Image Based Virtual Tour through Bitola

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Abstract – **A virtual tour (or panoramic tour) is a simulation of an existing location, usually composed of panoramic images, a sequence of hyperlinked still or video images, and/or virtual models of the real location. For creating virtual tour, first step is creating panoramas and then use them for creating virtual tour.**

This paper gives analysis of methods for creating panoramas and method of creating virtual tour.

Keywords – **Virtual tour, image stitching, panoramas, Virtual Walk-Through.**

I. INTRODUCTION

A virtual tour (or panoramic tour) is a simulation of an existing location, usually composed of panoramic images, a sequence of hyperlinked still or video images, and/or virtual models of the real location. They also may use other multimedia elements such as sound effects, music, narration, and text. As opposed to actual tourism, a virtual tour is typically accessed on a personal computer or an interactive kiosk. The phrases "panoramic tour" and "virtual tour" are often used to describe a variety of video and photographic-based media.

The word "panorama" indicates an unbroken view, since a panorama can be either a series of photographs or panning video footage. However, the phrases "panoramic tour" and "virtual tour" have mostly been associated with virtual tours created using still cameras. Such virtual tours are made up of a number of shots taken from a single vantage point. The camera and lens are rotated around what is referred to as a nodal point (the exact point at the back of the lens where the light converges).

A video tour is a full motion video of a location. Unlike the virtual tour's static wrap-around feel, a video tour is as if you were walking through a location. Using a video camera, the location is filmed while moving from place to place. Video tours are continuous movement taken at a walking pace.

Virtual tour today has wide area of implementation like:

1. Real Estate: People from estates make virtual tours of their estates, so that they can create beautiful and vivid effect of the houses to the public. That is quite eye-catching and greatly welcome by customers.

2. Tourism and Resorts: They make virtual tours of resorts, so that tourists can enjoy the beauty and attraction of those resorts beforehand. This has brought them more and more tourists and thus more and more money.

3. Web Design: Web designers embed virtual tours in their website, so that their webpage looks much more lively. Further, their websites are visited more frequently.

4. Exhibition: Some exhibits are made into virtual tour so as to achieve much more attractive effects.

5. Facility Management: Use panoramas rather than normal pictures to documents and manage your project or facilities.

Depending for what purpose is virtual tour, you can use different equipment for creating panoramas (the economical method is stitch photographs taken from the same point in space but of varying pitch and yaw and arranged them in spherical projection). In this paper we demonstrate low cost technology (with use traditional digital camera) for producing continuous 360-degree spherical virtual tour on long-range path (~ 1,5 km), instead traditional use of this technology for spot virtual tours.

II. METHODS OF CREATION PANORAMAS

There are many methods of creation panoramas. You can produce any type of panoramas with any type of camera, digital or analog. Depending on the lens you usually stitch 8-16 images for a 360º panorama.

Wide angle lenses with coverage of 60 degrees or more are usually used. The images are taken with 20%-50% overlapping. Important for all panoramas:

1. Use manual mode with same exposure for all images.
2. If possible do not use automatic white balance.
3. Use a tripod with a special panohead which rotates the camera around the nodalpoint.

Fisheye lenses are popular for spherical panoramas as we can cover a full view with only 3-8 images.

To be able to make a full spherical with 3 images we need a full circle of min 180º. This can be done by using a 35mm film camera or a fullframe digital and an 8 mm fisheye.

Fullframe Fisheye lenses usually 15 - 16 mm has been used for many years for panoramas with 35 mm cameras. The quality is much better than with the 8 mm fisheyes but they need 6-8 images around + top and bottom images.

One shot 360º panoramic solutions are parabolic mirrors which can be used as an ad on to many digital cameras. The resolution is low and the quality is also affected by the quality of the mirror.

Digital panoramic scanning cameras can make very high quality panoramas but the price is also high.

The method we used for creation of panoramas is to stitch photographs taken from the same point in space but of varying pitch and yaw (Fig.1) in order to create a panoramic image

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which, when rendered using appropriate software (web browser flash plugin), allows the end user to pan and zoom at will.
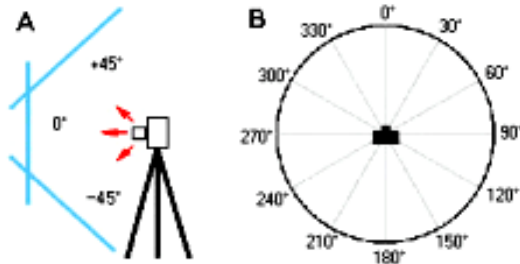

Fig.1 Method of taking photographs for creating panoramas

The benefit of this method is that it does not require any specialized equipment to capture the images, although using such can greatly speed up the process and render a higher quality result. This photographic technique results in a limited depth of field, meaning that the space may appear warped.

The next generation of this technology is the Virtual Walk-Through. This technology eliminates the limitations involving depth of field by enabling a user to travel tangentially throughout a space, in addition to rotating the point-of-view in any direction.

Image stitching or photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. For image segments that have been taken from the same point in space, stitched images can be arranged using one of these graphical projections:

- Rectilinear projection, where the stitched image is viewed on a 2D plane.
- Cylindrical projection, where the stitched image shows a 360° horizontal field of view and a limited vertical field of view. Panoramas in this projection are meant to be viewed as though the image is wrapped into a cylinder and viewed from within. When viewed on a 2D plane, horizontal lines appear curved while vertical lines remain straight.
- Spherical projection, where the stitched image shows a 360° horizontal by 180° vertical field of view. Panoramas in this projection are meant to be viewed as though the image is wrapped into a sphere and viewed from within. When viewed on a 2D plane, horizontal lines appear curved as in a cylindrical projection, while vertical lines curve as they get closer to the poles of the sphere.

The workflow of this method of creation panoramas with stitching photographs taken from the same point in space but of varying pitch and yaw includes:

1. Browsing folder that contains the photos taken from the same point in space (Fig.2)
2. Detecting panoramas (Fig.3)
3. Editing panoramas (cropping) (Fig.4)
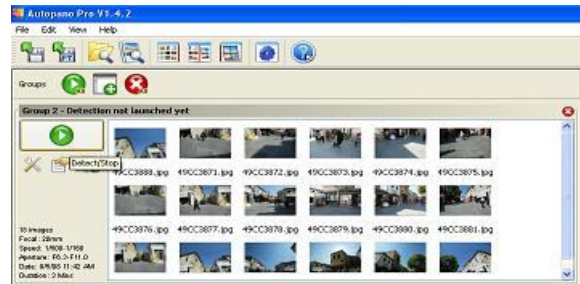4. Save and render panoramas (Fig.5)

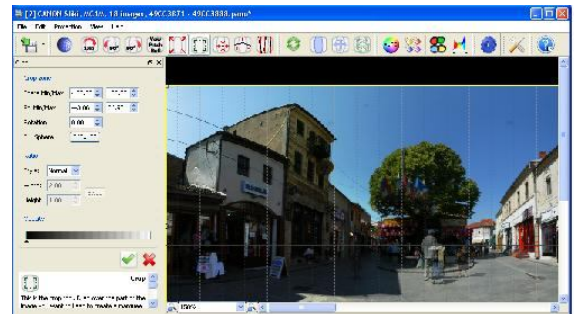Fig.2 Browse photos

Fig.3 Detecting panorama
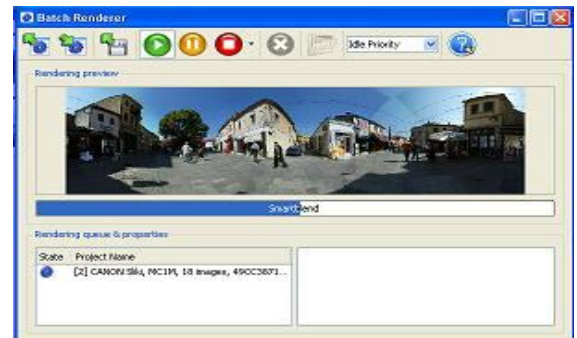

Fig.4 Cropping panorama

Fig.5 Render panorama

III. METHOD OF CREATION VIRTUAL TOUR

The first step required to create a virtual tour is to capture the virtual tour images. Virtual tour images are created by capturing from 6-18 images from the center point of view of the scene. This is done by placing a specially equipped digital or film camera on a panoramic tripod head at the center point of the scene and rotating the camera after the image is captured.

Generally 20%-50% overlap is sufficient for stitching together the virtual tour.

The second step required to create a virtual tour is to process and then retouch your stitched image. You must have appropriate virtual tour software for doing this step. There are many companies that provide software for creating virtual tours. Some leaders vendors you can find on this site. Virtual tour software comes in variety configurations from automated to complex, from free to expensive. Depending on your needs and quality your results can vary dramatically.

The workflow of the method of creation virtual tour includes:

1. Make virtual tour skin to get a unique virtual tour.
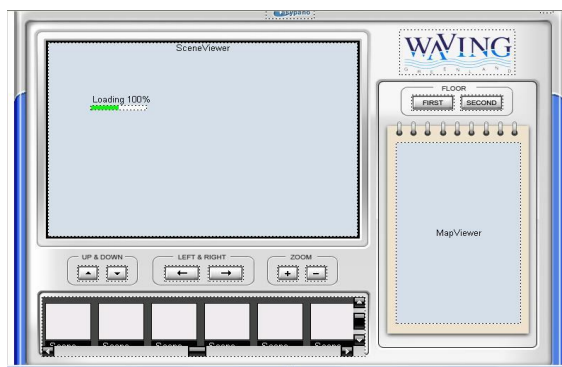
Fig.6 Virtual tour skin

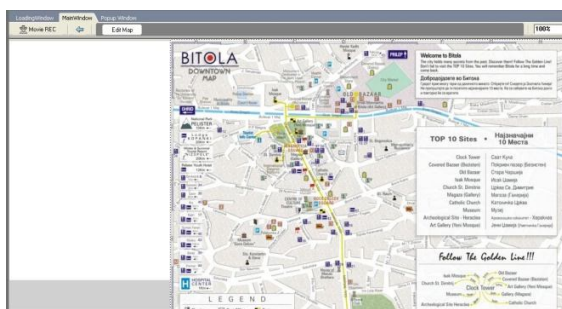2. Add panoramas and map.

Fig.7 Add panoramas

Fig.8 Add map

3. Add various hotspots, such as sound, URL link to link to another tour, link to scene, thus create vivid and colorful tours.
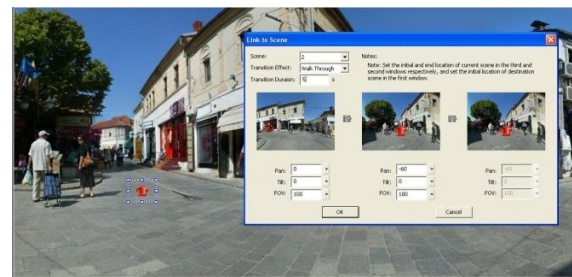

Fig.9 Add hotspot with Walk-Through effect

4. Adding hotspot and radar on map. Radar is actually a hotspot which contains a specified action to indicate the position and direction of the panorama in map.
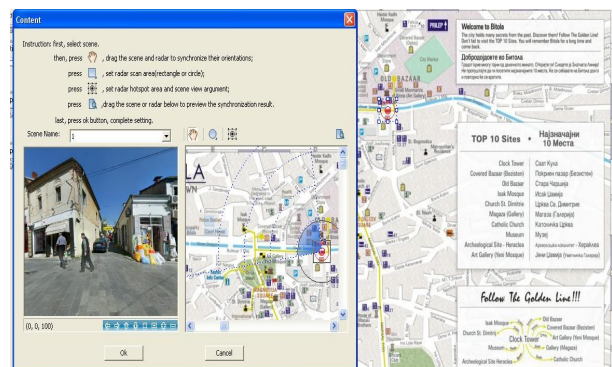

Fig.10 Add radar on map

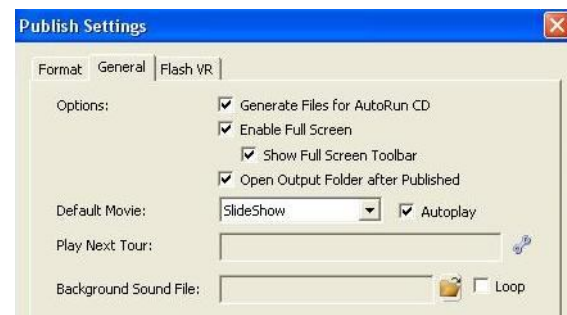5. Add background sound.

Fig. 11 Add background sound

6. Publish virtual tour.

The final step required to create a virtual tour is to prepare the virtual tour for deployment on the Internet. Virtual tours can be deployed using plug-in or Java technologies. A plug-in is a helper application which works within a Web browser, or as a standalone application. Plug-ins are usually available free of charge as downloads on the Web. The advantage of plug-ins is that they extend and improve a browser's capability by enabling the browser to play a wider and more robust selection of Web media.

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Using this method we created image based virtual tour through Bitola.

Fig.12 Image based virtual tour through Bitola

Visit: http://www.visitbitola.info and enjoy walking through Bitola.

IV. CONCLUSION

Creating virtual tour is method of creating panoramas and then retouch them with appropriate virtual tour software. Depending for what purpose is virtual tour, you can use different equipment for creating panoramas (the economical method is stitch photographs taken from the same point in space but of varying pitch and yaw and arranged them in spherical projection). In this paper we demonstrated low cost technology (with use traditional digital camera) for producing continuous 360-degree spherical virtual tour on long-range path (~ 1,5 km), instead traditional use of this technology for spot virtual tours.

Further research will continue toward improving procedures for efficient taking of the needed photos and avoid problems with blending of mobile objects on the scenes.

REFERENCES

[1] Anne Morgan Spalter, The Computer in the Visual Arts.Adision – Weesley, 1999.

[2] James D.Foley, Andries van Dam, Steven K.Feiner, John F. Huges, Richard L. Phillips, Introduction to Computer Graphics. Adison – Weesley, 1993.

[3] Malcom Kesson, An Introduction to 3D Computer Graphics. Malcom Kesson, 1995.

[4] Igor Nedelkovski, Computer Graphics, 3D Modeling and Animation. Faculty of Technical Sciences - Bitola 2008.

[5] http://www.autopano.net

[6] http://www.easypano.com

[7] http://www.realviz.com

[8] http://www.wikipedia.org/

[9] http://www.dpreview.com

[10] http://www.0-360.com

[11] http://www.panoramas.dk/

[12] http://www.panoguide.com

[13] http://www.realtourvision.com

[14] http://www.virtualtourusa.com

[15] http://www.thegnomonworkshop.com/

[16] http://www.cambridgeincolour.com

[17] http://www.commission5.isprs.org

[18] http://www.goodtutorials.org/

[19] http://www.photomodeler.com/

[20] http://www.canoma.com/