3-D Hologram Using Hand Gestures

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ABSTRACT: Holography is the next stage of photography and conventional film and its three-dimensionality creates completely new possibilities for use, such as for product presentation. A 3D hologram displays products, objects, and animated sequences three-dimensionally and enables seemingly real objects or animations to appear to float completely freely in space. Unlike a conventional film on a standard screen, a 3D hologram is visible from all sides, which means the observer can walk around the hologram, enabling an absolutely realistic-looking image to form. 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.

KEYWORDS:Zooming K-Time algorithm, Image processing, Arduino UNO, Raspberry Pi, Flex sensor, Hand gestures, Holograhic effects.

I. INTRODUCTION

A hologram is a physical recording of an interference pattern which uses diffraction to reproduce a three-dimensional light field, resulting in an image which retains the depth, parallax, and other properties of the original scene. A hologram is a photographic recording of a light field, rather than an image formed by a lens. A 3D hologram is a 3D projection that exists freely in space and is visible to everyone without the need for 3D glasses.sHolography is the next stage of photography and conventional film and its three-dimensionality creates completely new possibilities for use, such as for product presentation. A 3D hologram displays products, objects, and animated sequences three-dimensionally and enables seemingly real objects or animations to appear to float completely freely in space. Unlike a conventional film on a standard screen, a 3D hologram is visible from all sides, which means the observer can walk around the hologram, enabling an absolutely realistic-looking image to form.3D hologram object is a record pattern of the light method.Digital holography was invented in 1900. The improvement of computer science led to delivering the recording.Nowadays, holography has a broad range of applications various sciences.Display paradigm for unrestricted viewing of real-world objects that employs all real 3D principles.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 main objective of our project is to develop a fully functional 3D video capture. Our project allows the user to change the image using hand gestures without the help of any device.

II. PROBLEM STATEMENT

Many problems can be faced when using the traditional methods of viewing the pictures or any conventional films. Some of them can be accommodation-vergence rivalry that arises when a viewer's eyes converge or diverge in response to disparitybetween the left and right images, giving the illusion that part of the scene is coming in front of or behind the screen, but all the time the eyes must focus exactly on the screen. The other problem can be no motion parallax that arises when users move their heads slightly in 3D cinema, the objects do not move as they should if it was a 3D scene, this can give rise to visual discomfort. Everyone in the cinema sees the same perspective decided by cinematographer, changing seat does not give a new perspective of the 3D scene, as in the case in live theatre. Holography could be used to overcome some of these problems.The existing system discuss the creation of a three dimensional (3D) effect for an image by rotating the two dimensional (2D) one on a computer screen in order to add the required sense of image depth depending on image processing techniques. In the traditional system while

explaining something we use board or projector.Traditional system requires more time to demonstrate and need to draw image for different orientation

III. PROPOSED SYSTEM

In the proposed model we have created a 3D holographic box which will be used to display the image. The hologram box is made up of a wood. The top frame is simply a rectangle with a lip on the inside of the frame for the edges of the monitor to sit on. The bottom frame is similar to the top frame except for the inner lip. The top and bottom frame hold together the acrylic frustum within it. The frustum is three pieces of acrylic sheet brought together to form a three-sided pyramid with a 45 degree slope. The acrylic sheets used in developing frustum must be of exact dimensions. The dimensions are highly dependent on the size of the monitor used. The base and back of the hologram box is covered with PVC sheets or any similar material that serve the 3D holographic effects by blocking off the light and creating a dark background for the hologram. For the hand gestures we are using one wrist band which consist of an Arduino Nano, ADXL and a Bluetooth module HC05. For image modification such as zoom in or zoom out we make use of a flex sensor. Image is displayed in the holographic box along with the information provided to it. The proposed system uses a Raspberry Pi controller based system to achieve holographic projections. The power supply unit is designed such that it is connected to both the Raspberry Pi board and the Gesture Interface board simultaneously, both circuits are provided with different voltage and power requirements. The power supply unit consists of a bridge rectifier, capacitive filters and voltage regulators (LM7805).
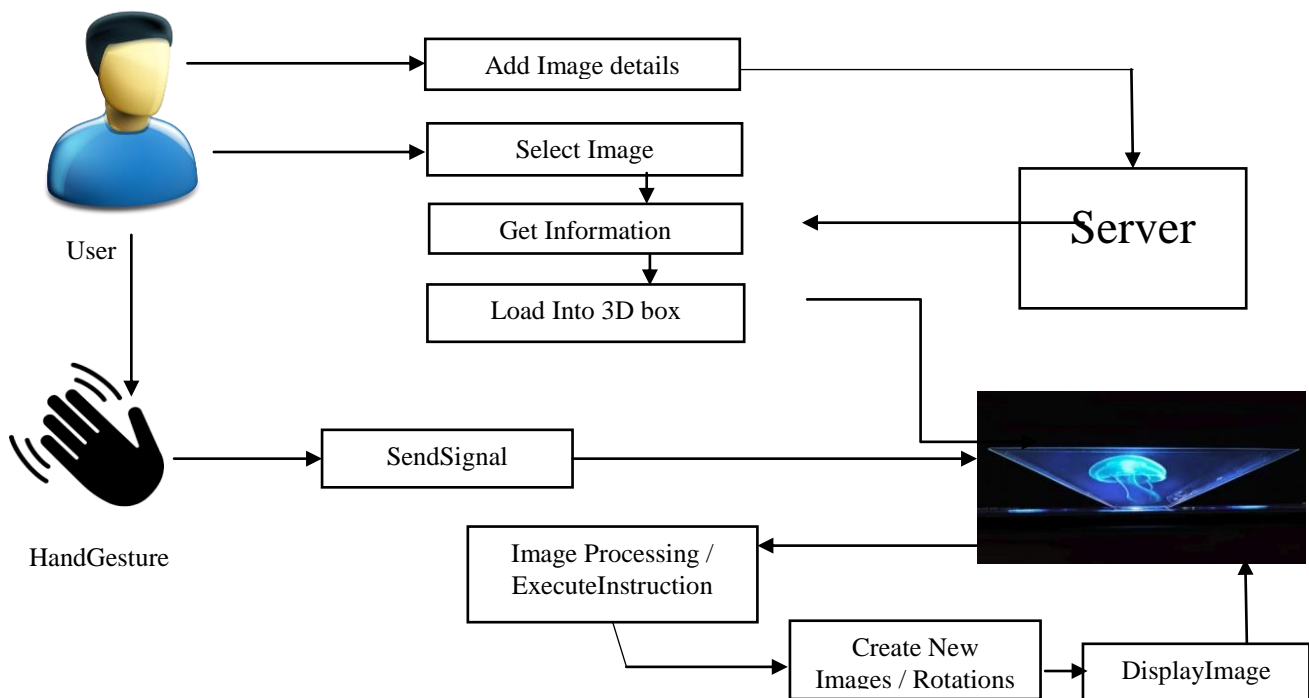

Fig 1: Working of the System

The step by step process how the images are displayed in hologram box is given
1. First the images and videos which needs to be displayed are stored in the web app along with its information. The application can be used in any smartphones.
2. The app is connected to the monitor of the hologram box using a Bluetooth. The images selected by the user is transferred through the Bluetooth to be displayed in the box.
3. There is a Raspberry Pi placed on the monitor. Once the Raspberry Pi receives the instructions from the android based mobile app, those instructions are applied on the selected images and displayed in the hologram box.
4. The user can change the images using hand gestures without the help of the mobile app. One wrist band is used for the hand gestures which consist of an Arduino Nano, ADXL and a Bluetooth module HC05. The ADXL detects the hand movement based on x, y, z axes and passes the data to the Arduino and the Arduino transmit the instruction to the raspberry pi. For zoom in and zoom out we will use flex sensor.

5. Based on the instructions given by the user the images are modified using the python program in the raspberry and is displayed in the hologram box.
6. When the zoom in and zoom out instruction is given the image processing algorithm is applied to zoom in and zoom out the images

IV. IMPLEMENTATION

A. Implementation

An android based mobile application is developed, to store the images along with its information that is needed to be displayed in the hologram box.
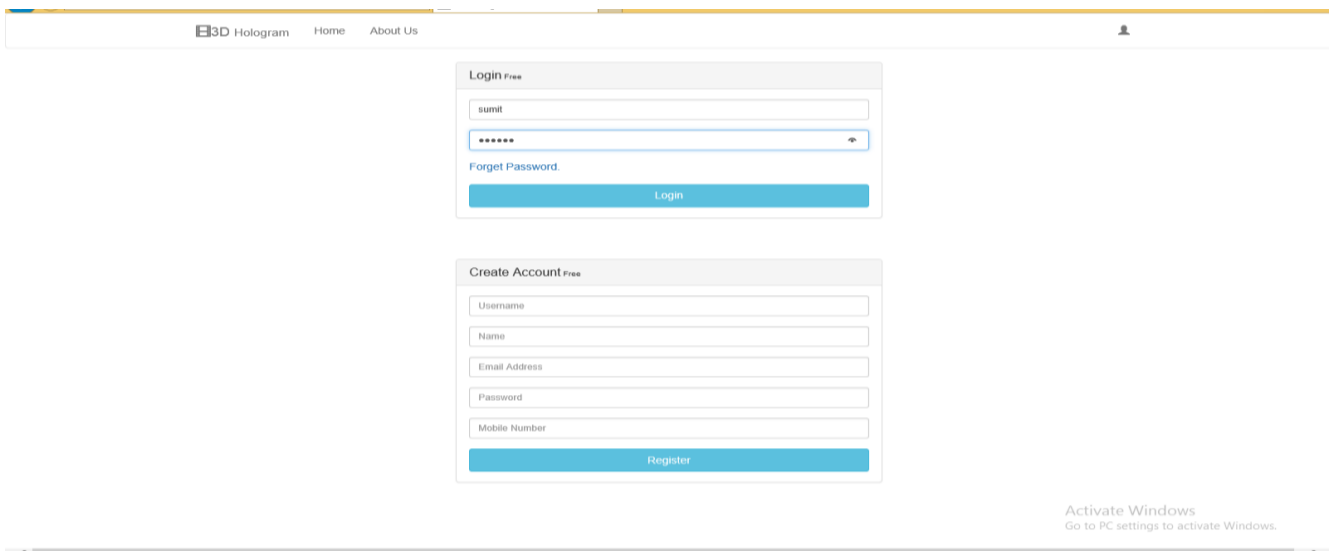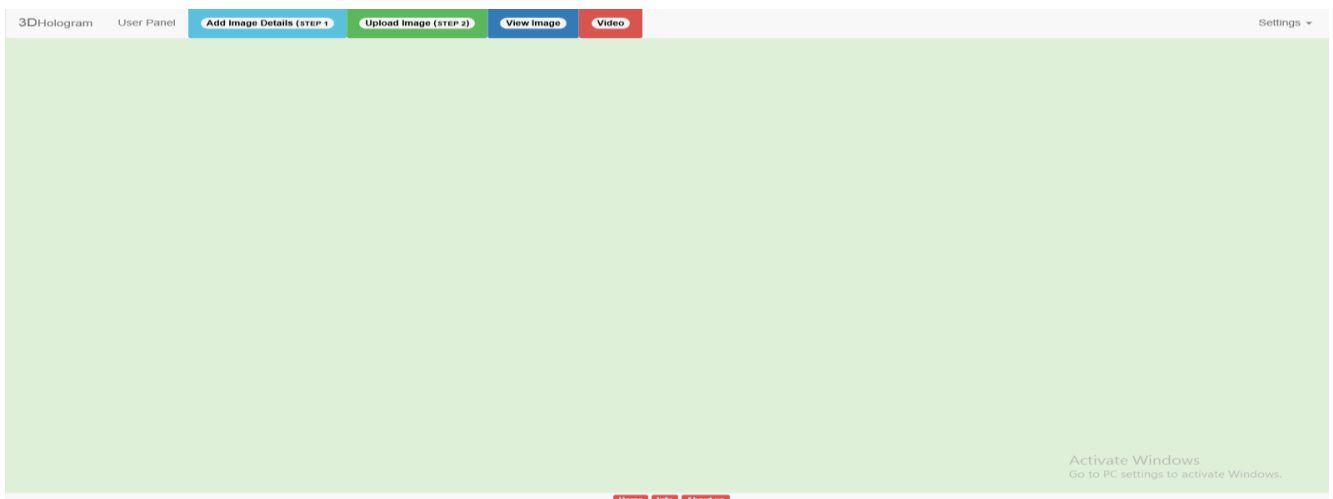

Fig 2: Login Page of the app

Fig 3: Home page of the user

Fig 4: Adding image and video details
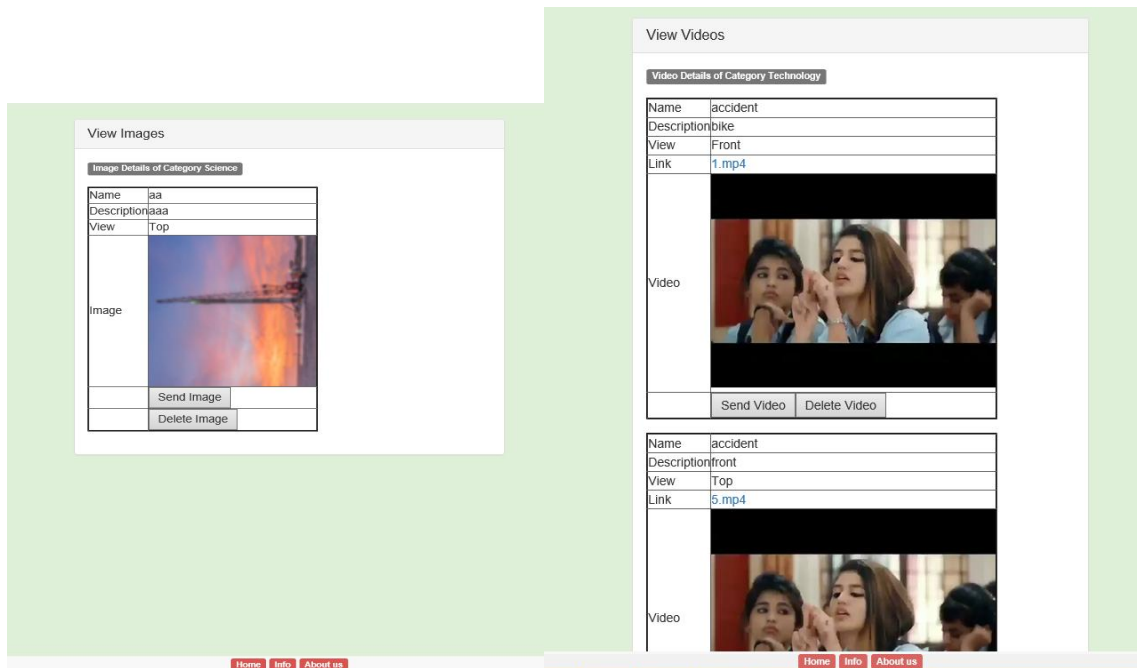

Fig 5: Adding images and videos

Fig 6: View images and videos

B.Software

For software purpose, we used 4 different software for different purpose in our project.

1. NetBeans 8.2
2. Jdk8
3. Python 3.7
4. Mysql5.1

V. HARDWARE

A.1. Hologram Box

The hologram Box is made up of wood as its base and top frame. The top frame holds the monitor within its inner lip. The top and bottom frames are held together by wooden pillars. The frustum is made of acrylic sheets, they are made in the shape of a pyramid with 45 degree. The image is seen within the frustum.

B.1. Arduino UNO

Arduino Uno is used to control the relay signal which will direct the signal based on their given code, the signals given by flex sensor are controlled and work accordingly.
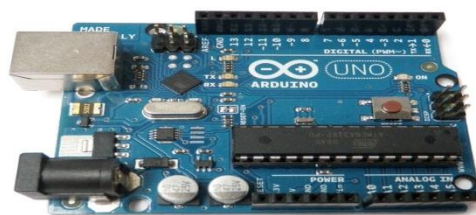

Fig 7: Arduino UNO

B.2. Raspberry pi

The Raspberry Pi device looks like a motherboard, with the mounted chips and ports exposed (something you'd expect to see only if you opened up your computer and looked at its internal boards), but it has all the components you need to connect input, output, and storage devices and start computing.There are two models of the device: **Model A** and **Model B**. The only real differences are the addition of Ethernet and an extra USB port on the more expensive Model B.

Fig 8: Raspberry Pi

B.3. Glove for hand gesture

The wrist band consists of an Arduino nano, ADXL and a Bluetooth module HC05. The ADXL detects the hand movement based on x, y, z axes and passes the data to the Arduino and the Arduino transmit the instruction to the raspberry pi. Based on the instruction, the python program in the raspberry, receives the instruction and applies on the image. For zoom in and zoom out we will use flex sensor. A Bluetooth is also connected to it.
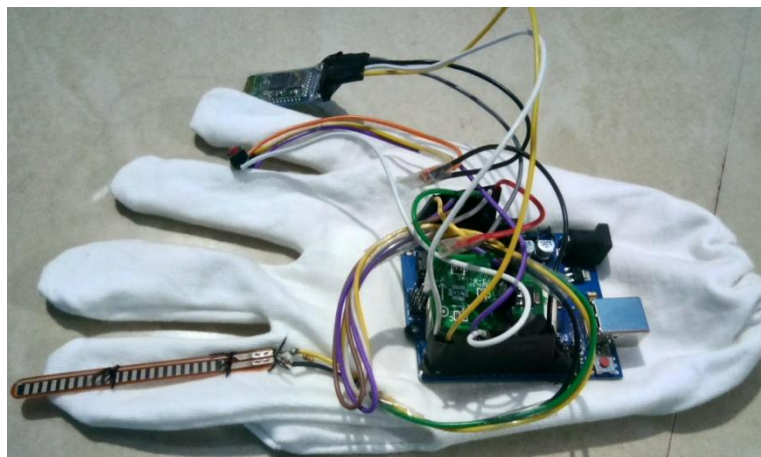

Fig 9: Glove for Hand Gesture

C.1. Power Supply

The power supply unit is designed such that it is connected to both the Raspberry Pi board and the Gesture Interface board simultaneously, both circuits are provided with different voltage and power requirements. The power supply unit consists of a bridge rectifier, capacitive filters and voltage regulators (LM7805).

VI.   RESULT ANALYSIS

The result of the project mainly focuses on two part. The hardware result which will focus on how the device is running displaying the images and videos selected, if the goal is being achieved properly. And the software result which will focus on storing the images and videos required to be displayed along with its information to be displayed in the hologram box.

Fig 10: Hologram box

The app consist of different views of a single image i.e. top view, bottom view, right view, left view and each of the view has its own information to be displayed in the hologram box.When an image is selected to be displayed, same image is same from all four directions for the user.
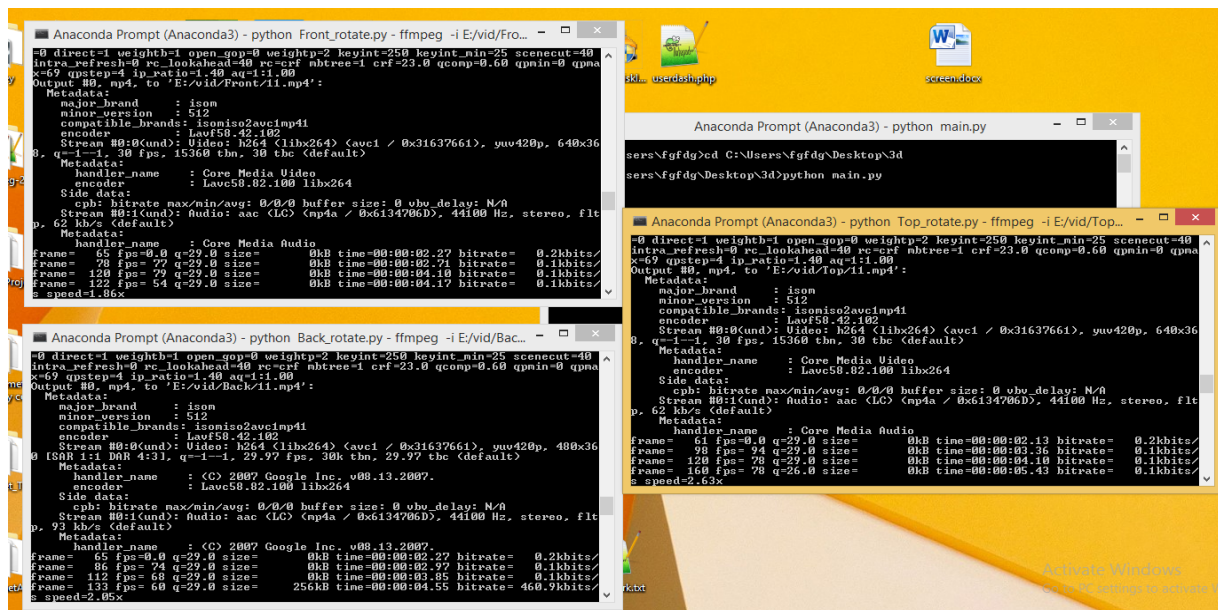

Fig 11: Command prompt to run the code for changing the view

VII. CONCLUSION

A digital display system is simulated to be capable of displaying 3-D images having all the relevant information and visual properties of the scenes to be viewed. The simulated model is a fast simple display technique without need to install optical system or even real objects. The created 3Dimages are viewed with depth impression and are scaled to a desired size. It is also possible to combine the constructed images with some graphical effects to be more enjoyable.This 3-D hologram is constructed in such a way that it is user friendly as well as can be used in almost every domain in order to deliver ideas in a creative way. The use of hand gestures will make it easy for the user to have control on the 3-D hologram as well as the image that is being represented inside it. Thus it plays an important role in digitizing most of the domains with latest technologies being inculcated in it.

VIII. FUTURE SCOPE OF THE STUDY

The future of holographic technology is said to be a game changer, set to revolutionize industries beyond the conventional standards we live in today.3D holographic projection technology clearly has a big future ahead. As this audio visual display continues to get high profile credibility, we are likely to see more companies advertising their products or marketing their business in this way. Whether it be large scale, big budget product launches or smaller retail POS systems, they are likely to become a common feature in the advertising world.The images that were being viewed in 2-D perspective can now be viewed from all sides and also in a 3-D manner with the help of the 3-D hologram. Along with the features of a 3-D hologram, it also enables the users to use hand gestures in order to have full control of the image inside the holographic box. In the near future, the 3-D hologram box will be very essential in digital education, as it will allow the users to teach the in a visually appealing way and also act as an amazing device for modern education. Along with being beneficial in the field of education, it also plays an important role in the medical and health care domain by providing a 3-D view of any scan report. The entire project is not only sustainable but very essential in mostly all of the domains which require a device to convey their ideas in a very creative way.The future integration of hologram technology in different sectors is thought to revolutionize certain industries like space research, medical research, information storage, architecture, non-photorealism and even entertainment. Holograms have the potential to dramatically improve training, design, and visualization in many business settings and production facilities, being able to look at, zoom in and manipulate 3D versions of in-progress designs.

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