# GC3: Memory for Life: Getting Things Back

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March 2, 2004

**Abstract**

A memory repository stands or falls by its retrieval mechanisms. Extra actions at the time of capture can aid subsequent retrieval.

## 1 Introduction

One of the challenges of any lifetime memory repository is to provide an easy means for users to recall items. This is difficult because the repository may be huge, may contain diverse multi-media items, and may have a content largely forgotten by the user. In its simplest form, which is our interest, the challenge relates to extracting individual items, exactly as they were originally stored. This challenge is hard enough. An even harder challenge, not our interest here, is a system that automatically extracts extra knowledge from items captured, and allows the user to employ this as a basis for retrieval.

Our experience of the challenge stems from participation in the Memory Prosthesis work[7] and Forget-me-Not work[3] at Xerox EuroPARC (as it then was) in the early nineties. These memory repository projects were ahead of their time, but helped gain useful experience.

An ideal is that retrieval should be ubiquitously available, irrespective of whether the user is at a desk or on the move. Indeed the mobile case is probably more important, because mobile users, when they need to recall information, do not have ready access to all the facilities of their office, e.g. bookshelves, content of filing cabinets or talking to colleagues.

One theme of our current research is how retrieval can be made easier by adding extra information at the time of capture. This may be done explicitly by the user or automatically. If done by the user it must obviously be easy to do, since if it requires significant extra effort the user will not bother — especially as the vast majority of items captured will never be individually retrieved at all. One way of adding information easily is by annotation.

Below we consider annotation (an approach involving user action) and context-aware retrieval (an automatic approach). As will be seen, these in fact merge into one another.

## 2 Annotation

One strand of our research has focussed on the use of annotation[1]. Annotation was originally proposed by Bush[2] as an aid to his Memex personal storage system, and figures strongly in an important modern manifestation, MyLifeBits[4][5]. In its narrowest sense annotation involves attaching comments to individual fragments of documents on paper or — our interest here — on the screen. Research scientists are big users of annotations: they annotate technical papers with comments that capture their opinions on the relevance and usefulness of the paper to their own work. It would be a huge help to research scientists if they had a simple means of annotating any electronic document they read, together with a memory aid that allowed them to recall, at any subsequent time in their career, the document plus its annotations. (Ideally annotated paper documents could be captured too, e.g. through Digital Desk technology[9].) If annotated documents are captured in this way, annotation can serve either or both of two purposes: (a) an aid to subsequent retrieval; (b) its traditional purpose as a means of tailoring the original document. Usage (a) in particular is strengthened if annotations have attached metadata (even if only simple properties and data types) that captures the nature of the annotation — indeed this is almost mandatory if annotations are to last a lifetime. Perhaps a PhD student might define an annotation data type called *Relevant-to-my-thesis*; data types like this may be used solely to record material for later possible retrieval. In our work items are only remembered if they are annotated, though a really comprehensive system would capture everything.

The above narrow definition of annotation can, of course, be extended by allowing both the annotated document and the annotation itself to be multimedia. Even in 1945 Bush proposed voice annotations. Annotations can also be made by gestures: the purpose of the user's gesture might be to record that a part of a document is interesting, and thus to be given precedence — an example of usage (a). Carrying this a stage further still, the annotation might be detected automatically ('When he read this section of the document his face lit up; it must be highly relevant and pleasing'); detection of annotations then comes in the realm of context-awareness.

## 3 Context-aware-retrieval

With the increasing use of sensors and of intelligent aids to extract useful information from raw sensor values, it is becoming easier to keep a record of a user's context. A principle of the Xerox work mentioned above was that, when in a certain context (which could, for example, be a comparatively high-level context[8], such as 'In a meeting of the XXX group'), the user would often want to recall information previously captured in the same context. Even when this is not so, the user often wants to use the context in which information was captured to recall the information ('What was the document I composed with Jim in Room 177 about 10 months ago?'). We have been working on retrieving

information by context[6], and in particular improving both the speed and precision of recall. Our work tries to exploit a specific property of a user's context: context usually changes gradually and semi-predictably. Thus some retrieval needs can be guessed in advance; furthermore retrieved documents can be made more relevant by taking account of past and likely future context. Clearly the application of this work is for retrieving itms in episodic memory.

# 4 Conclusions

We believe that users of lifetime memory repositories need aids to make retrieval effective. As a specific and simple example — but still a challenge — research scientists would gain greatly from a system that, throughout their whole career, recorded all documents that they had annotated. Here the annotations provide an added aid to retrieval, and are, of course, also valuable in themselves. As a general application, automatically capturing all elements of the user's context (one element of which may be gestures to be interpreted as annotations) provides an extra dimension to aid retrieval. This is a sub-challenge of Memories for Life, but it is still a Grand one.

# References


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