

StereoCam3D (An Android App That Lets You Capture Realtime 3D Pics And Videos)

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ABSTRACT

This paper is proposing an android app and a device kit which is based on the principles of stereoscopy and tricks of optics to capture 3D pictures and 3D videos when viewed through VR headset. The main aim of the project is to create an economically viable yet presentable solution for the 3D image capturing and realtime recording. Now a days having a smart phone is common thing, with inbuilt camera features. But taking a 3-d image out of that is still not possible. Static images and dynamic image sequences are the projection of time-varying 3D real world scenes onto a 2D plane. Because of this planar projection, depth information of objects in the scene is generally lost. Only by cues such as shadow, relative size and sharpness, interposition, perspective factors, and object motion, we can form an impression of the depth organization of the real world scene.

Keywords : Stereoscopy, VR(Virtual Reality),Panoramas, Image Stitching, Bundle Adjustment, Wheatstone Bridge

I. INTRODUCTION

The human perception of depth is gathered by the hardly understood brain process of merging 2 planar images of same object obtained from slightly different perspective viewpoints. Due to the different viewpoint of each eye, a small horizontal shift exists, called disparity, between corresponding image points in the left and right view images on the retinas. In binocular vision, the objects to which eyes are focused have zero disparity, while objects to the front and to the back have negative and positive disparity.

In order to be able to retrieve depth using recorded images, a stereoscopic camera is required which consists of two cameras that capture two different, perspective shots of same object i.e. left and right. The shift between the left and right images must be such that the resultant combined image must not look distorted. In the case that the camera position and focusing are changing dynamically, as is the case for instance in stereoscopic television production where the stereoscopic camera may be zooming, the camera geometry is controlled by a set of production rules. Stereoscopic images are completely 3-D images since

they contain very little depth information ,hence they are therefore sometimes called 2.5-D images. [1]

Once the images from different perspectives are taken, apart from viewing that image into 3-D, we can use the images into various applications. Recognizing panoramas out of the images is one of the major part of the project. Fundamentally, this problem requires recognition, as we need to know which parts of the panorama join up.

II. LITERATURE SURVEY

In the previous paper published by us, we did a complete review of various image stitching algorithms and listed the benefits of each technique, the most efficient technique suitable for implementation was found to be RANSAC[2]. The conclusion drawn was Image stitching can be done in either the gradient domain or in the intensity domain. both of the methods devised by the nobles has been summarized here with a brief description on each of them. Final it has been concluded that the choice of a particular image stitching algorithm depends on the type of application required. For example, in panorama making algorithm,

need to use the algorithm which can provide the final output using multiple input images and have multiple overlapping among the images. Two gradient domain algorithms are mentioned-GIST1 and GIST2[3], which has their own advantages and disadvantages. Recently developed algorithms make use of the previous algorithms to make an efficient result.

III. SIGNIFICANCE

3D has been a buzzword in the technology industry for years. There's been the resurgence of interest in 3D technologies, ever since the Avatar was released as a 3D in 2009. 3D is appealing and more significant to us because it is more like reality to us than 2D. The closer we get to 3D, the less visible the line between technology and the real world, and the more immersive the experience. 3D reflects our everyday experience of interacting with the world more accurately.

In entertainment industry, especially movies and games, users will be far more immersed in their 3D world. In movies, the experience is realistic because objects appear to be present in an individual's personal space, which can be scary, funny or thrilling. In technical cases, 3D is better than 2D for visualizing solid objects. Product design, remote surgery, layout of stores and molecular science are all examples where 3D has clear benefits.

IV. METHODOLOGY

1) Stereoscopy Concepts : Stereoscopy (also called stereoscopies) is a technique for creating or enhancing the illusion of depth in an image by means of stereopsis for binocular vision.[5]

3D Image Formation

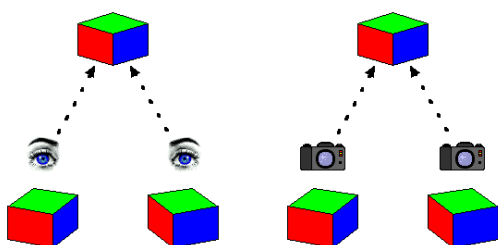


Fig. 1 Principle of Stereoscopy[4]

A 3D image is formed in 3 steps :

1. Both the eyes produces their respective images.
2. Information from both the eyes is sent to the brain.

3. Brain finds the key intersection points and does the depth analysis and produces a 3D output image by merging both the images which we visualize as our real world.

- 3D image formation using Cameras : In cameras people try to mimic the functioning of eye by taking images of same object from left and right side with a distance of 65mm in between i.e. the actual distance between our left eye and right eye and then those images are viewed through stereoscope(an optical instrument for creating or enhancing the illusion of depth in an image by means of stereopsis for binocular vision).
- The right and left image once formed can also be viewed in the VR headset like Google Cardboard, Gear VR ,Oculus etc as they are enhanced form of stereoscopes.

2) 360° Panoramic Image Formation

To form a panoramic view of images following work procedure is implemented :

Steps involved :

- 1.Initialization : Designated camera app is to be opened which has the feature of taking burst images in succession calibrated with motion sensors to track the user movement and store the images.
- 2.Saving Photos : All the photos with their positional information is stored in gallery in succession order.
- 3.Feature Extraction : Extracting key intersection points in all the images and ready all the images for stitching.
- 4.Image Stitching : Implementation of image stitching algorithms like RANSAC for stitching the images in reference to their common intersection point.
- 5.Final Output : Finishing the stitched image and save it as panorama.

V. IMPLEMENTATION

StereoCam3D App:

a. Camera APP : It uses multiple activities including camera activity of android. The 2 images of same static object is taken using or device holder i.e. left and right images and then on a canvas these 2 images are binded and saved as a single image.

b. StereoscopeCam Viewer : It just loads the image to be seen in Virtual Reality headset.

c. 360° panorama app : This app uses realtime image binding techniques to create a 360° x 180 ° panorama. The SDK used here is DMD pano lite. In the implementation of the view controller "PLITShootingVC" you have to implement the following list of callbacks:

- (void)preparingToShoot;
- (void)cancelPreparingToShoot;
- (void)takingPhoto;
- (void)photoTaken;
- (void)stitchingCompleted:(NSDictionary*)dict;
- (void)shootingCompleted;
-
- (void)deviceVerticalityChanged:(NSNumber*)isVertical;
- (void)compassEvent:(NSDictionary*)info;

"takingPhoto": notifies when the SDK is about to capture a photo. You can use this method to make an effect before a photo is taken.

"photoTaken": notifies when the SDK finishes capturing a photo. You can use this method to count the number of photos or to display a message informing the user to continue rotating.

"shootingCompleted": notifies when the SDK finishes taking photos (such as when the user requests to stop capturing or when the maximum number of photos are captured). It's preferable to display a progress indicator until the SDK finishes processing the photos.

"stitchingCompleted": notifies the when the SDK finishes stitching. You can use this method to save the newly created panorama or view it using DMD 3D Viewer.

d. Panorama Viewer : This app is used Google Cardboard SDK and enables the user to view upto 360° x 360° panoramas in the VR headset. The app is so designed that the person feels like they are literally present at the image location giving a complete virtual realization.

WORKFLOW :

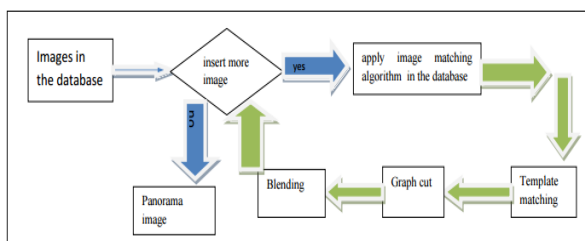


Figure 2 : Workflow for Panorama Construction[2]

e. Hologram Viewer : This app uses specifically placed video viewers in the activity which when used with specifically hologram viewer cutout from our kit displays the characters in the video as hologram effect. An especially designed for entertainment purpose.

StereoCam3D Kit :

The kit contains the Device holder, 3D video taker device, Hologram viewer.

DEVICE HOLDER: This device is used to hold the smart phone in a stable position while taking photo. There is a rough difference of 14mm between the right eye's image and left eye's image. There is a scale attached inside the device.

This device helps in taking the photos as follows:

- 1.Place the camera phone inside the space made for holding the phone in device.
- 2.Click the left eye picture from the phone.
- 3.Slide the phone right by 14mm.
- 4.Click the right eye picture.
- 5.Remove the camera phone and then view the two images through the VR viewer



Figure 3 : Phone Holder

3D VIDEO TAKER DEVICE: This device is used to take video which splits the scene in two frames- one for left eye and other for right eye. It is not feasible from the Device Holder to take 3D Videos as well. It can take 3D photos as well as 3D videos.

This device helps in taking videos as follows:

- 1.Fit the device at the top of the lens of the camera phone.
- 2.Now take photos or videos as normal ways.
- 3.Remove the device and view the images or videos through VR viewer, you will see 3D image or video.

NOTE: There is no restriction in keeping device stable or at same height as in the Device Holder.

3D Video Capture Device

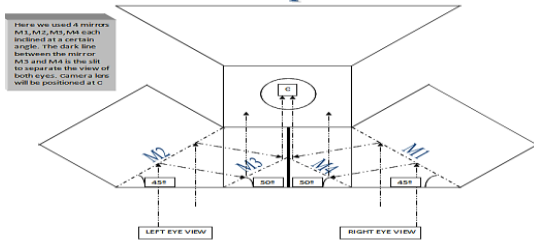


Figure 4 : 3d Video Capture Device

HOLOGRAM VIEWER: This is a simple device which is made up of a hard plastic. It is used to view a hologram from a specifically made video(which we have made through our hologram module of the spectroscopy module of our project).

This viewer works as follows:

- 1.Put the viewer over the camera phone between the 4 same frames placed at different places at 90 degree from each other.
- 2.We can see the 3D video in the air.

SAMPLES OF APP

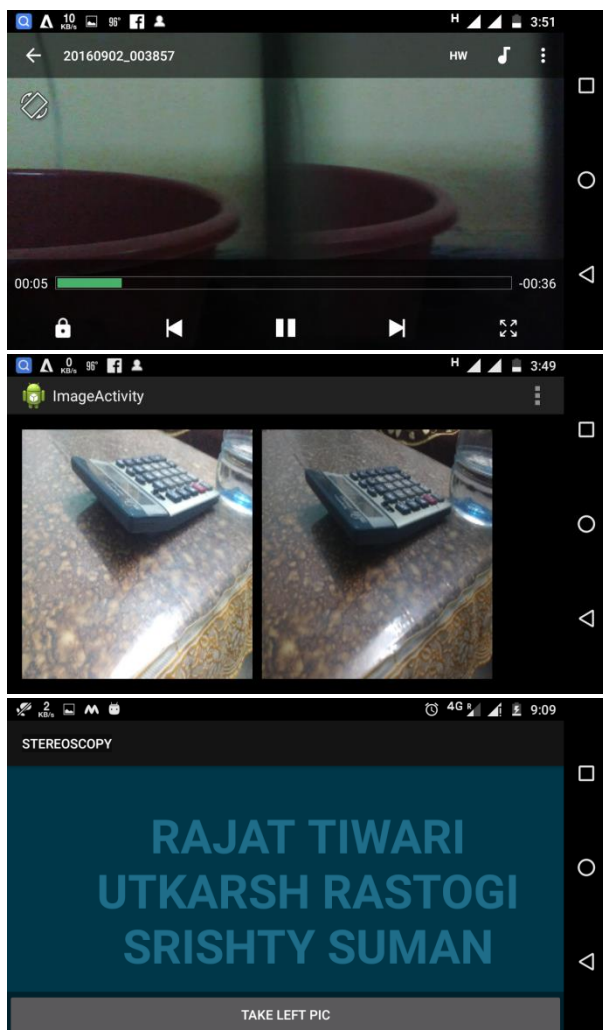


Figure 5. Snapshots

VI.CONCLUSION & FUTURE WORK

In this paper we had proposed an app which will reduce the need for highly priced 3d cameras for taking 3d shots and ensures the same power in your smart phone and gave user a new experience to immerse in virtual reality which is similar to its real world.

For future scope :

- Medical field for craniofacial surgery.: to pre-experience the after effects of surgery.
- Entertainment industry : To make the entertainment more real and with more vast experience.
- Real estate sector : To gave the experience of the actual property to the user without being on actual location etc.

The above fields have always scope for future development as Virtual Reality is a new field and we have a lot more to explore similarly the 3D image processing.

VII. REFERENCES

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