Realizing various urban spaces in Year 2050 Taiwan: Camera-matching in helicopter movement animations

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Abstract. This paper combines the 3D dynamic camera-matching technology adapted from the movie industry with the computer animation of digitally designed model and the multimedia video on high altitude of helicopter will enable realer and more effective representation of the diversities in an urban space.

Keywords. Digital media, urban spaces, camera-matching, representation

Introduction

In an urban space, there are sub-spaces contained with different attributes can be realized and represented through different digital media. Earlier researchers utilized a great amount of computer visual imaging technologies to simulate urban spaces. Wang et al. (1998) were able to evaluate and study an urban space of a historical city through recreating the city using this visual imaging technology. Other than static simulation, computerized 3D modeling and multimedia animations have also been frequently utilized later on (Bai and Liu 1998; Day and Radford 1998; Wang, Umeki et al. 1998). Bai and Liu (1998) used technologies of visual imaging, computerized 3D modeling, and multimedia animation to represent an urban space for visual impact analysis. In addition to these technologies, Virtual Reality was further utilized to enhance the dynamic features and interactive relationships between human bodies and environments of different attributes, which became a new media for urban space representation (Fukuda and Nagahama 2002; Tang et al. 2002).

Images produced by these media lack the integrity and realness after the physical space is integrated with the digitally designed models. With newly developed computer technologies, different new media should be reintegrated. The objective of this research is to present a solvent of design scheme with a futuristic coexistence of virtual and physical features in an urban space through integrating the above stated media, the 3D dynamic camera-matching technology which has had twenty years of history in movie industry utilized by the dynamically synthesized software in the normal business environment.
The 3D dynamic camera-matching technology

The basic principle of position tracking is to automatically or manually select a particular area on a still image of video, or is called it “tracked point”. This particular area changes the location on a series of still images by following the time variation of video and produces a new other one, and then analyzes these different particular areas can compile the 3D moving path of physical camera in computer environment.

Furthermore, to locate the tracked points on the key position of video, such as the signboards or housetops will be more effective in tracking tasks. For example, the Mayalive, this professional film synthesis software can compute the relative parameters about the moving path of physical camera and the variation of lens. The dynamic position of virtual camera will be the same as physical camera by outputting the topological data into 3D software. These data transform the tracked points into a 3D locus of physical camera, which is used to control the virtual camera and merge the 3D digitally, designed model easier into the 3D moving path of physical camera and synthesize this designed model into the actual film.

Helicopter-path planning

A careful planning of flight path was needed for filming on high altitude of helicopter. Besides, the same as the above method that the design team must locate some explicitly positional point such as pasted an A4 white paper on the car roof.

Manual tracking

The design team imported the filmed video on high altitude of helicopter into the Mayalive that this software was not provided with automatic tracking function, so designers located the tracked points of images frame by frame manually. In the initial frame, designers defined some tracked points by tracking frames, and then changed the position of tracked frames manually following the moving action of the tracked points in video images. In general, this step occupied most of synthesized working time caused by harder workload.

Position compile

The Mayalive could automatic compiled the rotated angles and moving positions of camera in 3D space. At this time, designers imported the digitally designed model in the Maya, chose one of frames, aided by the above tracked points, adjusted the position and size of the digitally designed model that have coherent proportions and perspective angles as the background images.
Synthesized rendering

There were some problems about the image qualities and blurred motions in the film of helicopter, so designers rendered an movement animation of the above digitally designed model which was already adjusted in the Maya, then utilized the synthesized software such as Adobe AfterEffect that the new multiple film synthesized the images with removed background and adjusted parameters by the image-filter function that conformed the rendered film to the quality of original images, then exported the new rendered film as a synthesized animation by 3D dynamic camera-matching technology.

Application: Year 2050 Taiwan

For the operational methods of digital media by 3D dynamic camera-matching technology as a presentation of Year 2050 Taiwan, the design team chose three urban spaces in Hsinchu according to represent the technical features of a city in the future, these spaces included the National Digital Museum, East Gate in Hsinchu, and ITRI’s STEPS Digital Museum.

Conclusion

With the above stated operational methods, the design team successfully synthesized digitally designed models and dynamic films into virtual and physical coexisting environmental animations. The team was also able to integrate these dynamically synthesized footages into this project as main scenes of the film segments.

Main significant of this research is the presentation of new media in representing a city's cur-
rent and future views utilizing movie digital technologies and tracking software to more effectively observe the relationships between designs and their environments. In this project, advantages of each media were maximized and fully utilized to produce higher quality of simulated animations. The directions of future research will be able to set at exploring space cognitive behaviors for various media representations and further studying of the relationships between usage of new media and the audiences.

References


