

GENERATING VIRTUAL LANDSCAPES BY DETECTING HUMAN-ENVIRONMENT INTERACTION

For Assisting Disabled Passengers at Airports

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Abstract. The goal of this research is to explore a potential application of human-environment interaction at international airports. It is a system for generating delightful interior virtual landscape from the sensors, which are sensitive to the passengers' various movements. For the disabled passengers, this research analyses how to assist them for visual relaxing and entertainment.

1. Introduction

This is an underdeveloped research, which ideas described in this paper are not totally already in well implementation. However, in an informational architecture era, this study proposes a potential application of human-environment interaction and a discussion about how to provide visual entertainment for passengers in airports, especially for the handicapped passengers.

This system collects human movement in international airports with the intention of enabling passengers to trickle a spatially correspondent multimedia information database about a specific nice environmental elements (sounds, lights, natural and architectural scenery) as the passengers move over time. The walking speed, body movements, and the colors of dressing are inputs. By analyzing these attributes of inputs, the system automatically

matches the environment database, generates virtual landscapes, and displays them through screens and speakers,

2. Review

For environmental studies, at beginning, researchers attempted to digitize three-dimensional shapes using multi-view image fusion (Chen, 1999). Later, researchers brought us inspiring inventions. They successfully provided methodologies for image processing which allow researchers catching the motion of parts of the body to be digitized in order to provide animation (Fenecott, 1999a, 1999b, 2001; Engeli, 2001). After that, the artists use electro-mechanical sensors, which are placed on the body to track the location of limbs in order to move animated figures (Jeffrey et al., 2003). Content and creativity in virtual environment design have brought academic interests for many years. However, we still need more research on the application of human-environment interaction. The aim of this research is to propose a methodology that the design and prototyping of an "environmental media" system for bringing artificial landscape to the physical world.

Second and subsequent paragraphs indented 5 mm from the left-hand margin, with no extra space between the paragraphs.

Citations are in the Harvard style, e.g. Sasada (1991) where author's name appears in text, or where authors' names are not cited specifically in text, add citation in parentheses (Bernus and Chase, 1990; Sasada, 1991) with citations in sequential order.

3. Methodology

At an airport, passengers who are waiting for boarding a plane often need places for relaxing, such as reading, sleeping, massage, etc. Cognitive scientists studied how passengers recognize the location with the design of these places (Mandler, 1985). Interior landscape is also an important design for relaxing and recognition of place. However, many artificial landscapes nowadays are unchanging.

Terminal 2 of CKS International Airport in Taiwan is a case for studying (Figure 1). This study has been developing a program to produce signals based on what is seen by video cameras. It enables the computer to sense movement and the position of subjects in space. The sensed information is interpreted by creating landscape effects such as producing sceneries, sounds, lighting or modifying virtual architecture. The output devices are screens, speakers and lights.

Following sections explain two kinds of proposed methods for detecting the interaction of passengers and environment.

3.1. HUMAN MOVEMENT DETECTION

Motion based approaches provide an efficient way to detect the number of pedestrians movement; there are several limitations on motion based approaches. First, motion-based schemes cannot detect stationary pedestrians obviously or pedestrians in unusual movement like jumping. Second, the pedestrian's figure should be visible in order to extract rhythmic features or motion patterns. Third, the recognition procedure requires a clear image, which delays the identification until several frames later.

3.2. SIMPLE HUMAN-ENVIRONMENT INTERACTION

The system inputs sensors on the buttons of the chairs. When passengers sitting on the chairs, the system senses the locations and numbers of occupied chairs. This simple human-environment detection allow system acquire the positions of people.



Figure 1. Lobby, passengers and screens in an airport.

4. Implementation

The current research develops landscape representations of specific locations derived from both automatic and real-time sensing devices. The system captures and generates real-time, behavior-sensed environmental information for users who are moving on the site. The overall aim is to develop environmental media capabilities to facilitate and create generative landscapes by interesting interaction between pedestrian and environment.

A set of algorithms is proposed to detect pedestrians in the image sequences acquired from video cameras. In this study, motion based approaches are taken into account temporal information and try to detect the periodic features of human gait in the movement of candidate patterns. The shape-based algorithms rely on shape features to recognize pedestrians.

The virtual interior landscape is the primary focus of this study. When researchers inquiry into the area of interactive media and human performance, computer scientists and artists are conducting ongoing research into the possibility of the digitization of human movement in real-time in performance settings, and using this movement to create elements of an environment (Hammer, 1991; Jaehne et al., 2002). In this study, a pedestrian's movement in front of a video camera interfaces with computational technologies to make delightful landscape as Figure 2.



Figure 2. Software interface (http://www.ideaspectrum.com/rls_pro_gallery.php)

The system uses the Realtime Landscaping Pro and movie creation features to present the landscape designs to the screen, which can render realistic models of their design concepts, with accurate dimensions, scale, and placement relative to existing property and landscaping.

The system makes songs and other sound clip that during a realtime virtual landscape showing. This can be done as long as the sound is in 16-bit PCM format (the standard Windows format) and has the extension ".wav". The sounds play at the start of the realtime walkthrough and automatically loop. We collect sounds like wind, wildlife. For displaying the wind feature requires a supported 3D video card. On the other hand, this system supports setting the time of day to sunrise, sunset, or evening, all lights in the landscape will automatically turn on during a realtime walkthrough. The environment settings are saved as part of the landscape file.

5. Disabled Passengers at Airport

In this study, the disabled passenger means a disabled people on limbs; in other words, those who disabled on listening, sight and others are not include in this project. Limb disabled people usually cannot go to mountain climbing or walk for a long distance. So people with limb disability are unable to arrive there easily and to enjoy very beautiful landscape in Taiwan, such as mountain A-Li, Caoling Historic Trail, or Yeliou scenic areas.

In this system, it generates famous scenic area of landscape in Taiwan. For this kind of specific user group, User Centered Design (UCD) principles need to be employed if appropriate technology is to be developed for such user group (Gregor and Newell, 1999). Limb disabled people can sit down and enjoy these landscapes then relax themselves in the airport. Figure 3 – Figure 5 are some examples.



Figure 3. Virtual landscape display at the side of a flying schedule.



Figure 4. The CKS International Airport Lobby and virtual landscapes.

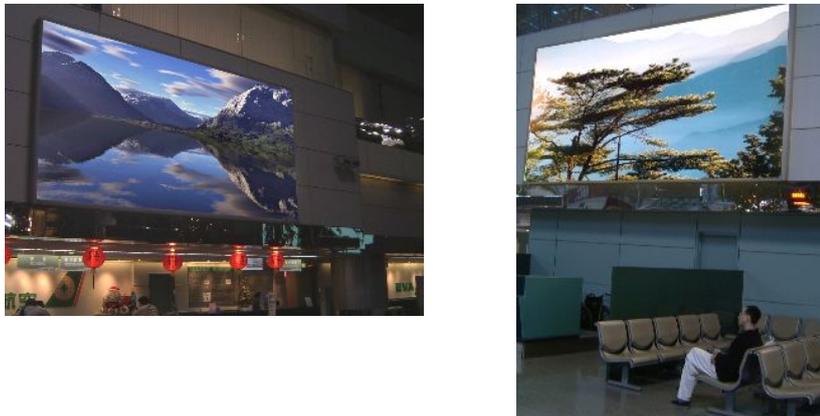


Figure 5. The system displays local famous beautiful scenery on screens.

6. Discussion

Design forms an important part of the realization of an interactive virtual landscape. This system has many design tasks including designing an interface, and the human-computer interaction. It needs technical skills for supporting these ideas. However, art is not built on a software code, or an ingeniously engineered hydraulic platform. A fine virtual environment design requires something else, a kind of surplus of inspiration. It has a goal to provide a visual cheerfulness, which will transcend the rational assembly of the "machine parts", melt them together. This is something different than creating a video game.

One of the most important fields in virtual reality (VR) research is the development of systems that allow the user to interface with the virtual

environment (Stock, 2005). The virtual landscape in this study provides a new media through which the artist's hand can create. The system has a creative method for generating ideas about how to provide a means through which to explore possible outcomes in an interactive way.

7. Conclusion

This research proposes how to build a system, which perceives human movement in an international airport with the intention of enabling passengers to trickle a generative system. It generates a virtual landscape according to spatially correspondent multimedia information database. As the passengers move over time, the virtual landscape interacts, and creates delightful scenery and sounds.

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