Hough Transform

This is a technique to detect any shape, if that shape can be represented in a mathematical form.

This is capable of detecting the shape even if it is broken or distorted a little bit.

Detecting the no. of lanes in a road can be done with the help of hough transform.
For this task:
The very first thing that is done is finding the edges using an algorithm.
Then we take a geometrical representation of that edge. For example to find the "slope of the edge or its intercept" we can use the "hough transform".

It plays a very crucial part in the application discussed above.

Basics:
The line can be represented in the 2 systems, one is "cartesian coordinate system" and the second one is "polar coordinate system".

The line can be represented in the "Hough space".
The "xy space" line can be represented in the "mc space". Here, "m" is the slope of the line and "c" is the intercept of the line.

So, a line can be represented by a point in the "mc-space". The vice-versa of this is also true. A "point in the xy space" can also be represented by a "line in the mc space".

So, what we do is we take an edge detected image and for every point(i.e. a non black point), we draw lines for mc space.

We use the polar coordinate system here in the hough space(mc space). Since, the xy coordinate system is unable to represent the vertical lines.

Hough Transform Algorithm:

1. Edge detection.
2. Mapping of the edge points to the hough space, stored in the accumulator.
3. Interpretation of accumulator to yield the lines of infinite length(Thresholding and other constraints).
4. Conversion of infinite lines to finite lines.

Using opencv we can implement 2 kinds of hough transform:

1. Standard Hough transform (using HoughLines method).
2. Probabilistic Hough Line transform (using HoughLinesP method).