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**In Proceedings of The 1st International Workshop On 3d Virtual Heritage,**  
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# Learning and engagement in a 3D environment— Teaching philosophy through the Art of Memory

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## Abstract

In this paper we describe an initial attempt at exploring the possible benefits of using the method of Art of Memory. This in a way as to inspire the design of a 3D environment for presenting non-trivial educational content. A pilot user study is reported from that empirically evaluated the environment on the dimensions of learning, engagement and attitudes. Our findings indicate that utilising the Art of Memory to construct engaging 3D environments has good potential, but that further research is needed before its educational benefits can be established.

## Introduction

The Art of Memory is a memorisation-aiding technique with ancient roots (Yates 1966, 1969a, 1969b). Using the technique involves using imaginary or physical places to act as scaffolding for remembering information. Two central principles of the Art of Memory are visualization and association, i.e., information is associated with visualized locations and artefacts within those locations. Historically, the locations and artefacts were chosen to maximise the practitioner's engagement in the subject. As a result, mental images of extreme or even surrealistic content were often used. As we shall see, this is reflected in the design of our 3D environment.

There are many application areas that rely heavily on 3D content. Simulation, design and visualisation have utilised 3D for decades. Since the early 1990s, 3D and Virtual Reality has also been introduced in educational contexts. Examples of applications include the teaching of physics (Dede, 1996), the greenhouse effect (Jackson, 1999), colour science (Stone, 2000) and advanced mathematics (Taxén and Naeve, 2002).

In addition, educators have recently shown an increased interest in computer gaming technologies, e.g., (Prensky, 2001). Games are known to be engaging, and an increasing number of today's youth have experience with and an interest in computer game playing. Because of the importance of motivation and engagement for learning, it is felt that the introduction of gaming elements into an educational context can be beneficial. Ultimately, our work aims to extend these efforts with design ideas from the technique of Art of Memory in order to further increase the level of engagement in the educational content.

In a previous set of studies, we compared 3D environments with papers containing text and images with respect to ease of learning, engagement and attitudes towards the content (Hedman, 2001). Our results indicated that difficult material could indeed be more engaging and easier to understand when encased in even a rudimentary 3D environment. Another finding in this work was that it was difficult to change previously established attitudes towards the content - encasing it in 3D did not make a difference. In this study, we wanted to see whether the Art of Memory could help in transforming attitudes towards the content.

## Description



Figure 1. A philosopher room with images, objects and text.

The content subject in this setting of our study is the philosophy of epistemology. We choose four philosophers (John Locke, George Berkeley, David Hume and Immanuel Kant) and selected a set of quotes and ideas for each of them. Then, a virtual world was designed with four rooms, one for each philosopher, in which the same set of ideas and quotes were arranged. In addition to the text, pictures, paintings and other artefacts that serve both to support the texts and communicate the personal character of the philosophers were added (figure 1).

The rooms are located in a spatial structure that is intended as an aid to memory. It is built with stairs, hallways and platforms and is located in a space. (Figure 2.) The philosophers' writings on epistemology are traced out to form a chain of arguments in a toroidal-shaped corridor that surrounds the four rooms. The design of the environment aims to be as varied and easy to traverse as possible, and special care has been taken to make it inviting and pleasing to the eye. The objects are, in according to the art of memory, chosen to have a striking appearance and to give depth and atmosphere to the setting. (figure 3).

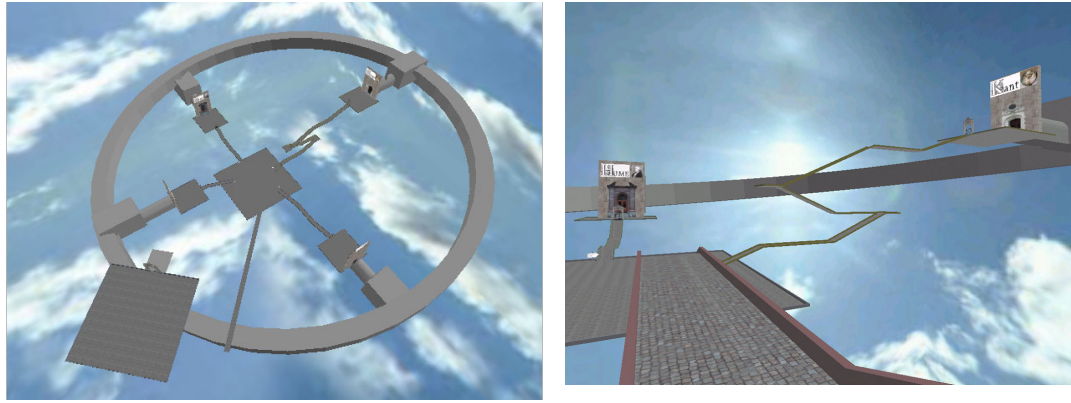


Figure 2. Overview from the outside with connecting walkways and corridor.

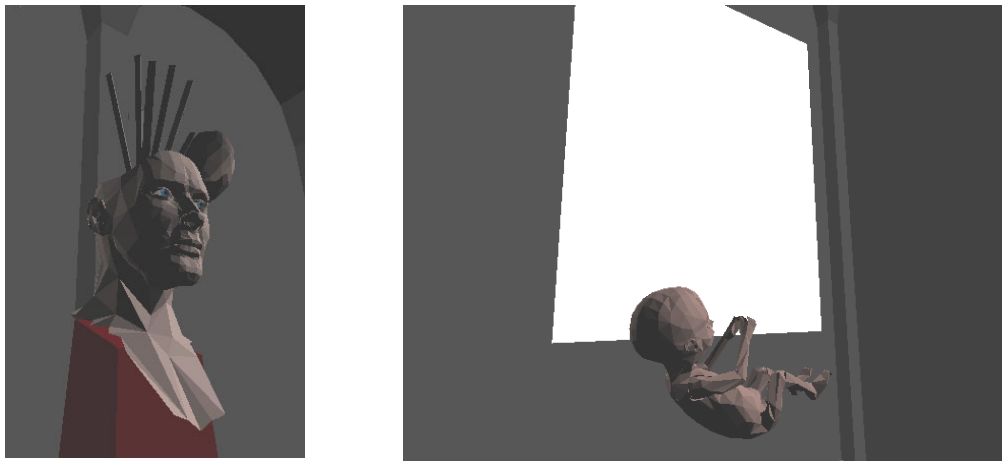


Figure 3. Striking objects.

The software platform is WASA, a set of tools for creating interactive 3D applications developed at CID. The 3D environment serves as a mini course on epistemology and it was compared to text materials presented as printed pages in a user study.

### **The study**

A pilot study was undertaken with two independent groups of subjects, five in each condition. The two conditions were text and 3D. The subjects who participated in the text condition were seated at a desk with four printed sheets of paper. Each paper covered material from one of the four philosophers. The subjects who participated in the 3D condition were seated in front of a projection screen (110 x 90 cm) with the 3D environment. The same textual content was available in the 3D environment world as was printed on the papers in the text condition. All subjects were given the same basic scenario: they were part of a study group that met weekly to discuss philosophy. Next week they were to discuss the philosophers soon to be presented to them. In the

3D condition, the subjects were given minimal operating instructions and were asked to explore the environment so that they could report on it at the study group meeting. No time limit was imposed on the subjects who were told to go through the materials in their own pace. After the subjects were finished they were given a questionnaire and a simple matching test. The matching test involved pasting labels with printed texts onto four sheets of papers each titled with a philosopher's name. The selections that the subjects were asked to match with each philosopher were taken from content that the subjects had encountered in the trial.

## Results

The results of the study are summarised in table 1. No marked differences were found in the subjects' attitudes towards the learning content. Overall, the subjects rated the philosophers just as appealing in both conditions. They found the subject equally engaging in both conditions and there were no marked differences in how difficult they perceived it to be. However, the subjects in the text condition performed markedly better in the label-matching task.

	<b>3D condition</b>	<b>Text condition</b>
<b>Average overall rating of philosophers</b>	5,8	5,6
<b>Average perceived difficulty of philosophers</b>	7,2	6
<b>Average engagement rating of the philosophers</b>	5,6	5,8
<b>Average number of correct matches</b>	10	16,4

Table 1: Subject ratings (in a ranking scale from 1 to 10.)

All subjects but one preferred the 3D condition and all subjects stated that they liked the 3D environment and thought it engaging, visually and aesthetically pleasing, well organised, and easy to navigate.

However, the study identified a set of issues that might improve the design of the environment. The large distances between the philosophers' rooms made it difficult for subjects to quickly move between the rooms. We observed that some subjects had some difficulty in positioning themselves and navigating through the environment. Some subjects suggested that more 3D objects, preferably of an interactive nature, should be put into the environment to illustrate the material. There is also the question of whether comparing the 3D environment to a text is a good method of evaluation and if not alternate ways of observing the result of the learning process should be called for.

## Discussion

Since we have found previously that attitudes towards difficult content can be improved by placing the content within a 3D environment we expected similar results would be obtained in the present study. The lack of such an improvement can be related to the design issues of the 3D environment described above. Making the areas between the rooms smaller might help in rehearsing and comparing the different materials. Making it easier to position oneself in the environment might improve the readability of the texts. Also different ways of presenting text could be pondered upon. One would be to combine 3D/2D and put texts in the screen plane when selected for easier reading. Enabling the user to cut and paste into some notepad for personal notes and comments, perhaps together with objects or links to locations in the environment, could be another improvement. Simply providing images, texts and



3D objects for illustration may not have been enough to make for a truly engaging experience, and it may be that the inclusion of interaction with objects or autonomous avatars is also needed. The structural aspect of the 3D world itself is another important question, which in this study was only briefly touched upon.

Clearly, no definite conclusions can be drawn from this initial study. According to writings on the Art of Memory, many people up until the late renaissance used this technique for memorising impressive amounts of information. However, practitioners of the Art of Memory could move swiftly within and between mental loci. The 3D environment used in our study did not allow for this kind of rapid traversal. Nor was it constructed by the subjects themselves. It is an open question as to how much of the Art of Memory can actually be deployed in a 3D environment. However, since it may be an enabling factor in creating engaging experiences and positive attitudes, we are planning a follow-up study with a modified environment. By conducting explorative studies of 3D learning environments with educational content we build on the old tradition of incorporeal places for harbouring information as in the Art of Memory. It may be that in the awakening of positive attitudes and engaging learning in 3D environments, the Art of Memory will have a new renaissance. However, further research is needed in order to provide a foundation for building such environments with insight into the design parameters of the modern version of the Art of Memory.

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