Concept for content-aware, automatic shifting for spherical panoramas

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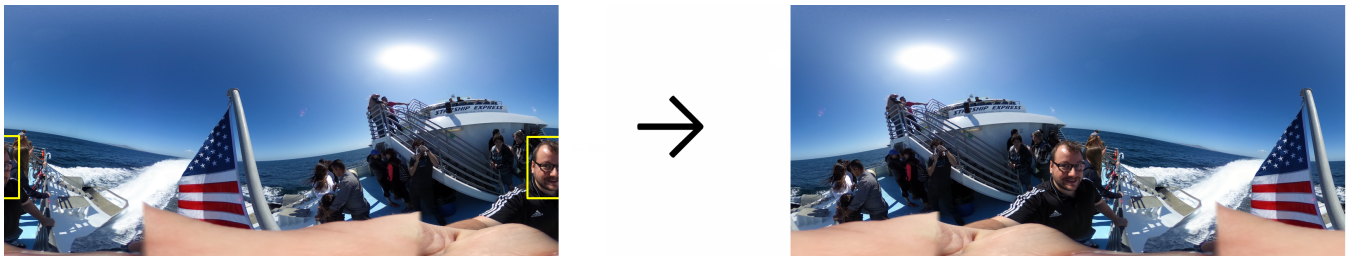

Figure 1: *We detect the area of interest in a spherical 360 by 180 degree panorama, e.g. the face of the photographer. Based on that, we do a lossless horizontal shift to move the object of interest into the center of the image for a nicer 2D representation.*

Abstract

With the adaption of virtual reality in the consumer space, spherical panorama photos are gaining popularity. Through wide-angle head-mounted displays, they can be experienced in a natural way and offer the user an immersive view of the captured scene. While being used in virtual reality, the alignment of the saved image does not matter much. However, when displaying the panorama on a 2D screen, the alignment can make a difference on how pleasant the image looks. We propose an automatic method to do lossless shifting of the image to make it look better on 2D screens.

Keywords: virtual reality, 360 degree panoramas, image processing

Concepts: •**Computing methodologies** → **Image processing;**

1 Introduction

The concept of panoramic views has fascinated humans since a long time. The first versions were hand-painted and found in the ruins of the ancient Roman city of Pompeii [Grau 2003]. Nowadays, capturing spherical panoramic 360 by 180 degree content is easy for consumers: smartphone apps guide the user to rotate the device around and automatically stitch the images together. Just with one click, new cameras like the Ricoh Theta S[1] generate fully spherical panoramas in an instant. The images are saved in an equirectangular format as shown in Figure 1. These have the property, that they can be shifted horizontally without resampling and therefore without loss of quality. When the user watches these photos in virtual reality, the alignment of the equirectangular images does not matter much as the user can freely rotate his head around to see all parts of the panorama. However, there are still plenty of use cases when these images are seen on a 2D screen, e.g. when shared over a chat application on the phone, for sorting on a monitor or storing them on websites that only support 2D displaying. In these cases, the alignment can make the difference if a photo is perceived as interesting. In this work, we propose to automatically find the area of interest in the image, shift it without quality loss and then store it.

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[1]http://theta360.com

2 Related Work

Modern digital cameras have features to detect the area of interest when capturing regular 2D images. For example, the Canon Powershot G7 X[2] detects in the mode "creative shot" faces and cuts out images with different aspect ratios and filters applied. Compared to that, we work on aligning equirectangular panoramas in a way where we assume that it looks better when displayed on 2D screens.

3 Algorithm

The regular process would be to take the spherical panorama photo and to save it. We add two new steps into that pipeline as shown in Figure 2. We search for the area of interest, e.g. using the OpenCV face detection algorithms. The face of the photographer might be stored in advanced as target. After finding the area of interest, we do a lossless horizontal shift to bring that area into the center of the image, making it visually more appealing on a 2D screen. To allow finding objects across the image borders, a wrap-around mode is needed or pixels from one end of the image can be copied temporarily to the other end.

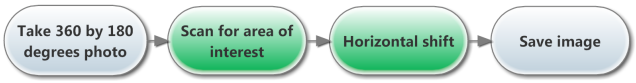

Figure 2: *Our method adds two new steps (marked green) into the pipeline of capturing a spherical panorama.*

Other area of interests could be determined after a foreground-background segmentation. Multiple faces in the foreground could be clustered and the center would be taken as new image center. In general, many principles of compositing a pleasant non-panoramic photo can be applied to panoramic photos and expressed as rules for an algorithm to find an area of interest and to shift accordingly.

4 Conclusion

We have shown a method for improving the alignment of spherical panoramas to make them look more interesting when watched at a 2D screen.

References

GRAU, O. 2003. *Virtual Art: from illusion to immersion*. MIT press.

[2]https://www.canon.com