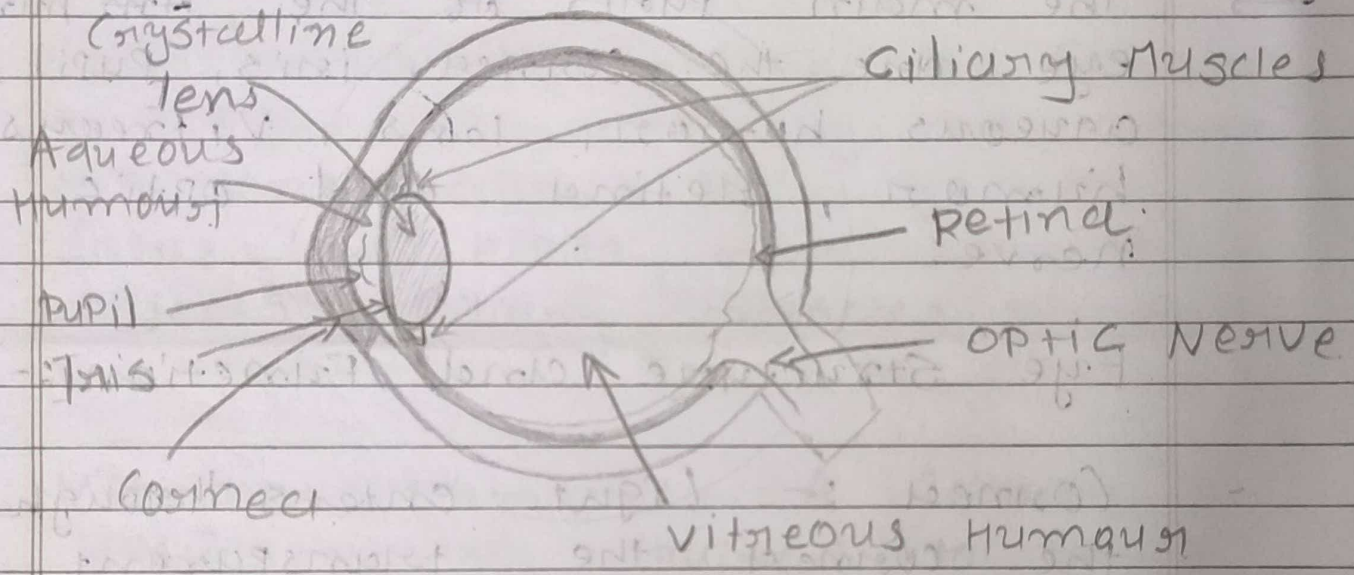
Assignment.

(1) Describe about the structure of human eye. how the image is formed in the eye ?

Human Eye



→ Human eye are "camera-type eye", which means they work like camera lenses focusing light onto film.

→ The cornea and lens of the eye are analogous to the camera lense, while the retina of the eye is like the film.

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→ The main parts of the ~~eye~~ human eye are the cornea, iris, pupil, aqueous humor, lens, vitreous humor, retina and optic nerve.

Eye Structure and Function :-

- Cornea :- Light enters through the cornea the transparent outer covering of the eye the eyeball is rounded, so the cornea acts as a lens. It bends or refracts light.

- Aqueous Humor :- The fluid beneath the cornea has a composition similar to that of blood plasma.

- Iris and Pupil :- Light passes through the cornea and aqueous humomon through an opening called the Pupil. The size of Pupil is determined by the Iris.

- Lens :- While most of the focusing of light is done by the cornea, the lens allows the eye to focus on either near or distant objects. Ciliary muscles surround the lens.

- Vitreous Humor :- A certain distance is required to focus light. The vitreous humor is a transparent watery gel that supports the eye and allows for this distance.

* Formation of image in human eye :-

Step 1 :- When light enters the human eye through the pupil, is.

bent by the lens; and is then absorbed by the retina's pigment cells.

Step 2 :- This result in changing of the pigments and setting of nerve cells to fire. A picture is created.

Step 3 :- Each eye receives a unique image as a result of the brain's interpretation of the specific arrangement of the activated cells.

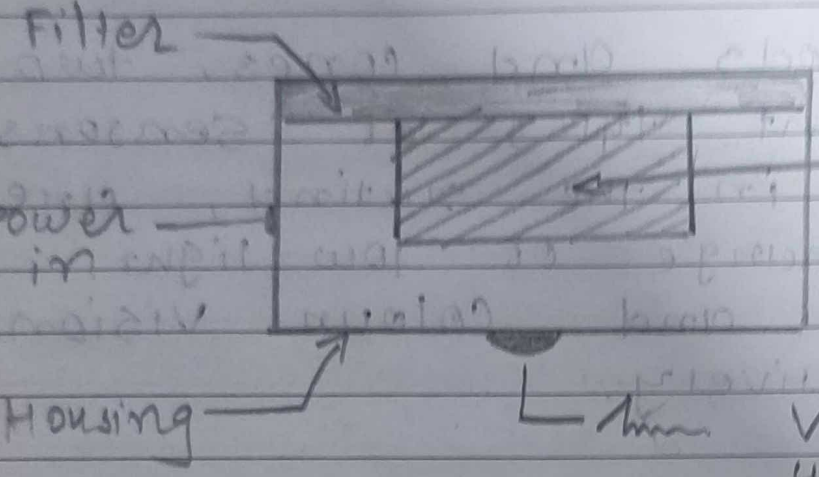
Step 4 :- Since light is inverted as it travels through the lens, light that strikes the retina at its top comes from the ~~top~~ bottom of the field of view.

Step 5 :- Rods and cones, two different types of sensors found in the retina, are in charge of low-light vision and colour vision, respectively.

(2) Different image sensing techniques.

(1) Single imaging sensor
(2) Line sensor
(3) Array sensor.

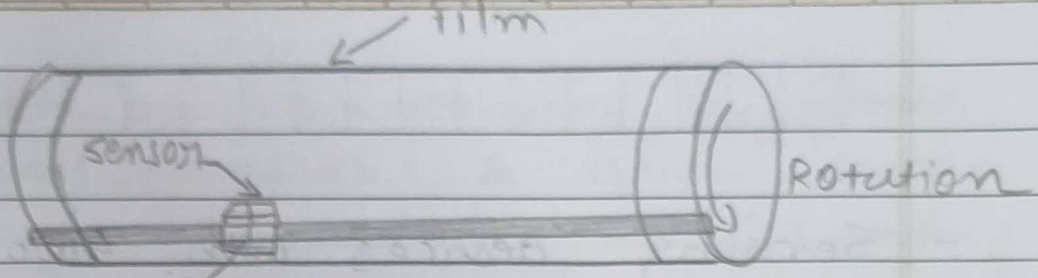
(1) Single imaging sensor
→ The most common sensor of this type is the Photodiode, which is constructed of silicon materials and whose output voltage waveform is proportional to light.



→ The use of a filer in front of a sensor improves selectivity.

→ Ex. a green (Puss) filter in front of a light sensor favours light in the green band of the color spectrum.

→ As a consequence, the sensor output will be ~~stro~~ stronger for green light than for other components in the visible spectrum.



one image line out per increment of rotation and full image displacement of sensor from left to right

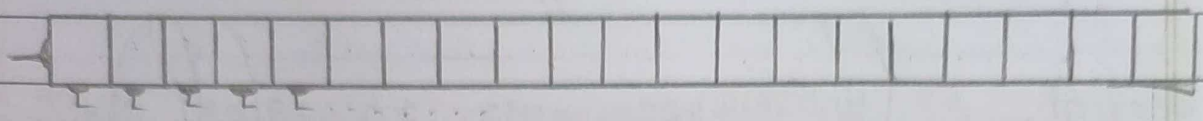
linear motion

- In Order to generate a 2-D image using a single sensor, there have to be relative displacements in both the x and y-directions between the sensor and the area to be imaged.

- The single sensor is motion can be controlled with high precision scanning where film.

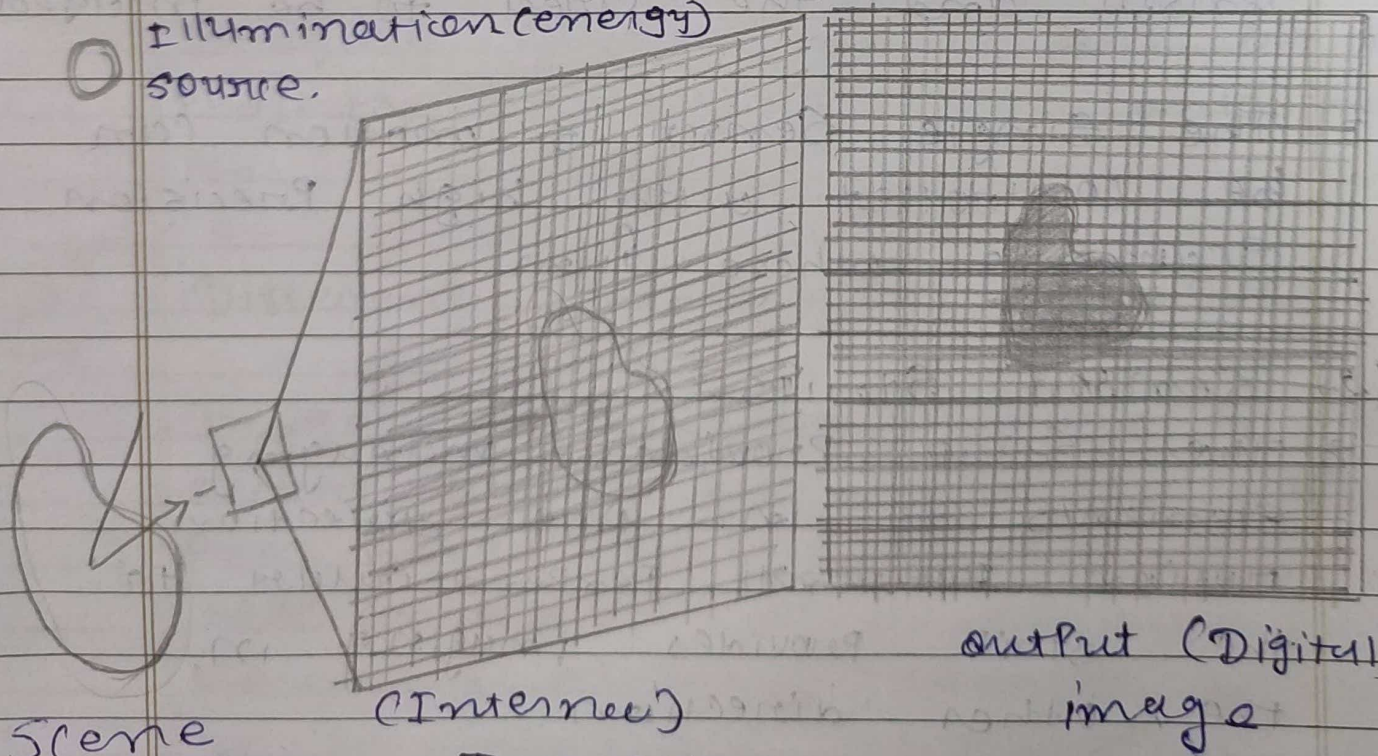
(2) Sensor Strips.

→ The strip provides imaging elements ~~is~~ in one direction. Motion ~~perpendi~~ perpendicular to the strip provides imaging in the other direction.



- Sensing devices with 4000 or more in-line sensors are possible. In line sensors are used routinely in airborne imaging application, in which the imaging system is mounted on an aircraft that files at a constant altitude and speed over the geographical area to be imaged.

(3) Sensor arrays.



→ This type of arrangement is found in digital cameras. A typical sensor for these cameras is a CCD array, which can be manufactured with a broad range of sensing properties and can be packaged in rugged arrays of 4000 * 4000 elements or more.

→ The first function performed by the imaging system is to collect the incoming energy and focus it onto an image plane. If the illumination is light, the front end of the imaging system is a lens, which projects the viewed scene onto the lens focal plane.

(3) Different Interpolation techniques.

→

Image Interpolation :- Image interpolation occurs when we resize or distort our image from one pixel grid to another. Image resizing is necessary when we need to increase or decrease the total number of

pixels, whereas remapping can occur when one is correcting for lens direction distortion or rotating an image.

3 Method of interpolation

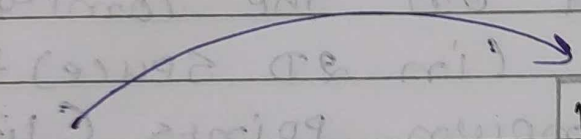
1) Nearest Neighbor interpolation.
2) Bilinear interpolation
3) Bicubic interpolation

1) Nearest Neighbor interpolation

→ Nearest Neighbor interpolation, the simplest method determines the grey level value (or color) from the closest pixel to the specified input coordinates, and assigns that value to the output coordinates. It should be noted that this method does not really interpolate values, it just copies existing values. Since it does not alter values, it is preferred if subtle variations in the grey level

values need to be retained.

For one-dimension Nearest Neighbor interpolation, the number of grid points needed to evaluate the interpolation function is two. For two-dimension Nearest Neighbor interpolation, the number of grid points needed to evaluate the interpolation function is four



10	4	22
2	18	7
9	14	25

3X3

10	10	4	4	22	22
10	10	4	4	22	22
2	2	18	18	7	7
2	2	18	18	7	7
9	9	14	14	25	25
9	9	14	14	25	25

6X6

(2) Bilinear interpolation.

→ Bilinear interpolation determines the gray level value (or color) from the weighted average of the four closest pixels to the specified input co-ordinates, and assigns that value to the output coordinates.

- Bilinear interpolation considers the closest 2x2 ~~into~~ neighborhood of known pixel values surrounding the unknown pixel's computed location. It then takes a weighted average of these 4 pixels to arrive at its final interpolated value. The weight on each of the 4 pixel values is based on the computed pixel's distance (in 2D space) from each of the known points (linear interpolations).

(3) Bicubic convolution interpolation.

→ This method determines the grey level value (or color) from the weighted average of the 16 closest pixels to the specified input coordinates, and assigns that value to the output coordinates.

- The image is slightly sharper than that produced by Bilinear interpolation, and it does not have the disappointed produced

by Nearest Neighbor interpolation. The Bicubic interpolation is advancement over the cubic interpolation in two dimensional regular grid.