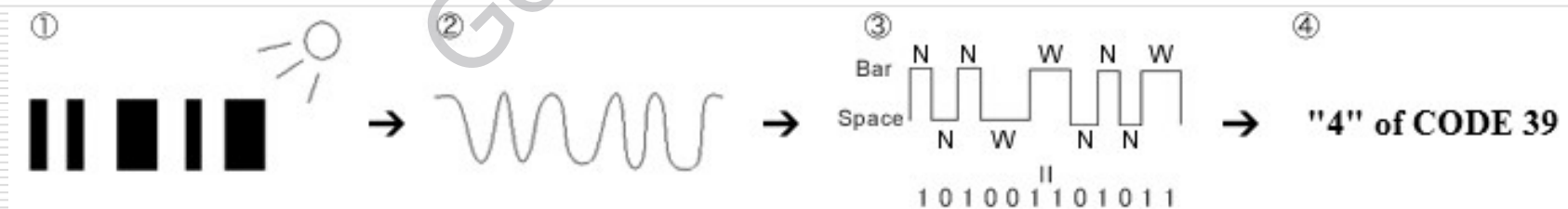


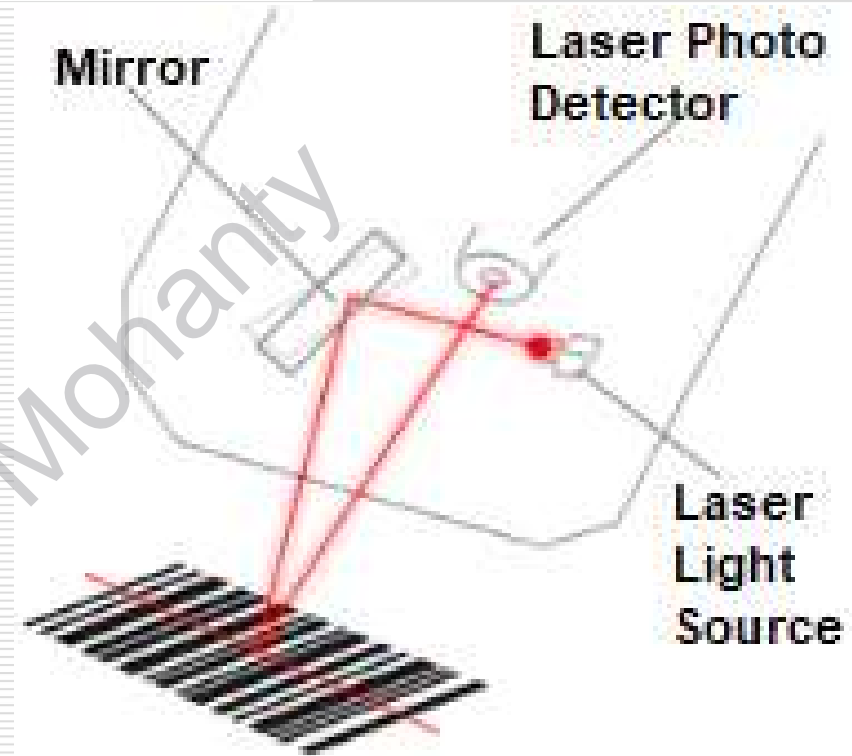
Barcode Scanner Using Laser

- A bar code consists of white and black bars. Data retrieval is achieved when bar code scanners shine a light at a bar code, capture the reflected light and replace the black and white bars with binary digital signals.
- Reflections are strong in white areas and weak in black areas. A sensor receives reflections to obtain analog waveforms.
- The analog signal is converted into a digital signal via an A/D converter. (Binarization)
- Data retrieval is achieved when a code system is determined from the digital signal obtained. (Decoding process)



Barcode Scanner Using Laser

- ✓ Laser light is shone on the label surface and its reflection is captured by a sensor (laser photo detector) to read a bar code.
- ✓ A laser beam is reflected off a mirror and swept left and right to read a bar code Using laser allows reading of distant and wide bar code labels.



Holography

Introduction:

- ❑ The word holography originates from the Greek words "holos" (complete) and "graphos" (writing). Thus, it is the technique to record the complete picture of an object. The technique was proposed by Denis Gabor in 1947.
- ❑ An ordinary photograph records the two dimensional image of the picture because it records only the **amplitude or intensity distribution**. But in holography technique, both, the **intensity** as well as **phase** of the light wave is recorded.
- ❑ In holography, the light waves reflected from an object is recorded. These light waves consist of intensity and phase and the record is called a **hologram**. The hologram has no resemblance to the original object but it contains all the information about the object in a optical code.

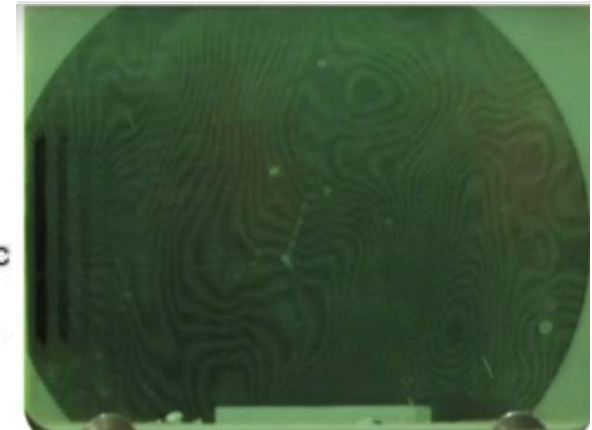
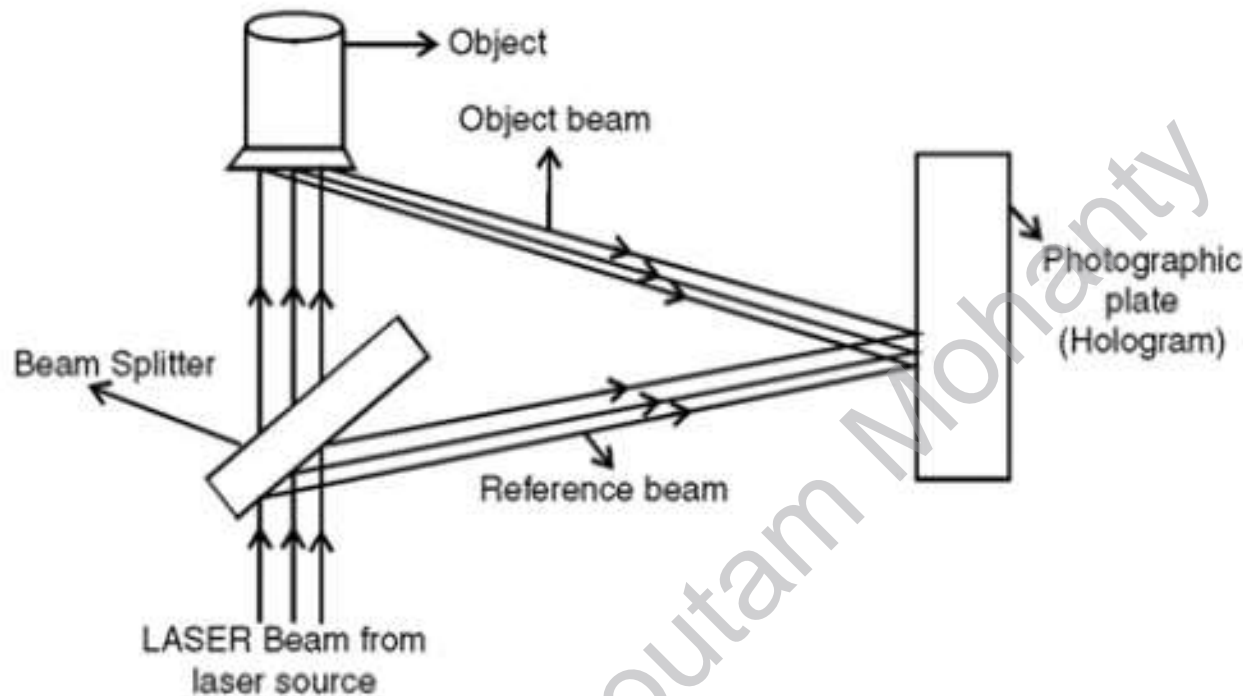
Principle of Holography

- The formation of hologram is done by a process called recording process. The formation of three-dimensional image from hologram is done with a process called reconstruction process. Thus holography consists of two processes :

I. Recording of hologram

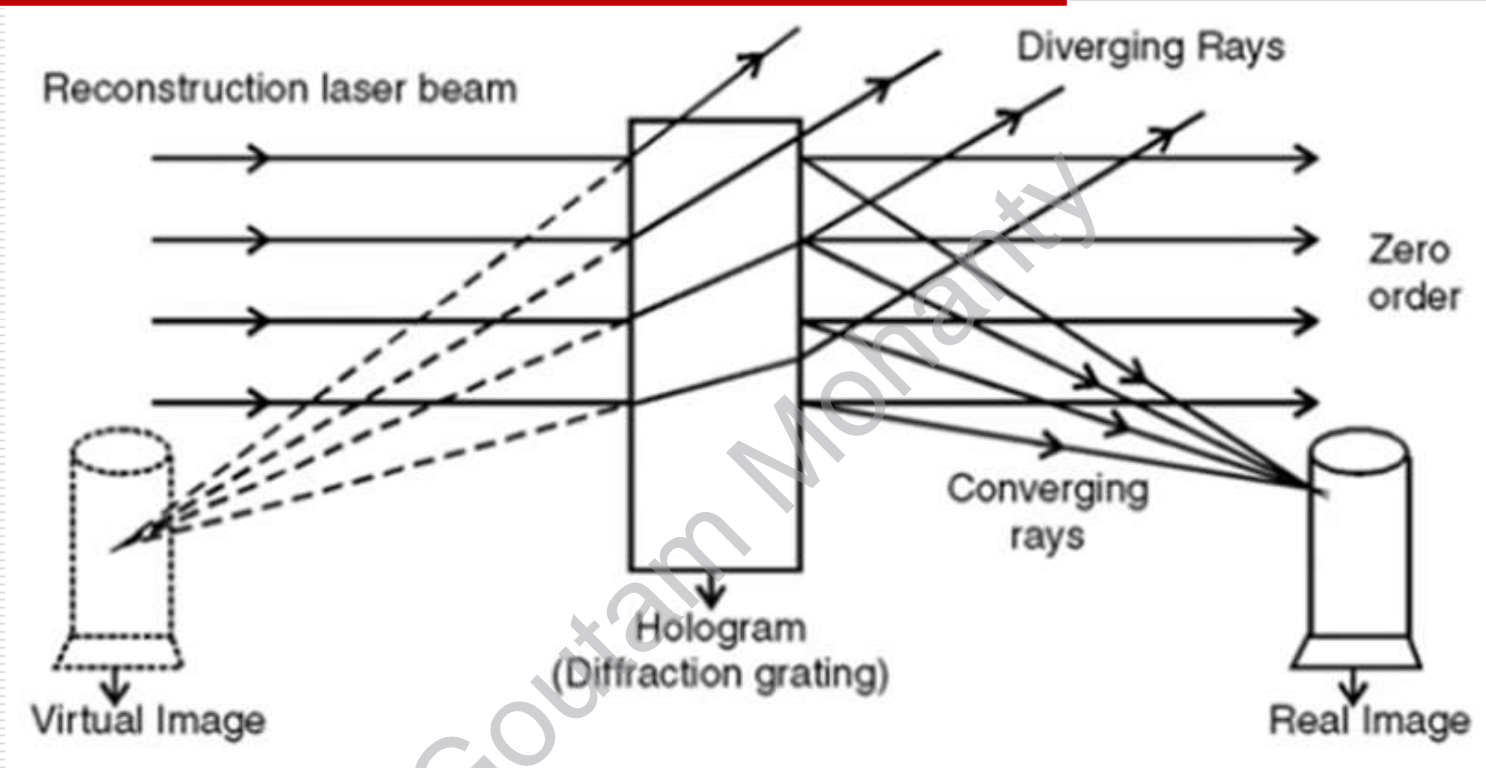
II. Reconstruction of image

Recording of hologram



- ❖ The recording of hologram is based on the phenomenon of **interference**
- ❖ The object beam reflected from the object **interferes** with the reference beam when both the beams reach the photographic plate. The superposition of these two beams produces an interference pattern (in the form of dark and bright fringes) and this pattern is recorded on the photographic plate.
- ❖ The photographic plate with recorded interference pattern is called **hologram**. Photographic plate is also known as **Gabor zone plate** in honour of Denis Gabor who developed the phenomenon of holography. Each and every part of the hologram receives light from various points of the object. Thus, even if hologram is broken into parts, **each part is capable of reconstructing the whole object**.

Reconstruction of image



- ❖ It is based on the principle of **diffraction**. In the reconstruction process, the hologram is illuminated by laser beam and this beam is called reconstruction beam. This beam is identical to reference beam used in construction of hologram. The hologram acts a diffraction grating. This reconstruction beam will undergo phenomenon of diffraction during passage through the hologram. The reconstruction beam after passing through the hologram produces a **real** as well as **virtual image** of the object.

Types of Hologram

- ❖ Reflection hologram
- ❖ Volume hologram
- ❖ Multiple-channel hologram
- ❖ Rainbow hologram
- ❖ Dichromatic hologram
- ❖ Polymer hologram

Goutam Mohanty

Rainbow holograms

- ❖ Though for measurement purposes one uses a laser for reconstruction, with advancements in technology it has been possible to construct holograms that could be reconstructed using **white light**.
- ❖ Such holograms are termed as **rainbow holograms**. These are made by a double holographic process. An ordinary transmission hologram is used as the object and a second hologram is made through a slit. The slit process removes the coherence requirement of the viewing light and hence the 3D object could be viewed with white light.

Applications of Holography

- ☐ Data storage
- ☐ Holographic Interferometric
- ☐ Interferometric microscopy
- ☐ Dynamic holography
- ☐ Optical phase conjugation
- ☐ Determine cubic dimension
- ☐ Atomic holography
- ☐ Electron holography
- ☐ Ultrasonic holography



THANK YOU