X-Corner Detection for Camera Calibration Using Saddle Points

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Research Objective: To accurately and automatically develop an X-corner detection of checkerboard pattern for camera calibration using saddle points

Introduction

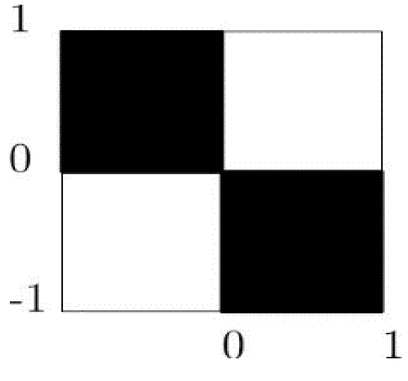
- Camera calibration is required for many computer vision and image processing applications.
- Quality of camera calibration is sensitive to the accuracy of corner detection

Saddle Points

- Lines and edges are important features for many image processing and computer vision applications.
- An edge in an image corresponds to a significant local change in intensity level

$$e(x,y) = ax + by + c$$

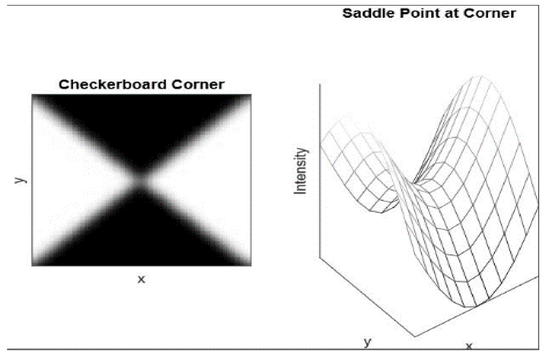
$$E = \begin{cases} 1 \text{ for } e(x,y) > 0 \\ 0 \text{ for } e(x,y) < 0 \\ \frac{1}{2} \text{ otherwise} \end{cases}$$



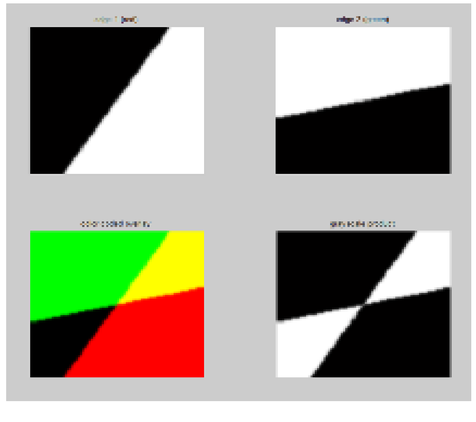
We could also model a local X-corner, or saddle point, by considering two lines, given as

$$l_1(x,y) = a_1x + b_1y + c_1$$

$$l_2(x,y) = a_2x + b_2y + c_2$$



The X-corner is given by the product of the lines used as the argument of the edge function.



Results