Reliving VE Day With Schemata Activation

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Abstract

This paper reports some preliminary work on the IntoMyWorld candidate Presence II project. One of the key components of IntoMyWorld is a mixed reality 'album' of important events. The album will contain entries which will allow people, for example, to re-immerse themselves in their own weddings or other significant events. Among our first tasks are (a) to understand the salient features and dimensions of events which must be captured and (b) identify the range of environmental cues required to trigger memories and re-immersion. Our psychological position has been draw upon contemporary thinking on autobiographical memory and add to this aspects of schema theory. Schema theory claims that memories are encoded and recalled in structured packets that have 'slots' which can store either default or individual values. While psychologists have studied schemata and have experimentally manipulated their formation and recall, we propose to activate them using technology. The IntoMyWorld system will make use of situated, interactive schemata to help trigger memories and with this a sense of being present once more at specific events and places. In this initial work we consider some of the issues in re-creating a significant event in the lives of our parents and grandparents, namely VE day – May 1945.

1. Introduction

IntoMyWorld is a candidate Presence II project which has been developed by a consortium of universities, research labs and industrial partners across Europe led by Centre for Research and Technology Hellas. As currently formulated, IntoMyWorld comprises three paradigmatic development streams, the first of which is *My Life Album*, an intelligent album that will selectively record, store and replay important events of our everyday life. The second is the *My Life Learning Notebook* which is an advanced notebook containing procedural and propositional knowledge acquired from practice and finally, *My Memory Aid* which will be of particular value to people experiencing memory problems and other forms of cognitive deficit. IntoMyWorld is an interactive system which aims to support recall, recognition and immersion in memories by supplying a cue-rich environment. The focus of this paper is a discussion of some of the psychological issues involved in constructing an entry in *My Life Album* and how this entry might then be used to immerse an individual in this memory. Among the major psychological research which is required to underpin the development of the IntoMyWorld concept includes:

- understanding 'everyday presence', that is, identifying the salient features of the environment – people, events, places – which are central to the experience of being present. Having identified these features, the technologists in IntoMyWorld will then be tasked to 'record' and 'replay' them.

- understanding the relationship between memory and presence. The IntoMyWorld technology cannot hope to faithfully replay all aspects of the occasion: instead the mixed reality system will present an evocative chiaroscuro of the event.

2. VE Day

This year being the sixtieth anniversary of the end of the Second World War, we have decided to consider what would be required to re-create the experience of VE day. As a first step in the development of the IntoMyWorld system we need to understand what people remember of a significant event such as this. While there are a number of psychological studies of remote memories and reminiscences (e.g. [1], [2], [3], [4], [5]), none have considered them from the perspective of providing a technological memory prosthesis.

VE day – Victory in Europe – was 8th May 1945. In Britain it was marked by street parties and wild celebration. We have chosen this event not only because of its significance but as there are abundant first-hand accounts of the day readily available on the Web. The results of an analysis of several sets of archived accounts are presented in section 6. There is also a significant historical archive of the event.

By a recreation of the experience of VE day we intend considering what would be required to re-immerse someone (who was there) in the sights and sounds of the event. (This is not to suggest that other people might not be able to engage in this sort of 'time travel' but this is outwith the scope of the current discussion.) The question then is, what are the environmental cues which might serve to trigger autobiographical memories of the event and together re-create the sense of being there. From this description it should be clear that we have not adopted the traditional approach to memory. For many psychologists, memory is a purely cognitive faculty but studied in the laboratory. For IntoMyWorld, memory is taken to be the everyday process of reconstruction which relies upon environmental, situated cues.

3. Memory and Presence

Memory must have a role in presence but there has been little or no empirical research conducted into this to date. A significant exception to this is Riva *et al.*'s (2004) three-layer model of presence in which memory plays an important role [6]. The three layers of the model are:

- *proto presence* – the embodied aspect of presence relating to the differentiation of the self from the world;
- *core presence* – a process of selective attention to perceptual stimuli, supporting the discrimination of external reality from the contents of one's consciousness, dreams or memories;
- *extended presence* - which serves to assess the relationship and significance of events in the world in the context of the memories and so forth which make up the autobiographical self.

It is evident that they see a role for memory in two of the three layers of presence. It is also worth quoting at length the scenario used to illustrate how the model works.

"To understand how these components are related we can use an example: the way our self experiences our first view of the Colosseum in Rome. We receive sensory signals from our eyes, ears, nose and sense of touch that are mapped by the proto self—the feeling of something happening. […] this leads to perceptual activity which is monitored by the core self and becomes the content of core consciousness […] Some milliseconds later, it adds dispositional records of that place (or similar places), records which typically include stored sensory, motor response and emotional data. If these records are also part of autobiographical memory — the organized record of the main aspects of our biographies we may consciously recognize the place because we studied it in architectural history; and we may have emotional ties because we associate the place with special memories […]. The result is a single conscious experience integrating perceptions, emotions and feeling. Once the event has ended, it is restored in dispositional space with new data about our most recent experience."

This 'thought experiment' clearly illustrates the intimacy of memory and presence. In reading this it is immediately evident that memory is a major substrate upon which presence 'resides'.

4. Our Epistemological Orientation

Despite the (above) discussion of the three-layer model of presence we do not subscribe to Riva *et al.*'s description of autobiographical memory as simply "the organized record of the main aspects of our biographies" (ibid: 408). Instead we have adopted an epistemological position similar to that of Clark and others who argued for a situated, interactionist account of complex cognitive and affective phenomena (e.g. [7] [8], [9], [10]).

Gero and Peng (2004: 3) define situated-ness as "where you are when you do what you do matters". They go on, "[It] states that an agent's knowledge depends on the conext in which it is situated. What can be cognized is also related to agent's experiences which are grounded from memory constructed though agent-environment interactions". Gero also regarded memory as a constructive process – constructed from the experiential responses to environmental cues, the activated memory and past experiences.

Clancey (1991: 91) writing from an artificial intelligence / cognitive science perspective, describes situated cognition as "the study of how representations are created and given meaning. An essential idea is that this process is perceptual and inherently dialectic. That is, the organization of mental processes producing coherent sequences of activity and the organization of representational forms … arise together". He continues in the same vein noting that Bartlett – a pioneer in memory research - observed that "mental organizations do not merely drive activity like stored programs, but are created in the course of the activity, always as new, living structures" [11]. The situated perspective should be seen as a continuum ranging from the very radical formulations which reject computation and representation (e.g. [12] [13]) to those which recognise that complex human behaviour cannot be described in a context-free manner ([14] [15]). However, situated cognition generally does recognise that such behaviour cannot simply be attributed to pre-existing internally in neural structures **or** features of the world *per se* but from an interaction between the two.

We argue for an interaction between internal representation and external, situated cues, consistent with the common experience that an environmental cue can evoke a memory which in turn can conjure an entire scene in which we can feel immersed, involved and present. Having made a case for a situated, interactionist account, we need to discuss the nature of the internal representation. this brings us to a review of the various aspects of memory.

5. A Proliferation Of Memories

There is a profusion of terms, metaphors, models and methodologies with respect to memory. After reviewing a number of candidate models we have adopted a *schematic* account of *autobiographical memory*. While we are presenting a psychological perspective on memory and presence, we must equally retain an engineering perspective too. Clearly, recalling personal memories, by definition, involves autobiographical memory and there is abundant evidence that such memories are recalled as stories and these stories have a schematic structure ([16] [17]). We begin, however, with a discussion of autobiographical memory.

5.1 Autobiographical and Episodic Memories

Tulving [18] was the first to propose two different forms of long term memory, namely episodic and semantic memory. Semantic memory hold general knowledge, facts about the world. This is not seen to be of personal significance. In contrast, episodic memory consists of a

record of personal experiences. While Tulving initially considered episodic memory to be synonymous with autobiographic memory, his position was eventually modified to recognize that autobiographical memory is a special kind of episodic memory concerned with life events. Moving beyond these early studies, we have found the Conway's work on autobiographical memory, episodic memory, mental models and their inter-relationships both compelling and convincing [19] [20]. Conway has argued that episodic memories comprise highly detailed sensory perceptual knowledge of recent experiences. These memories are typically retained for intervals of minutes to hours. They might also be thought of as a sort of 'sample' of past experiences and this sample is sparse compared with the number formed. These episodic memories may then be integrated with the autobiographical memory 'knowledge base'. Conway conceives of autobiographical memory as an account of our memories from the perspective of personal goals. As he puts it "a central tenet of this account is that a fundamental function of human memory is to retain knowledge on the progress of personal goals, i.e. whether they have been achieved or not" (Conway, 2001: 1375). Conway's model of autobiographical memory has potentially some interesting consequences for presence research. He describes our "mental model of the current situation" which might correspond to our sense of presence as comprising representations of the current situation in the episodic buffer *and* patterns of activation over knowledge structures in semantic memory *and* activation of the goal hierarchy of the working self *and* the affective state. Unfortunately space precludes a more detailed discussion of this model.

5.3 Schematic memory

We noted above that people recall events from their autobiographical memory as stories and these stories have a schematic structure. Schema theory can be traced back to the seminal work of Bartlett [11]. Bartlett introduced the notion of schemata in order to explain how it is that when people remember stories. He found, for example, that we typically omit some details and introduce rationalizations, reconstructing the story so as to make sense in terms of their own knowledge and experience. According to Bartlett, the story is assimilated to pre-stored schemata based on previous experiences.

Schema theory argues that our knowledge of the world is stored in memory as schemata, each of which incorporates all the knowledge of a given type of object or event that we have acquired from experience. Schemata operate in a bottom-up direction to help us interpret the bottom-up flow of information from the world. New experiences are not just passively copied or recorded into memory. A mental representation is activity constructed by processes influenced by schemata.

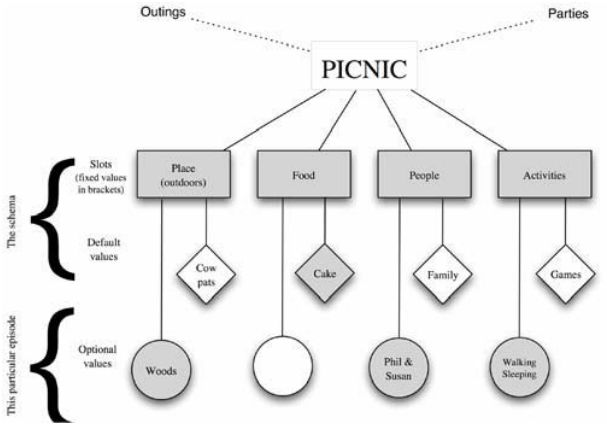

Figure 1: The picnic schema – after [21]

Current versions of schema theory have incorporated many of Bartlett's ideas, specifically the concept that what is encoded, stored and retrieved from memory is determined by existing schemata. Thus schemata drive the selection of what aspects of a new input will be stored and may modify the memory representation of a new experience so as to bring it into line with prior expectations and make it consistent with past experience. New experiences in turn can be stored as new schemata or modifications of old schemata, adding to our store of general knowledge. Structurally schemata are packets of information representing knowledge about objects, situations, events, or actions. Rumelhart and Norman [22] list five characteristics of schemata:

1. Schemata represents knowledge of all kinds from the simple to the more complex including *episodic memory and autobiographical memory*.
2. Schemata are linked together into related systems as can be seen in figure 3, the picnic schema is linked to 'outings' and 'parties'.
3. A schema has *slots* which may be filled with fixed, compulsory values or variable, optional, personal data.
4. Schema incorporate all kinds of different information we have accumulated.
5. Schemata operating at different levels may re-organize and interpret new inputs.

The interactionist, situated account of memory which we have proposed underpins the modified version of schemata which we now suggest as a psychologically-plausible means of *indicating* the contents for a particular type of (re)-experience. (It is tempting to suggest we could *specify* the contents, but it is much too early in the development of these concepts to make such a strong claim.) These schemata contain one set of slots whose default values are pre-identified and re-created using the IntoMyWorld technology. These values will draw on data from analysis of the contents of individuals' memories of the type of event concerned and historical accounts where available. A complementary set of slots have contents which are necessarily unique and personal to the individual: their contents cannot be pre-specified. The instantiation of

these elements of the schemata, we propose, is achieved through the triggering of memories of one's emotions, activities, close companions and so forth by the IntoMyWorld experience. We argue that this is an interactive, situated process which will engender re-immersion in the event and a sense of being there again. However we do recognize that there is a good deal of conceptual work to be done to bring together Conway's work with schema theory.

As an illustration, section 6 describes how an analysis of individual memories of VE day might indicate the range of elements to be included as slots in an IntoMyWorld schema, the default values for some of these slots, and the sort of instance values which might be expected to be triggered when an individual re-experiences the events of this particular piece of the past.

5.4 Activating Schematic Memories

Central to our reasoning is the belief that the IntoMyWorld mixed-reality system can trigger or more correctly, activate networks of autobiographical schemata. In this section we discuss prior studies intended to specifically activate schematic memories. Unhappily the evidence is 'sharply contradictory' as noted by Rojahn and Pettigrew's meta-review of 60 independent studies with 165 comparative tests [23]. They found overall result shows a slight overall memory advantage for schema-*inconsistent* information. However they are quick to note that the effects are highly heterogeneous. They go on to remark that "schema-based processing is moderated by an array of variables" including "guessing and whether the measurements were of recall or recognition, length of exposure to inconsistent information, delay between presentation of the stimulus and the memory test, proportion of inconsistent items, order of schema-presentation, degree of inconsistency and importance of categories to subjects all had significant impacts on inconsistency resolution". To this should be added that while there is considerable interest in the fine psychological detail as to how schemata operate, for the current purposes we have settled for the psychological plausible. And there is evidence that schemata do apply to memories mediated by virtual environments. For example, Flannery and Walles [24] have reported a study in which explored how schemata operate in a well-known environment and to examine whether or not schemata operate differently in real versus virtual environments. They found that the virtual reality situation produced similar outcomes compared to the real world.

6. Remembering VE Day

The preliminary study below illustrates how schemata might be derived from a set of real world accounts of being present at a memorable event. There is of course a wide spectrum of events which might be re-created in IntoMyWorld, from the small-scale intimacy of a child's first words to the large public occasion. The event discussed here is largely of the latter type, namely the VE day celebrations of 7/8 May 1945. VE day immediately followed the Nazi surrender to Allied forces towards the end of the Second World War. In Britain Winston Churchill announced the end European hostilities on the evening of 7 May, declaring May 8 as a public holiday and day of celebration. Historical records and contemporary accounts document people celebrating in the streets on the evening of May 7 and throughout May 8, celebrations which culminated in London with the appearance of members of the Royal family and Churchill on the balcony of Buckingham palace. Outside London celebrations were naturally smaller in scale and varied in character.

6.1. Archive sources

A number of publicly available web archives are available which bring together personal, individual memories of VE day. Of these, the largest and most accessible collections identified were those collated by SAGA[1] magazine [25], the Museum of London [26], and the BBC [27]. The memory texts have been volunteered by individuals and range in length from a couple of sentences to 10 or so paragraphs. The wording of the call for contributions to the SAGA magazine is not available. The Museum of London specifically prompts its contributors "How did you find out that the war in Europe was over? What did you do? How did you feel? What did it mean? What do you think now, looking back? ". On the BBC site (dedicated to WW2 history in general), contributors are asked to be "post authentic stories based on their own, honest interpretations of the time." It is also suggested that they may wish to check facts against material elsewhere on the site, and to read other stories to gain inspiration. There do not, however, appear to be systematic differences in style or content between these three archives analysed, and the description following aggregates the texts from the three collections.

A caveat here: it is impossible to know from the information available on the web archives exactly how far, if at all, the texts have been edited. Certainly all examples are grammatical, correctly spelled and so forth and are coherent 'stories' or fragments of stories, and some of the BBC stories which appear on the main page of the archive in question have had their text "polished and cross-referenced". However, since the point of this study is to identify possible schemata in the content of VE day memories we do not consider the likelihood of some traces of an editorial hand to be a problem.

24 texts in total described the experience of VE day somewhere in Britain, whether from the perspective of a child, a civilian teenager or adult, or a member of the armed forces joining public celebrations. A further 11 texts – treated separately – are accounts of VE day from the perspective of members of the forces on active service overseas.

[1] SAGA is a British organization 'providing high-quality services for people aged 50 and over'.

6.2. Identifying Potential Schemata And 'Slots'

An iterative process of categorization and re-categorization of the content of the accounts resulted in the identification of recurrent elements in the 24 'home' texts which were agreed by both authors. Both first-person and third-person perspectives were evident: representative examples of the former being the identification of one's own vantage point in a crowded public space or feeling thrilled to see the Royal Family, of the latter descriptions of crowds singing and dancing, or the sight of many bonfires.

Only 11 texts were generated by members of the services abroad. Given this small body of evidence these do not merit systematic comparison with the civilian data. The main differences, however, appear to be more reporting of one's own activities, fewer mentions of large masses of people and less explicit retrospection.

Even a passing consideration of the main dataset, civilian celebrations, suggests that the four of main elements of any story are present – who, what, when, where. Why is usually implicit, but is the historical fact of the end of the European war. More usefully, however, we can begin to see what a set of 'VE day celebration' schemata might look like – as shown in table 1 below.

6.3 IntoMyWorld In Practice

We are now in a position to visualize IntoMyWorld in operation. We have used a data-rich historical event to illustrate some of the psychological challenges facing us but IntoMyWorld is expected to be used prospectively. We can imagine that it has been used to capture and record the salient features of the a significant event guided by a system of interlinked schemata. The mixed reality platform which is at the heart of IntoMyWorld is then able to create a chiaroscuro of the scene / event, and in doing so activates the interlinked, schematically organized autobiographical memories of the user. Then, technology and psychology work together to re-immersed the user in the event.

Mass public celebration	
Crowds[2]	Extremely large crowds[3]
Public figures	Royal family and Churchill "shouting and cheering at the appearance of Winston Churchill and all the Royal Family" *Saga 4*
Central public space	In front of Buckingham palace "being in the crowd outside Buckingham Palace" *MoL 11*
Crowd behaviour	Singing & dancing, hugging and kissing, waving flags "Hundreds of people all waving flags were crowding in" *BBC 1*
Crowd emotions	Joyful and relieved. "The crowds were enormous and unbelievably joyful and happy" *MoL 9*
Physical sensations	Tired at the end of the day "reached my home with very sore feet" *MoL 9*

Being part of a historic event	
What led up to the event	Wartime events as experienced by London population "We had just come through the horrors of 'Doodlebugs' & V2 rocket attacks" *MoL 3*
Who I was with	Friends and family "went by train from New Eltham to Charing Cross to join up with our fellow students." *MoL 9*
Where I was	In central London
What I feel about it now	Grateful to others. "Looking back now, I really appreciate all the efforts of our forces and those at home." *MoL 5*

Table 1: Possible VE-day Schemata

7. Discussion

In this paper we have reviewed the main strands of current autobiographical memory research and indicated the relationship of autobiographical memory to presence. We then presented a case for an interactive, situated treatment of memory based on schema theory and illustrated how a modified version of schemata might serve as a plausible way of embodying the aspects of memory theory which are most pertinent for applications aiming to recreate the personal past. The last section of the paper discussed how VE-day schemata might be defined and re-created, using the IntoMyWorld technology to provide environmental cues matching the default values of slots in the schemata, which together with the instantiation of an individual's personal slots and values would trigger re-immersion in past memories.

We hope that such schemata are both psychologically plausible and sufficiently substantial to provide a starting point in guiding the design of the IntoMyWorld technologies and the contents of the experiences to be re-created. The success of the concept in this and any similar application contexts will demand close co-working between psychologists and technologists to create a conceptual framework and define associated terminology which is theoretically robust and practically useful. There are, of course, numerous questions raised but left unanswered by the argument and proposals above. To indicate just one question which is directly pertinent, what is the role of priming in successfully activating the contents of memory schemata in such contexts? There is little helpful applied material to guide us in this area – for example Nunez and Blake [28] who proposed a schema-based account of perception and presence, found no direct relationship between sense of presence and priming participants with literature relevant to the virtual environments experienced, so the effects are not as clear-cut as might be expected. Nonetheless, most documentaries and feature films

[2] Possible 'slots' (illustrative examples only)

[3] Possible default values for VE day from archived accounts with selected illustrative quotations. We are aware here that the provision of a set of slots with default values raises the unwelcome possibility of the manipulation of the contents of people's memory. Clearly there are ethical issues here which demand very careful consideration.

featuring historical events prime their viewers with brief factual introductions, period music and other effects. How might these and other stimuli best be adapted to support the transition to a recreated past? What might be the role of tangible stimuli? Applications which seek to create a sense of presence in the past provide both stimulating technological challenges and a rich environment for the exploration and further development of the theory of memory and other related areas of psychology.

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