Past Viewer: Development of Wearable Learning System for History Education

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Abstract
We have developed a system that helps users acquire historical viewpoints using a wearable computer. This is accomplished by overlaying incidents from the past and live scenes from the present on a see-through display. The purpose of this system is to enable history learners to combine past and present information and obtain a significant notion of the continuity of time through viewing part of the series of events which happened in that very place. In evaluating this system, we found out that users could experience and feel history as a reality. We contend that this system is effective in furthering the motivation of history learners, and we have an expectation that it can become a significant new educational media.

Keywords: Wearable Computer, Overlay, History Learning, Motivation, Augmented Reality

1. Introduction
1.1. Research background
A “wearable computer” is a component with a computer attached to a human body and a Head Mounted Display (HMD, Fig1). It had been originally developed for military purposes, such as maintenance of complex equipment. The amount of manuals regarding maintenance of an airplane, for example, was enormous, and it was a herculean task for mechanics to refer to such manuals while working in the bottom of a huge airplane body. By introducing a wearable computer, their work efficiency was drastically improved. Today, with technical innovation, the total weight of a main computer and a display has become less than 1 kg and HMD became almost the same size as a pair of glasses. This made its application to the fields of education, medicine and architecture more practical.

1.2. Prior research
Much research on wearable computers emerged from Augmented Reality (AR). AR is a kind of Mixed Reality that connects extended reality to the real world. A system called KARMA (Feiner 1993) is famous in this field. This is a maintenance support system for laser beam printers. Nakajima (1999) developed a system that enables viewers to see stars on a celestial sphere as a constellation. Past research was emerged from engineering standpoints. Research on educational use of wearable computers has just started.

Ockerman (1997) compared effectiveness between textbooks and wearable computers when non-Japanese learn how to make “Origami”, Japanese paper craft art. Bowskill (1999) verified distance communication with ABATA on a wearable display. This study also mentioned that using a wearable display was applicable for scientific experiments and processes of cross-cultural exchange.

2. Development of Past Viewer
2.1 Past Viewer
Past Viewer is designed for history learners to use in front of a historical building. It overlays news films reporting historical events which have occurred there on top of the present scene in order to encourage viewers to connect the important events in the past with the present historical monument. With help of a see-through display, they can feel as if they are experiencing a historical incident in front of the historical monument.

Fig.1 Head Mount Display (HMD)

2.2 Historical Objects to be Studied
For this research, Yasuda Auditorium (built in 1925, Fig2) at the University of Tokyo was chosen as a historical object. This place can be traced back to 2000 years ago with archaeological items, and especially in contemporary history of Japan, it is well known as political battlefield between students and the government in the 1960’s. This method of overlaying the past incident and present scenery is applicable, for example, for famous world monuments like the Arch of Triumph in France(Fig3) or the Berlin Wall in Germany.(Fig4)
2.3 Structure of educational scenario with Past Viewer

1. A learner wears a backpack containing a note-type computer, a HMD, a headphone and a mouse. (Fig5)
2. Educational scenario consists of the following three parts:
   Part 1 Three minutes of news film clips taken at the place where learners are standing at present.
   Part 2 Six one minute movies of the could sympathize with people who were here before me
   and I was awaked by a new viewpoint.”

A, B and C seemed that they already have historical viewpoints from the results of pre-test. These persons are considered to reinforce their own viewpoints in this experiment. On contrary, in the case of D, she could succeed in getting a historical viewpoint because she has never imagined such an interpretation. We consider that

Fig.2 Yasuda Auditorium (1969/2001) Fig.1 The Arch of Triumph (1919/2002) Fig.4 Brandenburg Gate (1989/2001)

University of Tokyo Dispute
in 1969.
Part 3 Ten minutes of movies and photos of scenes between
1927-2001

In Parts 1 and 2, Users watch the past movies with the navigation shown on HMD. In Part 2, they move to the six different geographical viewpoints with mouse operation In Part 3, still pictures and movies on Yasuda Auditorium from 1927 to 2001 are presented. Users are asked to find out where these pictures were shot. As overlaying pictures, they voluntarily perform these tours which deepen their knowledge about history.

3. Implementation

We interviewed ten people aged 10-40 who used Past Viewer. The purpose of interview is whether they experienced changes about their own historical viewpoints by overlaying past and present information. After using this system, four of ten persons recognized acquiring new viewpoints which connect the past and present as follows:

A (man in 30's): “I noticed afresh that the place where I stood had been existing for a very long time!”
B (woman in 20's): “It gave me a cue to reflect present situation, I feel as if I entered into history.”
C (man in 20's): “I haven’t experienced history with feeling. But I can do so now”
D (woman in 20's): “I thought that history was another person’s affairs and looked on it from the outside. But (through using Past Viewer), I

Fig.5 The scenery of practice

she could notice a viewpoint which connects the past and present.

4. Summary and further research

We developed the system using a wearable computer to enhance learners acquiring historic viewpoints with the expectation that this will give stronger motivation to those who study history. Though we admit that the number of subjects is not enough, it is significant that some learners showed their deeper interest on connection between place and its history after they used Past Viewer. We will keep collecting data and analyze patterns of the experience.

5. References