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Implementation of 3D Calling using Holographic Views

Virtualization at it's best!

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***Abstract*—The era of the twenty first century commenced with the start of globalization which further led to new innovation and technologies, which ultimately aimed in building up a digital virtual world. In consortium with the emerging expertise, virtualization is indeed a common topic to be spoken about. Holography is an art of producing holograms, that are virtual images and that be displayed on any handheld device in order to get a holographic view. The 2D to 3D Conversion system basically provides a medium to communicate with anyone around the world over a simple, cost-effective and light device namely, a prism. Combining the properties of light, along with a series of real time video frames, it is possible to construct a three dimensional view of the user within the prism, placed at the end-user's destination smartphone screen. It would not only provide a realistic view but a sense of an emotional touch to the human race. Hence, considering the future advancements, this technique would probably be a boon for almost all the smartphone users in the few years to come.**

Keywords—prisms,3D video calling,refraction,virtualization.

I. INTRODUCTION

After Avatar's phenomenal success, three-dimensional video has become one of the most popular multimedia content formats [4]. Ever since, this favoured technology has caught immense attention of the audience that has led to the acceptance of 3D devices across the globe. An original two dimensional video is comprised of frames, combined together in order to give an agile view of the particular scenario. Moving a step closer towards reality, 3D videos have proved to be more beneficial, right from business to the entertainment industry. Hence virtualizing this 2D video would certainly deliver a perfect appearance of the video. A Video may be defined as a collection of visual images, either recorded or reproduced and provided digitally [13]. An Image Lifecycle consists of :

(1) Acquisition

(2) Storage

(3) Processing

(4) Display

The image Acquisition begins with the first user initiating a call to the second user using normal video calling service via his/her smartphone.

Once the call begins, the second user places the prism (suitable to his smartphone screen) at the centre of his phone. Every filtered image is stored within a panel of the 2D-to-3D conversion system, using techniques like colour mask filtering and perspective filtering. Further, Image Processing is acquired by applying 2D transformations, the same image is scaled, translated and then rotated at a certain angle so as to create four images on all sides of the second user's screen. It finally concludes with processing of these frames all together, in such a way that every frame refracts from either side into the prism that generates a 3D view of the first user.

In this paper, we have proposed a new system in order to generate a 3D video call. Section II gives a detailed survey review in context to the project. Section III and IV describes the working and methodology of this system.

II. LITERATURE REVIEW

This system is used to develop a simulated environment that would virtually inspire the future communication networks to walk a step further towards reality. Our survey and research about this concept is given in the papers specified below:

A. A Novel 2D-to-3D Conversion System using Edge Information

3D Image Visualization using Bilateral Filtering:

This approach has inspired to develop the algorithm that has been used within this paper. The filtered depth map has a comfortable visual quality because the cross bilateral filter generates a smooth depth map inside the smooth region with similar pixel values and preserves sharp depth discontinuity on the object boundary [1].

B. A Real-Time 1080p 2D-to-3D Video Conversion System:

Local Depth Refinement:

Local Depth Refinement refers to:
People feel red(warm) colour is nearer and blue(cold) colour is farther in visual perception [2]. We can conclude that few objects that have higher luminance feel nearer, and objects with low luminance feels farther.

III. PROPOSED SYSTEM ARCHITECTURE

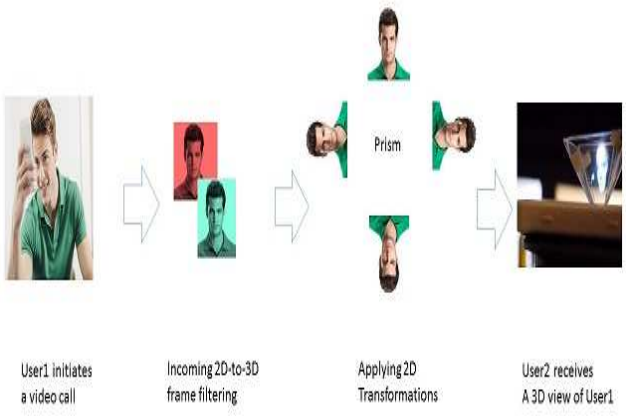

Fig. 1. Projected System Architecture

The proposed system consists of two end users, each assisted with a well-equipped smartphone. Both the user's initiate a video call which is a normal 2D video, taking place at real time. The audio video synchronization works fine as tested in a high speed network (30fps). If one of the user wishes to get a 3D view of the other, he will simply place the prism in the centre of the smartphone screen, in a way that the tip if the prism is placed in perpendicular with the smartphone screen. The application is enabled with a 3d option, on clicking it the current frame will be divided into 4 parts, on either side of the prism. Every frame will undergo the 2D to 3D Conversion system after which the filtered image will be saved within a panel. The resizing and rotation of the frame will be done by the basic 2D transformations. Once the resized frame will appear on either side of the screen, the frames will be refracted into the prism at a common point thus appearing as a 3D virtual image of the individual.

IV. COMPUTATIONAL TECHNIQUES

A. 2D TO 3D CONVERSION SYSTEM

Fig.2. 2D to 3D Conversion system

The algorithm consists of two techniques:-

Colour Mask Filtering:

Every Image consists of the RGB colour model. The Red colour component of the received user image is first filtered and then the filtered image acquired is printed onto the panel after resizing. Similar steps are carried out for the Blue and Green colour components.

Perspective Filtering:

Apply the perspective transform onto the Red filtered image and print it onto the panel after resizing. Similar steps are carried out gor Blue and Green coloured filtered images.

Merging the two images:

Printing the 3D image onto the panel after resizing.
Note: The Panel specified is a swing applet where we can display the rotated frames (Video Display Area).

B. TWO DIMENSIONAL TRANSFORMATION

Any operation on a point in space (x, y) that maps point coordinates into a new set of coordinates (x1, y1) are called two dimensional transformations.
The Transformations are applied only to the vertices of an object and new lines are drawn through the resulting points.

TRANSLATION:

Translation maybe be defined as moving of an object. We translate an object by translating each vertex in the object.

$$\begin{bmatrix} X' \\ Y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & T_x \\ 0 & 1 & T_y \\ 0 & 0 & 1 \end{bmatrix} \bullet \begin{bmatrix} X \\ Y \\ 1 \end{bmatrix}$$

Fig. 3. Equations for translation

SCALING

A transformation in which image size can be changed is called scaling. Scaling an object is implemented by scaling the X and Y coordinates of each vertex in the object.

$$\begin{bmatrix} X' \\ Y' \\ 1 \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{bmatrix} \bullet \begin{bmatrix} X \\ Y \\ 1 \end{bmatrix}$$

Fig. 4. Equations for scaling

ROTATION

Rotation is a transformation that causes a point p to be moved relative to a central point, without changing the distance of p from that point. This transformation is accomplished by applying the rotation equation to each vertex of the object. A rotation is specified by providing an angle, B, indicating how many degrees of rotation are desired. This angle may be either positive or negative.

$$\begin{bmatrix} X' \\ Y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\phi & -\sin\phi & 0 \\ \sin\phi & \cos\phi & 0 \\ 0 & 0 & 1 \end{bmatrix} \bullet \begin{bmatrix} X \\ Y \\ 1 \end{bmatrix}$$

Fig. 5. Equations for rotation

C. GLASS PRISM

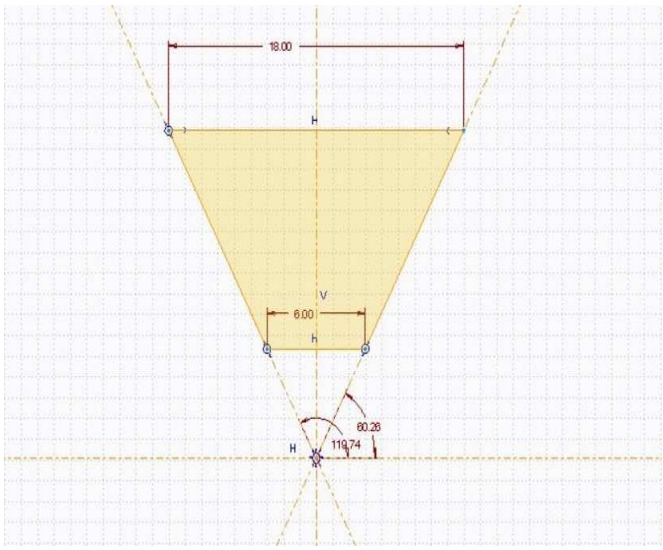

Fig. 6. Internal structure of a Prism

In optics, a prism is a transparent element with flat, polyhedron with surfaces that refract light. At least two of the flat surfaces must have an angle between them. The exact angles between the surfaces depend on the application.

V. CONCLUSION AND FUTURE WORK

In this paper, we have implemented a 3D video calling service which is more effective than a 2D video call. The concept of holography further helps in generating a realistic view of the presence of an individual over a video call. Furthermore, in order to improve the efficiency as well as make it profitable, we decided to use a prism which is simple to carry and wise enough for common man to get an advantage to enhance his experience in 3D applications. Likewise, Prisms in communication is the most innovative approach to commune with one another. Thus, this system would also be beneficial in

a stream of applications right from business meetings to being in contact with your fellow mate. The Future work includes on modifying this system of making it a two-way communication that would be beneficial for both the user to get a 3D perception.

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