Worksheet- 4

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Subject Name: AR Lab **Subject Code: CSF- 484**

1. **Aim/Overview of the practical: Discuss the properties of real and virtual images in view of augmented reality in detail. In Addition, create an augmented reality effect of head decoration using AR Spark Studio.**

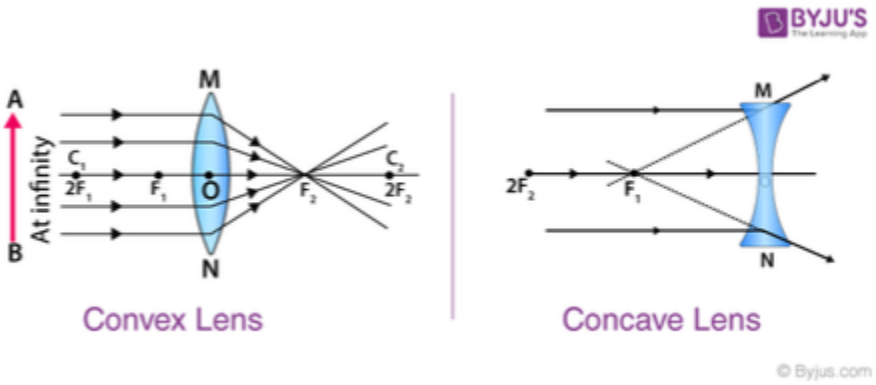
2. Task to be done:

Discuss the properties of real and virtual images in view of augmented reality in detail. In Addition, create an augmented reality effect of head decoration using AR Spark Studio.

3. Theory:

Lenses

Lenses are made from polished surfaces that act as mirrors, lenses bend rays of light so that a focused image is formed. Over the past, it is being used in the manufacturing of several devices such as telescopes, magnifying glasses, binoculars, cameras, and microscopes.
There are mainly two types of lenses:
1. Concave Lens
2. Convex Lens



Diopter

It is a unit of measurement with the dimension of reciprocal length, equivalent to one reciprocal metre, 1 dioptre = 1 m−1. It is normally used to express the optical power of a lens or curved mirror, which is a physical quantity equal to the reciprocal of the focal length, expressed in metres.

The dioptre can also be used as a measurement of curvature equal to the reciprocal of the radius measured in metres.

Real Image and Virtual Image

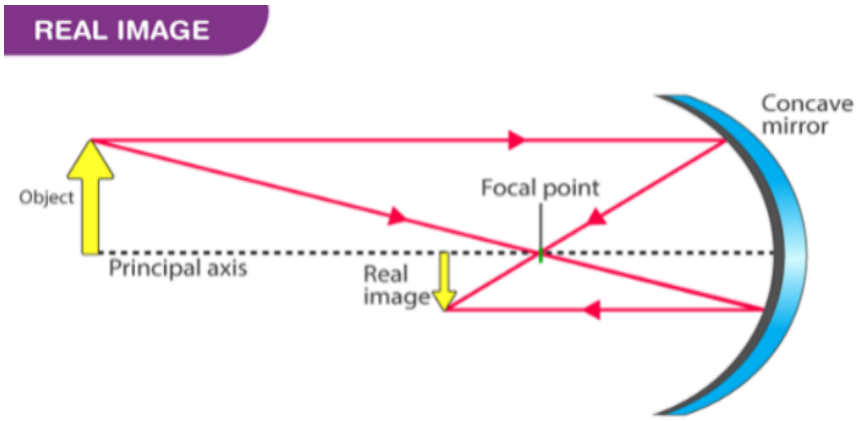
There are differences between real and virtual images:

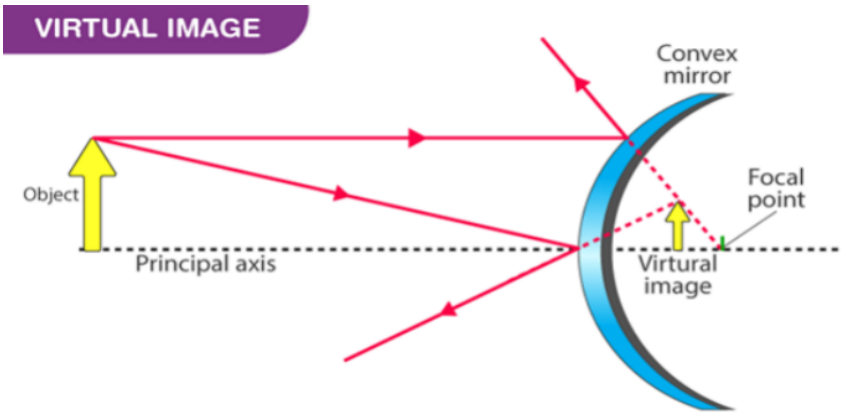
Real Image	Virtual Image
Real images are inverted.	Virtual images are erect.
Convex lenses form a real image.	Concave lenses form a virtual image.
Real images are formed on the screen.	Virtual images appear to be on the lens or the mirror itself.
Real images are formed by a concave mirror	Convex mirrors form a virtual image.
Real images are formed due to the actual intersection of light rays.	Virtual images are formed due to the imaginary intersection of light rays.

A real image and a virtual image are different forms of image. The main difference between real and virtual images lies in the way in which they are produced. A real image is formed when rays converge, whereas a virtual image occurs when rays only appear to diverge.

A virtual image is an upright image that is achieved where the rays seem to diverge. A virtual image is produced with the help of a diverging lens or a convex mirror. A virtual image is found by tracing real rays that emerge from an optical device backwards to perceived or apparent origins of ray divergences. Because the rays never really converge, a virtual image cannot be projected onto a screen.

Therefore, we can say that the difference between real and virtual images is that the real image can be obtained on the screen whereas the virtual image cannot be obtained on the screen.





Optical Aberrations

To get the best image quality, a lens must correct for optical aberrations. Without the proper corrections, images can end up blurring in some way and losing vital image data.

An optical aberration refers to a defect in a lens design which causes light to spread out instead of focusing to form a sharp image. This ranges from all the light in an image to only certain spots or edges being out of focus.

There are several types of optical aberrations that can occur when imaging. Building an ideal vision system that has all possible aberrations corrected would add significantly to the cost of a lens. There is always some type of aberration found in the lens but minimizing the effects of the aberration is crucial.

Conversion Process from Real Images to Virtual Images

To obtain an actual image the light source and the screen must be placed on the same plane. Real images are obtained using a converging lens or a concave mirror. The size of the real image depends upon the placement of the object.

An augmented reality effect of head decoration using AR Spark Studio.