

# Design of Hologram App using Real Time 3-D Live Video Streaming

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**Abstract:-** The propose projected system will stream the input 2D video footage from webcam of the device into a 3D hologram while also monitoring the gesture of the user to start or stop some processes like zoom in/out and stopping the stream, of which the gesture recognition and control will be performed by Open CV. The stream will be available globally via twitch platform along with OBS and the output audio and video setup will be supported by a Raspberry Pi beneath the holographic Prism. This setup will be useful for more interactive and dynamic presentations, conferences and product advertisements.

**Keywords:-** Open CV, Gesture Recognition, Gesture Control, Hologram, Raspberry Pi, Holographic Prism, 3D Live Streaming.

## I. INTRODUCTION

As human beings, we have a tendency to identify and interact with 3-dimensional objects more profusely. While there are systems of Augmented and Virtual reality are presents but in order to make them portable, they require complex wearable which limit the user mobility. There are also the services like Skype that can connect two individuals from across the world but lack interaction modification with the real time feed. Our 3-dimensional live streaming setup combines the best of both worlds while providing an innovative approach for display while also having the advantages of real time video manipulation [1].

In this paper we have designed a system that converts the 2- dimensional webcam stream from a device into a 3-dimensional footage. The initial webcam footage will be fed to a program using the OpenCV libraries implemented by Python.

The OpenCV will be responsible for recording the stream, gesture recognition as well as the gesture control. The output footage will then be fed to a software called OBS for streaming the footage globally on a streaming platform, which will also handle the audio input of the stream. The resultant video output will be projected on to the holographic prism via an assembly of screens and a holographic prism supported by the Raspberry Pi Platform and audio output will be played over a server Icecast 2.

The objective of this paper is to give more human elements to the conventional presentations, conferences or any public event by incorporating the use of hologram. What we see on our computer and mobile screen is the 2-dimensional version of the world and our project aims to improve that by converting it into a more interactive and user friendly 3-dimensional look.

## II. METHODOLOGY

### A. Block Diagram:

A Computer, chosen to be a Raspberry Pi handles the positional input from the capacitive sensor array (treating it like a HID and reading through a USB serial port) and will map appropriate 3D object projections to the 2D, LCD screen. The aforementioned conversion will be done via standard graphics libraries (i.e., Open GL ES) onboard [2]. This will also be running basic program logic.

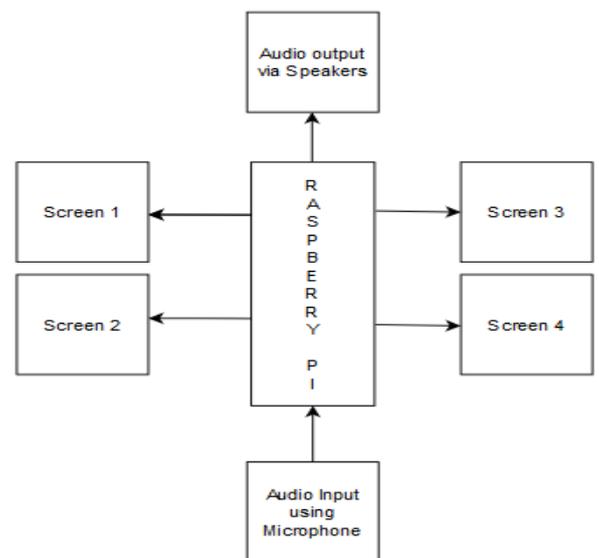


Fig 1. Block Diagram of Raspberry Pi

### B. Hardware Diagram

It represents the basic block diagram of the 3D Holographic Display Technology. It works on the principle of varying voltages between the two IR sensor and receiver pairs.

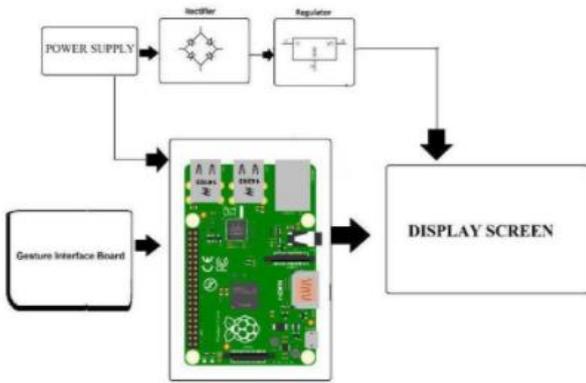


Fig 2. Hardware Diagram of Holographic Display

The gesture inputs are processed by the microcontroller (Atmega 328P) and the output is fed to the Raspberry Pi board which processes the action to be taken according to the given gesture. In this way we can easily navigate through the videos without any delays. The LCD display is used to provide part live videos to the projector in order to get the desired 3D hologram.

This paper is analysing a frame which is constructed to project images and videos in 3D state. A gesture interface circuit is designed using IR sensors and comparators (LM2576) which is a cost effective alternative to ready-made gesture interface boards which are again, bulky and costly[1]. It works on the principle of varying voltages between the two IR sensor pairs and receiver pairs [2].

The gesture inputs are processed by the microcontroller (Atmega 328P) and the output is fed to the Raspberry Pi board which processes the action to be taken according to the given gesture [2]. In this way easy navigation can be achieved through the videos without any delays.

**III. SYSTEM FLOW CHART**

Hologram makers, render 3D projections whether it's inside a glass tube or suspended in thin air. 3D multi dimensional images enable users to interact with content in a totally unique way from a 360-degree seeing point. The way to the operation of holographic projectors is the 3D image.

A holographic projector utilizes part illuminations reflected together from multiple viewing angles of the subject in a combined form to reproduce a picture of the subject in a 3D state.

The presented system can produce holographic projections created through anticipated picture by refraction through the interference design, losing barely any light, and working with substantially more productivity. It is using a raspberry pi controller-based system to achieve such holographic projections.

A display is used to provide part live videos to the projector setup in order to get the desired 3D hologram [3].

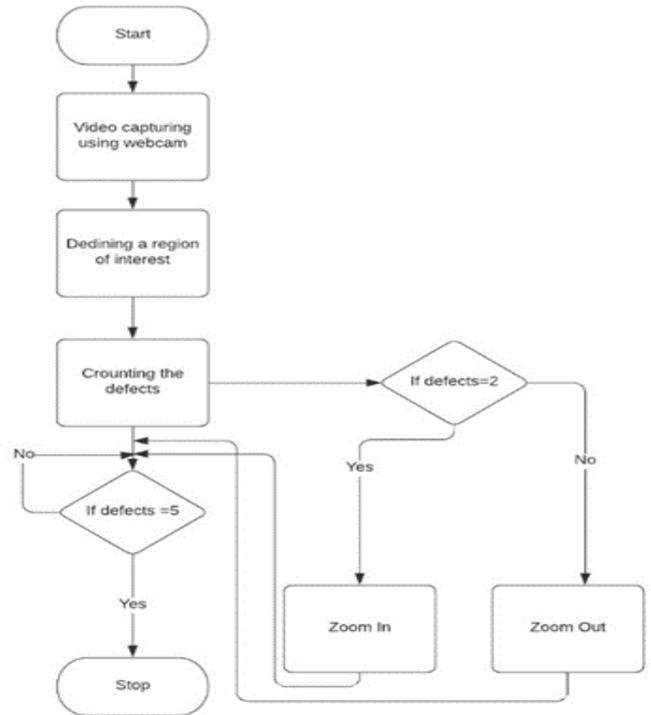


Fig 3. Flow chart for gesture control

A frame is constructed to project image in 3D state using a clear pyramid frame in an accurately designed 3D reflective state. A gesture sensing board is used for raspberry pi to detect the gestures by user and then use it to forward or rewind previous projections without even touching the panel [4].

In this way an efficiently 3D holographic display system with gesture interface controller is successfully designed.

**IV. COMPONENTS DESCRIPTION**

**A. HOLOGRAPHIC PRISM:**

The holographic prism is a glass prism of following dimensions as shown in figure 4. The prism will be placed on top of thw screen architecture to reflect the image that is being transmitted which will give the height element to the traditional 2-dimensional projection and incorporate the feel of 3D.

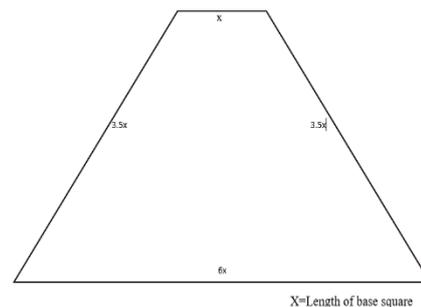


Fig 4. Dimension of the prism.

*Resistant to intense light:* Most Holographic displays on the market require a dark room in order to project holograms. The Holographic Theater, instead, guarantees an image that it's clearly visible in a wide variety of environments, being resistant to natural and intense light.

*High resolution:* It has high resolution that clearly defines the 3-Dimensional view.

#### B. Hologram Pyramid:

The Hologram Pyramid is a technology that permits you to see and make pictures from your telephone that seem to coast above it with the hallucination of a 3D holographic picture.

#### C. Holographic Spinning Mirror Technique:

Spinning mirror systems generate a different view to each viewer depending on the angle of vision that takes over the screen. It is used to build interactive 3D holo-graphics and autostereoscopic to multiple simultaneous viewers around the screen.

#### D. The Pepper's Ghost Effect:

The basic gadget utilized to arrange the delusion is an optical pillar splitter worked backward to consolidate two pictures towards the crowd's perspective. The pillar splitter component is normally a huge, level sheet of common glass.

The picture of one scene is reflected from the glass surface towards the watchers, and the picture of a subsequent scene is transmitted through the glass. The stage lighting is controlled to specifically enlighten the scenes, however not simply the glass, which is imperceptible to onlookers.

#### E. Fan Type Hologram:

3D multi dimensional image fan show, 3D impact picture and video are delivered by turning drove fans. It can help shop proprietors spread and offer promoting content productively.

#### F. Holographic video:

To create a real time holographic video, we need a video which will be recorded and streamed on our video streaming setup which will implement the use of green screen and a streaming service. The video will then be cloned and joined in the form shown below:

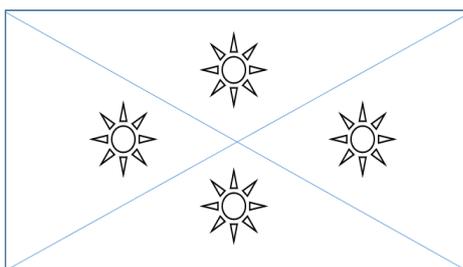


FIG 5. LAYOUT OF IMAGES TO CREATE A HOLOGRAPHIC VIDEO

When combine both the holographic prism and holographic video the output will look like this:

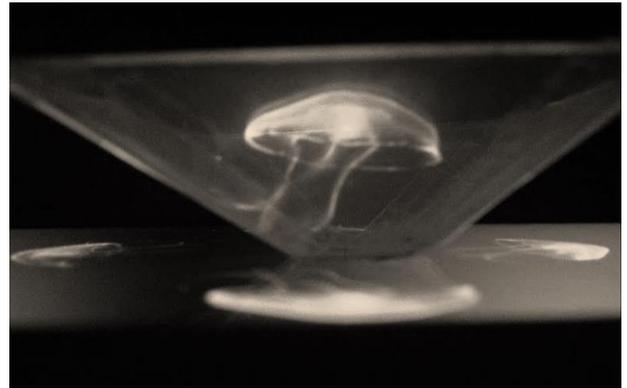


Fig 6. Final 3- Dimensional Result

Holograms are the technological marvel that had and always have been the one to become a visual feast to everyone. As various authors proposed various implementation on generating holograms and implementing them. We came across some references from various papers and based on it, our concept of the holographic app is made. The multimedia technologies have a great potential to support learning and teaching as the 3D images allow the student to understand the certain topic easily and intuitively.

To improve the presentation of teaching material in the classroom, the holographic pyramid is used to let the digital content to be shared in a group of people easily without the use of glasses and wearable devices. However, there are also some issues and challenges founding the current scenario.

The screen which causes difficulty for the user to view the content on the screen as the current AR application is displayed in a small screen of a Smartphone where not many information can be displayed on. To view the virtual objects, present on the device's screen, users also need to always hold their Smartphone or tablets and target their devices to an image target. Socially separated user experience AR technologies are only available for only one user to view the AR object at a time.

This problem makes human-computer interaction difficult and hard to share digital content. The application of holographic pyramid is static and support for exhibition displays only, where user cannot interact with the holographic display. Although there is some effort being made to improve the interactivity of holographic display, for example, the addition of a tracking sensor that allows the user to interact with the 3D objects using hand gestures. Besides that, in Smartphone are used for the interaction.

In this paper, we have proposed 3D output generating systems taking input from Kinect 2.0 sensor for sensing the user and the skeleton movements made

by the users are tracked and the gesture made in thin air is processed and the required action is performed.

It is an excellent innovative idea for gesture controlling over the traditional methods used today. Although the framework is defined precisely, sensitivity and area defined for gesture movements are the two critical areas to be controlled according to the system requirements.

## V. PROPOSED IMPLEMENTATION

### System Specifications

Hardware Specification  
 Full HD Android Display  
 Speaker  
 Minimum 2Gb Ram  
 Uninterrupted Power Supply  
 Beam Splitter Glass  
 Metallic Outer Rig (Stand)  
 Connectors  
 Black Frame

### Software Specification

Android 4.1(Jelly Bean) or Higher

#### 1. Hologram Layout:

The holographic projection without any medium is a technological advancement which is yet to be Implemented. From its origin, the hologram that is generated always based upon some sort of medium to Projects the holograms.

As, everyone in the world uses some sort of android devices like Smartphone or tablet or even TVs, android had been impacting every industry. Our idea is to develop an app that converts the normal video call app into a *holographic video call app*.

This app combines the concept of video call with hologram. The app looks like a normal video call app.

On the sender's side, the sender selects the person whom he/she wants to contact. As the received side, video appears natural on the holographic display when users are viewing through the Pyramid Prism in single view point.

The app made specifically converts the live video call into a four directional video structure so that a 3D Holographic form in the receiver side based on the layout shown in Figure 7.

#### 2. Hologram Projection Pyramid:

The holographic display is created by implementing the Projection Pyramid as shown in figure 8. This technique requires a combination of two main hardware an android display that is placed bottom with the projection pyramid placed on top of it.

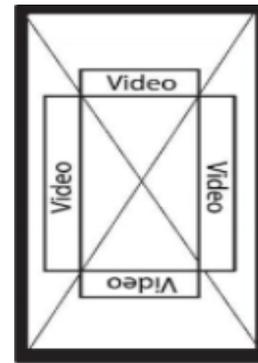


Fig 7. Holographic layout

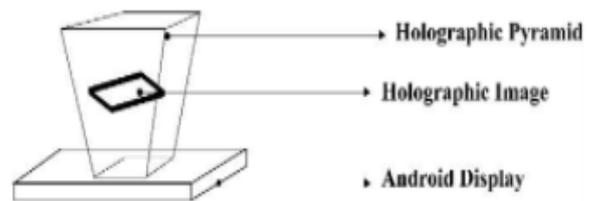


Fig 8. Hologram Projection Pyramid

The display projects the video from the app and the video in the scene is reflected on the reflective surface at an angle of 45 degrees so that it shows an holographic video in it.

#### 3. Full Holographic Display:

This defined the hardware which are implemented as shown in figure below. Inside this block consists of android display with the app installed in it. The display act as a holographic projector with an app helps in creating holograms. The metallic rig acts as a stand with black frame forms the outer surface with a single viewport which helps in viewing holograms with more accuracy. As the black outer frame blocks the outer atmosphere lights entering inside.

## VI. FUTURE SCOPE

CAR Driver Training at 200 mph with Future Technology of Holographic Projection; the projected image would be ahead of the car to allow the driver to get use to corner, turns, drafting and driving next to other cars.

Modeling Holographic Projection to Study Hurricanes and projecting these in the classrooms for weather modification scientists to study. To practice Public Speaking in Virtual Reality, project the crowd in front and getting used to talking in front of very large groups.

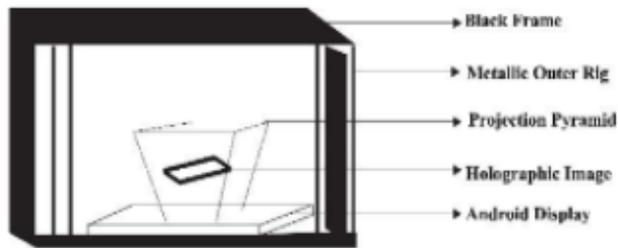


Fig 9. Full Holographic Display

Holographic Companions, when people go off to work, their children and elderly parents can have a holographic human friend, to keep company [5]. Holographic Projection and Accident Recreation in Virtual Reality to determine what happened and prevent it in the future and enable engineers to examine the accident and to recognize the part failures thereby coming up with preventive methods in the future designs. Hang Gliding Training using Holographic Projections, learning to fly a hang glider is a dangerous task and VR holographic simulation would be another great application.

The Real world uses of hologram application are endless. It ranges from Live stage shows to Military and space application. In 2012, Snoop Dogg closed out his headlining set by bringing out a “hologram” of the rapper Tupac Shakur which is astonishing as the rapper died in 1996. These kind of holograms helps in making a fantasy to reality.

In Marketing, the holograms help in making advertising more realistic approach as it helps in attractive more people and helps in reaching business at greater heights. Holograms in Gaming makes simulation like experience without need of additional gadgets. Education field will be more impactful as holographic teaching helps in students to understand the concept more in depth gaining knowledge faster and easier [6]. The 3D experience is easily replaced when the holograms came into practice in terms of Entertainment field. Training like driving a car or accident test in car are easily simulated by holograms as it produces far more greater results than just numerical data. Medical practices from surgery to scientific experiments are more sophisticated and more accuracy of practices are done.

Communication using holograms are greatly improved and helps in communicating as they are in person. Military and space applications from stealth on enemy borders to establishing a civilization on other planets are achieved using holographic technology without spending a lot of budgets on it. From Star Wars to Avengers End Game, all sci-fi movies have some kind of holographic communication in it. As the development of holographic technology, makes this into reality.

## VII. CONCLUSIONS

Hologram is the technology of the future and with the means of our project we want to contribute our part in the building a better world for coming generations. Our project has the potential to replace the age-old video conferencing and live chats by using the futuristic and innovative use of hologram, not only in meetings, presentation and conferences it can also be useful in the field of 3D entertainment which is growing day by day.

We have used recorded videos of high quality and adjusted its resolution according to the aspects of the display system used. The Raspberry Pi controls the interfacing and processing of user input along with the microcontroller.

The gesture controller board responds to be given hand gesture precisely and processes the output instantly by switching between the videos. This technology is sizable and is feasible in comparison to other methods such as use of hollow table, RGB projectors, etc.

The use of holographic elements could be the future of Augmented Reality applications without using bulky AR helmets.

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