# Motion

## Motion estimation

Text, letter

Description automatically generated

## Block matching

Split image in blocks, a similar block is searched for in the previous image

* Different type of search methods:
  + Full search, logarithmic search, n-step, conjugate search, pyramid search

There are several techniques used for motion detection in computer vision, including:

* Background subtraction: This method involves analyzing consecutive frames of a video, and subtracting the background (static elements) from the current frame to detect any moving objects.
* Optical flow: This technique uses the pixel intensities in consecutive frames to estimate the motion of objects in the scene.
* Frame differencing: This method involves taking the difference between consecutive frames, and thresholding the result to detect any changes in the scene, which indicate motion.
* Motion history images: This approach involves creating an image that accumulates the motion of objects in a scene over time, and can be used to detect motion by analyzing changes in the image over time.
* Blob detection: This method involves detecting connected regions of pixels that have similar characteristics, such as color or texture, and tracking them over time to detect motion.

## Stereo vision

Disparity estimation. Disparity: change, change of two scenes/images

Disparuty vectors tells which point in one image corresponds to the same physical object in previous image

Stereo vision is a technique used in computer vision to estimate the 3D structure of a scene from two or more images captured by cameras with slightly different viewpoints. The concept is based on the principle that the human visual system uses the slight differences in the images seen by the left and right eyes (binocular disparity) to perceive depth and estimate the distances to objects in the scene.

In stereo vision, two cameras are positioned at slightly different locations, and are used to capture images of the same scene from slightly different viewpoints. These images are then processed to find correspondences between the pixels in the two images, and the disparities between the corresponding pixels are used to calculate the depth of the objects in the scene. This process is called stereo matching.

## Segmentation

Can be based on texture, motion, disparity, colour etc. Subdividing segments of an image

Segmentation divides an image R in N disjoint subsets. Each of these subsets are labelled with a colour gray level or just colour in general.

Can be based on regions or objects.

Types:

* Thresholding: based on pixel intensities
* Region based: group similar pixels
* Edge based: seach for discontinutiies

1. Thresholding: This method involves converting an image into a binary image by thresholding pixel intensities. The threshold value is chosen such that pixels with intensities above the threshold are assigned one value (e.g. white), while pixels with intensities below the threshold are assigned another value (e.g. black). This method can be used for simple images with clear boundaries between objects and background.
2. Region-based methods: These methods involve grouping pixels into regions based on some similarity criteria, such as color, texture, or intensity. Region growing and region splitting are examples of region-based methods.
3. Edge-based methods: These methods involve detecting edges or boundaries in an image and then grouping pixels that are connected by these edges into segments. Canny edge detection is an example of an edge-based method.
4. Clustering methods: These methods involve grouping pixels into segments based on the similarity of their feature values. K-means and mean-shift are examples of clustering methods.