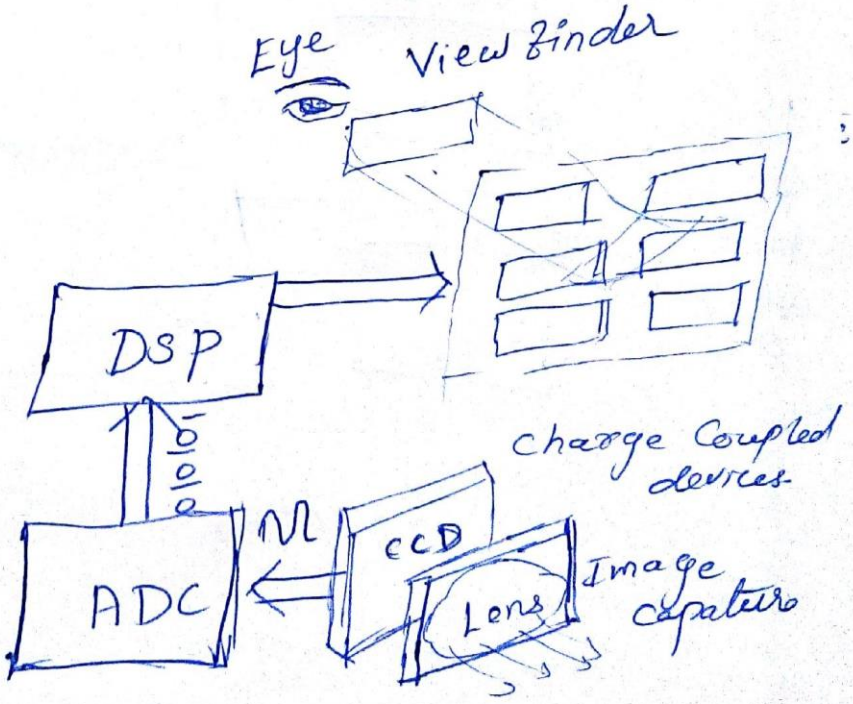
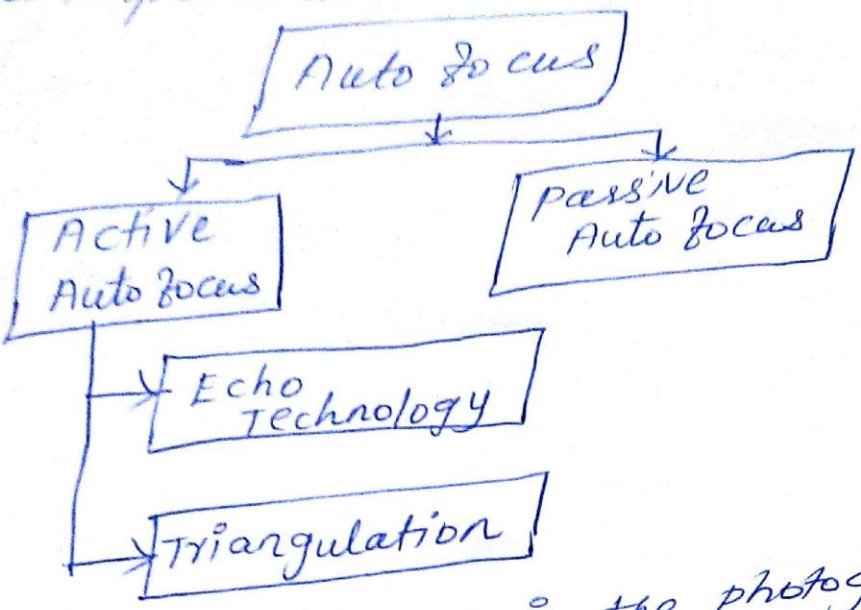
Auto focus Camera :-

* A Camera is basically a black box with
  - a lens to focus the image
  - an aperture that determines how bright the light is.
  - a shutter that determines how long the light enters &
  - light sensitive film / an image sensor.



Camera working

- Today, auto focus has all but eliminated fuzzy pictures and is a must for actions shots. The implementations of auto focus are diverse



- A sharp image is the photographer's elusive goal, but even when focus & depth of field are just right, a photographers hands are still wiggling.
- A vibration reduction system must counteract vertical vibration (pitch) & side-side vibration (yaw) & every direction in b/w & it needs to make the correction within a few milliseconds.

Active Auto focus :-

- In Active Auto focus, the Camera uses an infrared beam to determine focus, while in "passive focus" the camera uses contrast to determine focus.
- Active has the potential to be more accurate but is limited by distance.
- Active is still used on some P&S Cameras.

- In active autofocus, there are 2 types of less expensive cameras

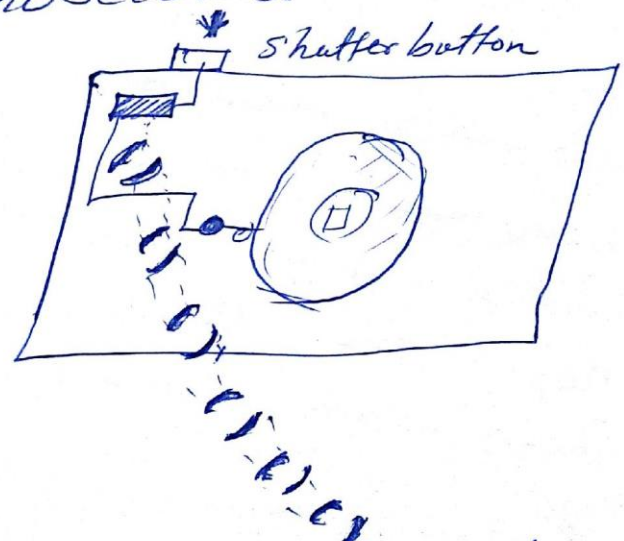
* The first type is the echo technology of radar and sonar.

* The second is based on the triangulation used in range finders.

Echo active Auto focus :-

- when the shutter button is depressed, an infrared light is emitted towards the subject of the photograph.

- The infrared light bounces off the subject & returns to a detector. The time it took for the light to make the round trip is determined - usually in nanoseconds.

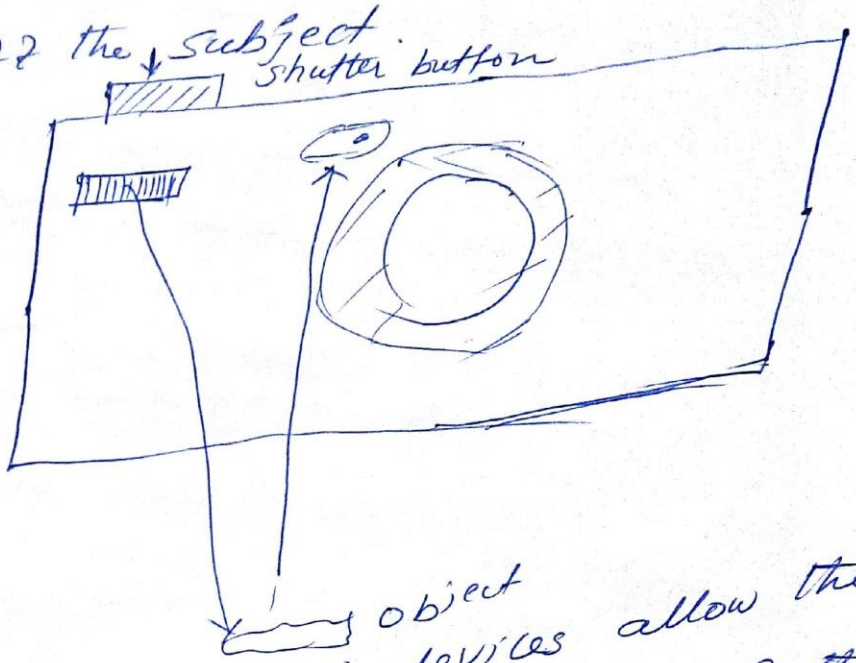


- A microprocessor controls a motor built into the lens housing. The motor rotates to a position that's been calibrated to focus on an object at the distance determined by the infrared bounce.

- This type of autofocus works with objects not more than 30 feet from the camera.

Triangulation Active Auto focus:-

- unlike timing auto focus, which uses the same transducer to generate and receives bursts of light, triangulation active auto focus works with one device to shine light at the photo's subject and a second device to receive the light after it bounces off the subject.



- The separate (third) devices allow the auto focus mechanism to make use of the different angles formed by the light's path to the subject and its path on the return trip.

Passive auto focus:-

- In this, the light from the image is used to focus the camera.

- Here light passes through the lens of the camera and is diverted from the image sensor at the back of the camera by a mirror or prism.

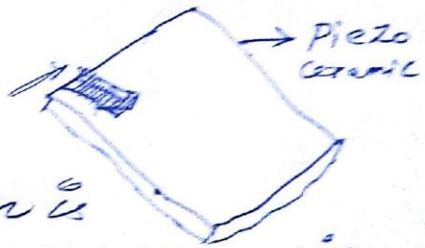
- The light falls on a strip of 100-200 photocells called linear sensors, similar to those that makeup

- The strip is positioned so that the distance the light travels to it is equal to the distance to the imaging sensor.
- The camera's processor compares the intensity of the light falling on each photocell to the intensities of the adjacent cells.
- Adjacent pixels have similar intensities for an out-of-focus image.

* Both the active & passive types require a motor to make work & that motor is an ultrasonic motor.

- The motor that moves the lens (ultrasonic motor):-

- Any autofocusing camera must have a motor to move the lens elements to bring the subject into focus. Great speed and precision is required & there is so little space. The ultrasonic motor meets those requirements.



- The ultrasonic motor is built on a phenomenon called the "piezoelectric effect". The effect is shown in the diagram for the substance zirconium titanate (PZT), a ceramic lead.