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RESEARCH ARTICLE

A NOVEL APPROACH: 3D CALLING USING HOLOGRAPHIC PRISMS

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ABSTRACT

Today, everything from gaming to entertainment, medical sciences to business applications are using the 3D technology to capture, store and view the available media. One such technology is holography -It allows a coherent image to be captured in three dimensions, using the Refraction properties of light. Hence we are proposing a system which will provide a 3D calling service wherein a real-time 2D video will be converted to a three dimensional form which will be diffracted through the edges of the prism. The prism will be constructed along with the system. Two users who wish to communicate using this 3D calling service need to be equipped with latest smart phones having front cameras and speaker phones. Holography provides the users with a comfortable and natural like viewing experience, so this technology can be very promising and cost-effective for future commercial displays.

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INTRODUCTION

3D Video is getting immense public attention recently because of vivid stereo visual experience over conventional 2D video (Sung-Fang Tsai *et al.,* 2011). 3D displays have applications in a variety of areas, right from scientific to entertainment industry, from 3D games to 3D kiosks. A Video may be defined as a collection of visual images, either recorded or reproduced and provided digitally. Each image undergoes a lifecycle:

- Acquisition
- Storage
- Processing
- Display
- Transmission

Each 2D image generates a depth map that is essential for its conversion into a 3D image. A depth map is used to generate a binocular depth cue, such that depth information is generated. According to human perception, the brain integrates these depth cues to form a single 3D image.

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Different eyes have different perspectives that the human vision system can sense (Liang Xinan *et al.,* 2009). Image Fusion is used for the combining the depth cues. In our 2D-to-3D conversion system, Image Acquisition is achieved successfully with the help of visual front camera's inbuilt in almost all the smart phones, which is then partitioned on four sides of our screen. The 3D Display we are going to provide is a simple ,cost-effective ,light-weight prism to be placed at the center of the screen. The Prism will be made of tinted glass to generate a clear view of the sender. As studied in physics, Prisms are used to diffract a light beam into its original seven VIBGYOR colours. Similarly, the prism is used to reconstruct our 2D image within itself. Since the 2D image is partitioned on all the four sides, it results in a virtual holographic image of the sender being formed inside. The sender's image is received over a video calling application we are going to implement. Various Optimization techniques will be used for streaming the data frames (30fps) from the sender to the receiver. Thus, we see 3D [video] technology moving into the cell phone, which will have the ability to transmit information off the cell phone to create a 3D (Vighnesh *et al.,* 2012). This proposed system will be capable of real-time 1920x1080p conversion (Sung-Fang Tsai *et al.,* 2011) and is suitable for all the smartphones enabled with front-cameras and speakers.

Literature Review

Our research basically is used to develop an application for enhancing the virtual market of applications. The base paper symbolizes how to recover depth information from various depth cues in single view video (Sung-Fang Tsai *et al.,* 2011). Use of human visual perception to generate visually comfortable depth maps rather than physically correct depth maps. The depth map is used to generate the left/right or multi view using DIBR (Depth Image Based Rendering) for 3D visualization. The disparity can be calculated based on the known depth information. Considering the frequent frame losses in wireless network that may lead to temporal asynchrony, this paper makes use of TSS (Temporal Synchronization Scheme) for live 3D streaming over wireless networks for the left and right views in the same frame order that compensates for frame damage and loss during the decoding phase (Yohan Yoon *et al.,* 2014). Nowadays, holographic view is implemented for mobile calls in 3D using hologram projectors (Vighnesh *et al.,* 2012). The projector we will be using is a simple prism, that will focus the frame from either side of the screen. The concept of extracting the depth information from the monocular image and automatically and convert it to 3D video is been proposed in this paper (Li Sisi *et al.,* 2011).

PROPOSED SYSTEM ARCHITECTURE

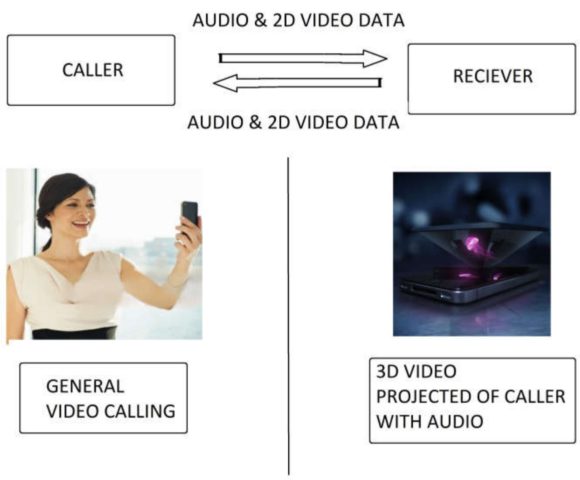

Fig. 1. Projected System Architecture

The system proposed in this paper requires two users who wish to communicate through our 3D calling service to have smartphones at both ends equipped with front cameras and speakerphones. Also a 3D calling service application should be available in both the smartphones. Caller or the sender will make a normal 2D video call to the receiver .So our system will be converting a real-time 2D video into a three dimensional view by calculation of depth cues by algorithms specified in further sections.After calculation of depth cues the resulting image formed is divided into four frames which is then visible on the receivers screen. From these four frames a single elevated 3D image is formed by diffracting through the edges of the prism. The prism is constructed along with the system and is placed exactly in the center of the mobile screen. Audio can be received through speakerphones or headphones

COMPUTATIONAL TECHNIQUES

Cropping algorithm

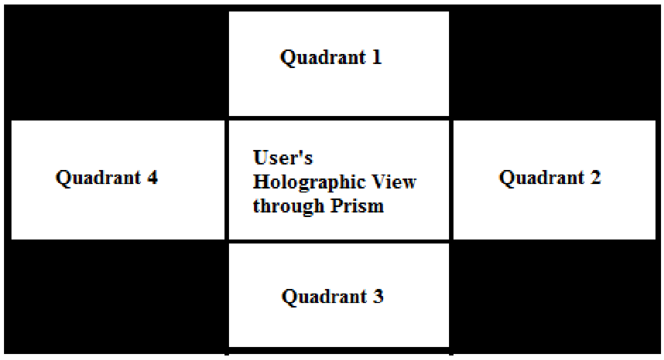

Fig. 2. User's Smartphone Screen

The user's image obtained is a collection of pixels, called a bitmap. Here, every quadrant contains the user's view facing the prism. Initially, merge the two bitmaps together making sure template is placed on top**.** Create a new blank bitmap with known size of the template. Then go out quadrant by quadrant, from the centre of the combined image, going through every pixel value and copy it onto the blank bitmap. Thus the pixel value is set of the blank bitmap transparent. Once it hits the colour of the template lines, a cropped image is obtained. After it has gone through all of the 4 quadrants, and also returns the created bitmap

2D-To-3D Image frame conversion

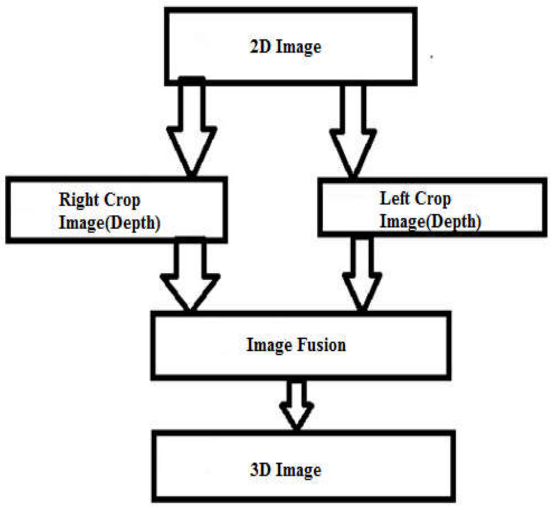

Fig. 3. 2D-to-3D Frame Conversion

2D to 3D conversion system works on human depth perception fusion of global depth gradient and local depth refinement to give multiple views of the images through DIBR output images will produce 3D display. In DIBR (Depth Image Based Rendering) image is converted to multiple views and disparity of these images will produce 3D effect. Thus the shared memory buffering and dynamic programming take care of bandwidth and visibility problem. Finally, the 3D video is synthesized exactly like of 3D display device.

Temporal synchronization

A better quality 3D video can be obtained using temporal synchronization. This consists of two modules those are QoS Mapping Module and Compensation Module. Accordingly the QoS module delivers left and right priority, to add on the compensation module works on damaged and lost frames and to reduce temporal synchrony it make use of three techniques: Image Copy(IC), Image Delete (ID) and Image Replication (IR) in which lost frames are replaced by latest synchronized frames using IC, temporal synchrony frames are deleted by ID and decoded frames are replaced by lost frames with the help of IR. Thus to provide proper streaming of 3D Video Temporal Synchronization is used.

Video sterilization

This particular algorithm gives you stereoscopic videos from conventional videos. The specific input image is passed through three automatic modules: Thus the sparse set of 3D points are recovered by applying structure from motion to input image. The following shots are effective in which rapidly changing background and relatively static foreground are observed. Finally, the relatively depth changes between the frames are estimated and also inspects the size change of an object's image. Also this algorithm is user friendly. The major advantage of this algorithm is only applied to stereoscopic videos.

Conclusion

In this paper, the technique of a 3D calling service which has the capability to be more effective and impactful than the regular 2D video calling services available is specified. The 3D image of the receiver can be viewed using the technique of holography. In addition to this existing system, a technique to manage energy and cost savings and thus providing an effective system for communication which is light on the pockets for the users is the motivation of this system. These holographic views can be projected through a prism which again is light, compact and easy to carry. Thus the users are provided with a new, elegant and novel method for communication, bringing them a step closer to reality.

Future work

Future work for this system includes experimental implementation of our proposed system for its ability to be projected through any 3D and VR viewing devices. Also we are working to increase the size of our projection and its resolution compatibility with different viewing devices.

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