Research Article
Basic Study on Tourism Support by Aerial Video using 3DCG

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ABSTRACT

Tourism has the effect of healing the minds of tourists in a different environment. Tourists will also be delighted by the rare lands and excited by the magnificent architecture and nature. On the other hand, tourism will be a big business for local people, which can be expected to revitalize the area and increase the number of residents. In recent years, rural areas have been declining due to the concentration of work in cities and the declining birthrate and aging population. Along with this, there are many towns and villages that are merged or abandoned. Against this background, the number of local governments that are trying to regain the vibrancy of the past by focusing on the tourism industry is increasing year by year. As part of this, we took Takachiho Town as an example to see if we could contribute to more effective tourism PR by incorporating Information and Communication Technology (ICT) such as Computer Graphics (CG) into introductory videos such as Promotion Video (PV) and commercials.

1. Introduction

Sightseeing is for people to refresh themselves and for their hobbies, so it heals the mind in a different environment than usual. However, from the perspective of the local people, it is a big commerce that can be expected to revitalize the area and increase the number of residents.

In recent years, rural areas have been declining due to urban concentration of work and declining birthrate and aging population. Meanwhile, the number of local governments that are trying to regain the vitality of the past by focusing on the tourism industry is increasing year by year. As a first step in the tourism industry, consider whether it is possible to increase the number of tourists by incorporating Information and Communication Technology (ICT) such as Computer Graphics (CG) into introductory videos such as Promotion Video (PV) and commercials.

This study is part of a joint development with Takachiho Town, and the beautiful nature of Takachiho is created by making the images taken by the drone look like the mountain hawk-eagle inhabiting Takachiho is swirling or plunging in the sky. We conducted basic study to create a promotional video to introduce people in the area [1].

2. Benefits of tourism

When many tourists come to visit due to the development of the tourism industry, economic activities in various fields such as accommodation, transportation, eating and drinking, and travel industry become active, and the economic ripple effect is high. For example, by

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utilizing the nature and historic sites that originally existed in the area, even a small scale can be established as an industry. Therefore, at least some funds can be developed.

Also, if you can attract tourists from abroad, you can earn foreign currency. In Takachiho Town, the mythical nature is the centerpiece of tourism, so even a small amount of assets can demand high productivity.

Initiatives of Takachiho Town6 [5].

・ A tour of mythical nature and shrines (see Fig. 2).
・ PR of traditional Takachiho Kagura based on myth (see Fig. 1).
・ Sale of gourmet foods and souvenirs that make use of the rich land of Takachiho Town.
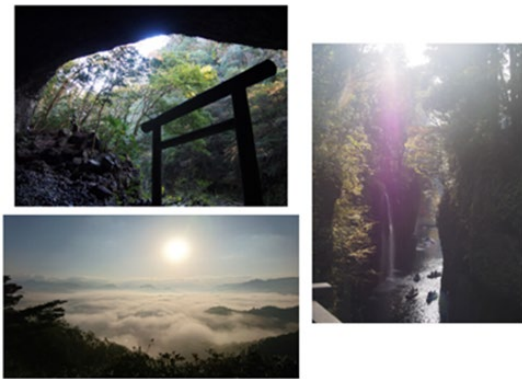

Fig. 1. Actual Kagura.

Fig. 2. Amanoyasukawara(upper left), Kunimigaoka (bottom left), Takachiho Gorge(right).

3.　CG

In a narrow sense, it refers to images and videos generated from scratch through drawing, editing, and processing on a computer, and in a broader sense, it is a composite of images created by a computer with the original photographs, drawings, and videos. Including those processed and processed in a manner significantly different from the original

In recent years, Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) have made remarkable progress. However, CG is playing an active role not only in entertainment, but also in invisible parts such as model production of architectural design and simulation in the event of a disaster.

4.　CG Tool

In this study, as CG tools, we have adopted the free 3DCG software Blender and Unity that are currently used all over the world. Blender is a free and open-source 3-dimensional CG (3DCG) software toolset used for creating animated films, visual effects, art, 3-dimensional printed models, motion graphics, interactive 3-dimensional applications, computer games, VR, and so on. On the other hand, Unity is a cross-platform game engine developed by Unity Technologies. The software development environment is summarized below.

・ OS：Windows10
・ Software：Blender, Unity / Unity MonoDevelop
・ Language：C#

4.1.　Blender [2]

Objects are created from a single cube using the extrusion and split functions (see Fig. 3).
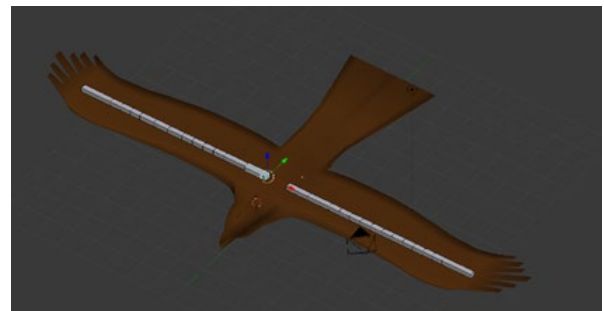

Fig. 3. The created hawk.

In order to smoothly reproduce the flapping of the wings, which is the greatest feature of birds, a total of 12 bones, 6 on each side from the base to the tip of the wings, are added to play the role of joints. Bones are normal ones and B-bones that are easier to express curves.

4.2.　Unity [7]

・ Animation

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: In order to express the flapping and dive of the wings, the animation function is used to assign numerical values to the main body of the hawk-eagle and the bones attached to the wings. The animation function applies keyframe animation, and by changing the interval of each numerical value, smooth movement is reproduced.

・ Turning
: The movement of the object turning is processed only by the script without using the animation function. In this research, since the object is moved according to the video shot, the rotation is only rotated around the z-axis.

The turning is limited to 30 degrees on each side, and it is set so that it does not turn even if the key input is continued beyond that. However, as an important process here, the turning angle is also different between the value on the console and the value to be acquired, so conditions are set so that the value is the same.

・ Image composition
: An ICO ball is used to make the image change when the hawk turns.

This is achieved by installing a hawk object and a main camera inside the ICO sphere (see Fig. 4) so that the sphere rotates when the arrow keys are input.
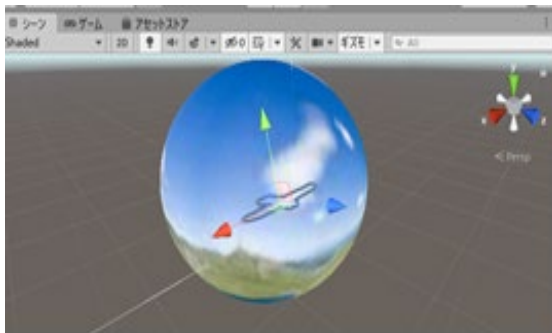

Fig. 4. Composition of 360-degree image on a sphere.

・ ICO sphere

Fig. 5. 3D sphere model.

In this study, since it is necessary to paste the texture without distortion as much as possible, ICO spheres are used in the 3D sphere model (see Fig. 5), and ICO spheres are treated as distributed [4].

・ glTF [8]
: Blender can export in glTF format, which allows it to be imported into Unity with almost the same shading as Blender (see Fig. 6).
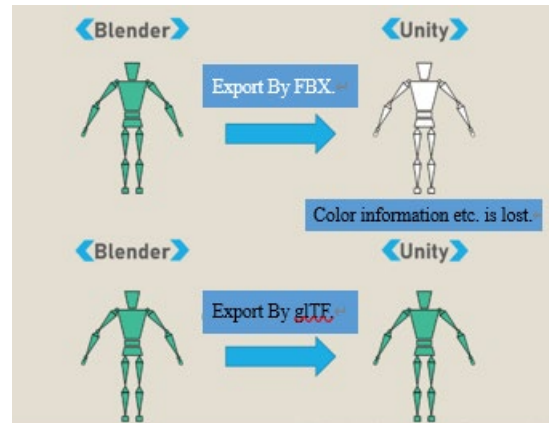

Fig. 6. glTF.

Since it is necessary to paste the image on the inner surface of the sphere, download and use the UniGLTF plug-in [6].

・ Screen transition due to a sudden descent of a hawk
: The screen transition is processed by the script, and the screen transition is performed when the space key is input.
In this state, the screen transition will be performed before the animation of the sudden descent of the mountain hawk eagle is performed, so when the space key is input, the elapsed time will be observed and the video of the tourist introduction will be played when the elapsed time reaches the end of the animation. Transition to the scene.

・ Sound / Video
: Free materials are used for sounds, hawk-eagle calls, aerial images, and sightseeing introduction videos [3].

5.　Consideration / Future issues

In this paper, we used Blender and Unity to create a CG animation that promotes Takachiho by synthesizing the CG of a mountain hawk eagle flying in the sky with the actual image of Takachiho taken aerial with a drone. This time, we succeeded in pasting the image on the sphere,

but there is a problem that the resolution of the free and usable image is too low and it becomes too rough at the time of compositing.

In addition, although the specification was originally to combine images, the moving image file must be in the Equirectangular format in order to combine images from a 360-degree viewpoint, so in this research, images are combined.

Since it is possible to transition to only one scene in the screen transition, I think that it will be possible to transition to multiple scenes by acquiring the rotation angle of the sphere and assigning it to the scene corresponding to a specific angle.

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Authors Introduction

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He received the Ph.D. degree in computer science and systems engineering from Yamaguchi University. He is presently a professor in the Faculty of Engineering, University of Miyazaki. He is a theoretical computer scientist, and his current main research interests are automata theory, languages and computation. He is also interested in digital geometry, digital image processing, computer vision, computer graphics, virtual reality, augmented reality, entertainment computing, complex systems, data science, and so forth.

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