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Progress report for week 1

Task:

Extract the pixel coordinates of the corners of a table tennis table from a picture.

Idea:

Use the color difference between table and background together with edge detection techniques to extract the edges of the table. Use these edges to calculate corner positions.

Implementation:

1) Filter for a specific color spectrum and create a masked black/white image, where every pixel falling in that spectrum is turned white and others black.

2) Reduce the noise around the table by applying gaussian blur and thresholding a few times. This removes some noise and fills out big noisy areas, reducing the further detected amount of edges.

3) Apply edge detection to extract edges from the image.

4) Use the Hough transformation to determine lines in the edge-image which should correspond to the table's edges. Begin with a high requirement of points on one line and lower it gradually until 4 defining lines are found. While doing so, some lines are sorted out to reduce the effect of noise. They get sorted out if they fulfill one of the following criteria:

a) There already exists a very similar line.
(Hough Line detection often stacks multiple only slightly different lines on each other)

b) The line crosses the image borders on both sides in the upper third of the image.
(This makes them very unlikely to represent a table edge)

c) The line has no partner line which is almost parallel.
(The opposite edges of a table are almost parallel in every picture)

5) Under the assumption that the final chosen lines are the edges of the table, calculate their crossing points and make them the estimated corner positions.

Problems:
The main problem with this approach is that large amounts of noise can occur. One can tighten the color spectrum observed, but that reduces the versatility of the program, as the table's color varies decently much across different images. Therefore, sometimes big areas of the background are filtered together with the table. If their edges now exceed the length of the table's edges, they get detected first, which most likely results in wrong corners. Fine noise also is a problem, as the Hough Algorithm does not check if the points are from just one group/line or multiple groups.

Other notes:
I did not implement a version for green tables yet, as i might change my approach after the meeting.