

# AN OVERVIEW OF METHODS TO ACQUIRE AND VISUALIZE 3D CONTENT

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## **Introduction of 3D**

**3D** (Three dimensional) displays a pictures or objects in from that appears to be physically present with a designated structure.

Humans are able to perceive the spatial relationship between objects just by

looking at them because we have 3D perception, also known as depth perception.

**3D Content Acquisition Kinect:** Kinect is a motion capture device of Microsoft Xbox 360. It is used to capture the depth of the image by a binocular-like depth sensor based on Infrared ray (IR). It requires much more time to scan and in that time if the object is moving then it can't find the depth. While capturing the images it takes much time to capture the images, which is the disadvantages of Kinect.

#### **Stereoscopic camera :-**

It consists of two lenses with a separate image sensor. It allows the camera to simulate human binocular vision and therefore it gives the ability to capture the 3D image. It is used for making 3D pictures for movies, range imaging etc. During our explorations, we used two types of stereo cameras. One of them was made using mounting two monocular cameras (Basler acA1300-30gc) on a stereo mount. The other one was LG P920 stereoscopic camera phone. **Multiple camera-based acquisition:-** It consists of multiple cameras and images are captured by these cameras. And after matching the feature points the 3D image is reconstructed.

#### **Application of 3D Reconstruction:**

- Healthcare
- Robotics.
- Film industry (computer graphics).
- Gaming.
- Animation.
- Virtual reality.

● Digital media. **Some topics in Multi-camera based acquisition and reconstruction: Pinhole camera:** A pinhole camera is a basic or simple camera without a lens but having a tiny aperture.

#### Applications of pinhole camera:

- In ancient times, pinhole camera is used to study the nature of light and to watch solar eclipses.
- It is also used to capture the movement of sun over a long period of time. **Characteristics of pinhole camera:**
  - It has nearly infinite depth of field and most important every image appears in focus.
- Only one ray passes through due to small aperture. **Limitations of pinhole camera:**
- Not scaled (depth is not present). Pinhole camera cannot be used for studying moving objects. **Camera calibration:-** Camera calibration is the process of finding the true

parameters of the image. Some of these parameters are focal length, principal point, skewness etc. We can use these parameters to determine the location of the camera in the scene.

**3D VISUALIZATION :-** 3D Visualization helps in education, entertainment, healthcare:- **EDUCATION:-** 3D visualization solution help us to facilitate deciphering of conceptual which presented information and provide a generic feel of the concept through gaining more attention in case of education.

**ENTERTAINMENT:-** 3D visualization enable viewers to experience the real life feeling with a deeper sense. It also enhance the entertainment experience.

**HEALTHCARE:-** 3D visualization offer a clearer picture of disease classification for medical empant, leading to better and safe treatment in the healthcare sector.

**Examples of 3D Visualization Methods:- Stereoscopic Display:-** Stereoscopic display is a device capable of conveying depth perception to the viewer.

**Head mounted devices:-** A head mounted display is a device ,worn on the head or as part of helmet, that has a small display optic in front of each eye.

**Autostereoscopic Displays:-** It is a device that enables a 3-D( three dimensional) effect without requiring the viewer to wear special glasses.

**Light field display:-** The display uses a microlens array to split an image into individual light rays.

**“Feature point:-** Feature point is a point which gives the information about the neighbourhood of any point.”

**Feature vector:** It is an n-dimensional vector of numerical features that represent particular feature point.

All the feature points are matched using several algorithms for example, SIFT, SURF, HARRIS CORNER etc. The use of each algorithm depends upon the image orientation.

**Sift algorithm:** The scale- invariant feature transform (SIFT) is an algorithm used to detect and describe local features in digital images. SIFT includes both a detector and a

descriptor.

**Surf algorithm:** This feature is mostly used for object detection purposes. It is also patented local feature detector and descriptor. But SURF is 3 times faster than SIFT. It can be used for tasks such as object recognition, image registration, 3D reconstruction.

**Harris corner algorithm:** Harris corner detector is a corner detection operator that is commonly used in computer vision algorithms to extract corners and infer features of an image.

In 3D, I have learnt about 3D image processing , Kinect, capturing the images using DSLR camera , extracting the feature point using stereo camera, matching the feature point using MATLAB.