. When the scene cue appears first, extra processing is required to reconstruct a MOP context, slowing retrieval. An alternative explanation is that when the scene cue is first, an episode is retrieved, but it may not match the MOP that is presented later. In contrast, when the MOP is first and a memory is retrieved, it is much more likely to match the scene cue. Hence, the scene first trials would be slower, because sometimes the retrieved episodes must be discarded and memory search resumed. However, this alternative explanation fails to account for the Failure Scene results. It assumes that memories retrieved with MOPs are likely to fit the scenes, while memories retrieved with scenes may not fit the MOPs. This is true for the Regular Scenes, since restaurant experiences typically contain a *Paying* scene, but paying is experienced in contexts other than restaurants. However, this is not true for Failure Scenes, since an episode retrieved from a MOP cue would *not* be particularly likely to fit the given Failure Scene description. Thus, the results are better explained by a model in which retrieval of the MOP is an essential stage in remembering an individual experience.

Since the MOP provides the context for retrieval, the scene cue provides a constraint on the use of the experiences that are stored with the MOP. Each MOP contains a pool of available indices that specify very salient experiences in that context. Subjects search that pool of indices to discover whether any of those experiences could fit the scene cue. For the Regular Scene trials, the subject is relatively free in drawing from this pool of indices — one must be sure only that the experience that is retrieved can be reconstructed to include the necessary scene. However, when a Failure Scene is presented, the use of available indices is severely constrained, since an index must be found that retrieves an experience containing the particular type of goal-failure that is described in the scene cue. This requires careful consideration of the pool of indices, and perhaps some inferencing about the reasons that such a goal failure would arise, thus adding extra processing to the memory retrieval. Therefore, subjects are slower to remember an experience for those trials involving Failure Scene cues.

Experiment 2

If constraining the target experience to a particular MOP context facilitates retrieval of an experience, then subjects should find it easier to remember an experience when given both a MOP and a scene (presented simultaneously) than when presented with a scene alone. However, if activation of a context is a simple matter of retrieving associations of a scene, then there should be little difference between presentation of a MOP and scene combination and the scene in isolation.

The facilitative nature of the MOP was tested in a second experiment by comparing retrieval times for three types of cues: (1) Scene alone, (2) MOP alone, (3) MOP + Scene combination. All MOP + Scene combinations from Experiment 1 were used; in addition, each MOP and each scene phrase was presented alone. Each subject received 10 trials of each cue type. (These trials were blocked by condition, to guard against the MOP of one trial facilitating the scene of the next trial.) The instructions differed slightly from Experiment 1. Subjects were told to recall an experience that fit the presented description consisting of one or two phrases. Since the materials in the three conditions necessarily differed in length, both reading and response times were collected for each trial. Subjects first indicated when they had read the cue, and then responded to indicate whether they remembered an experience that fit the cue. Retrieval times were measured from the subject's reading time button press until the memory retrieval response.

Table 2 presents the mean retrieval times for *Yes* responses in the three conditions for 36 Yale undergraduates. As predicted, subjects were able to

retrieve an experience more quickly when both a MOP and scene were presented, than when the scene was presented alone [*min* $F'(1,42) = 3.53$, $p < .10$; $F(1,35) = 8.43$, $p < .01$ for subjects; $F(1,18) = 6.08$, $p < .05$ for items]. Subjects were faster to respond to Regular than Failure Scenes, but this difference was only marginally significant [$F(1,35) = 3.08$, $p < .10$ for subjects; *ns* for items].

	Scene Alone	MOP + Scene	MOP Alone
Scene Type			
Regular Scene	5.296	3.383	
Failure Scene	5.292	4.307	
Mean	5.294	3.845	2.154

Table 2: Retrieval Times (in seconds) for Exp. 2

Since the MOP provides a better search context than the generalized scene, the combination is a better retrieval cue than the scene alone. Subjects are slower to respond to the combinations than to the MOPs alone, because the scene cue provides an extra constraint on the use of the indices that are stored with the MOP. The subject must be sure that the recalled experience includes the specified scene of the MOP when given a MOP + Scene combination, but any of the indices may be used when given the MOP alone.

Conclusions

The different structures we have discussed may be considered in terms of the amount of *constraint* they place on the search space — i.e., the set of experiences potentially satisfying the cue. A MOP constrains the set more than a generalized scene, since the scene can occur in multiple contexts. A MOP is somewhat less constraining than a MOP + Scene combination, since the combination specifies a particular segment of the event sequence. In addition, Failure Scenes are more constraining than Regular Scenes, since they specify a particular type of occurrence within a given scene.

Our results suggest that a MOP constitutes the optimal level of specificity for a memory cue. Generalized scenes are not constrained enough, since they become better cues when combined with a MOP, and the scene slows retrieval when presented before the MOP. Once a MOP has been accessed, constraints on the use of indices may *increase* retrieval time, since the most accessible indices may not retrieve experiences that satisfy the given cue. Thus, subjects are slower to remember an experience that satisfies a Failure Scene cue than a Regular Scene cue, and are slower to recall an experience that satisfies both a MOP and a scene cue than one that satisfies only the MOP cue.

In summary, we have argued that knowledge structures may be functionally distinguished by their effectiveness in providing a search context. Accessing a MOP is an essential part of retrieving a past experience from memory, since it provides an optimal search context, and can generate context-specific indices to retrieve memories stored with a scene. Specifying the activity type by naming a MOP is facilitative, but constraining the type of experience that occurred in that context may require extra processing to generate appropriate indices. We suggest that research on the use of memory in naturalistic tasks should focus on considerations of how the content of a generic memory structure is utilized to find and reconstruct a memory for a specific experience.

References

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