CS435 Final Project - Paper Homography

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1 Image Prep and Edge Detection

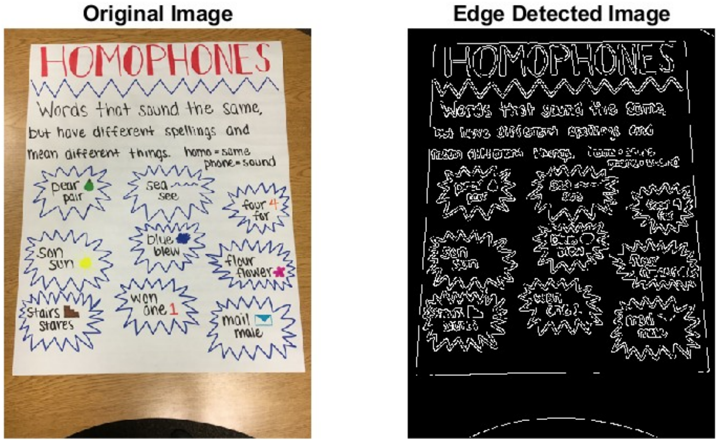


Figure 1: Input Image 1 with edge detected

2 Hough Transform for Line Detection

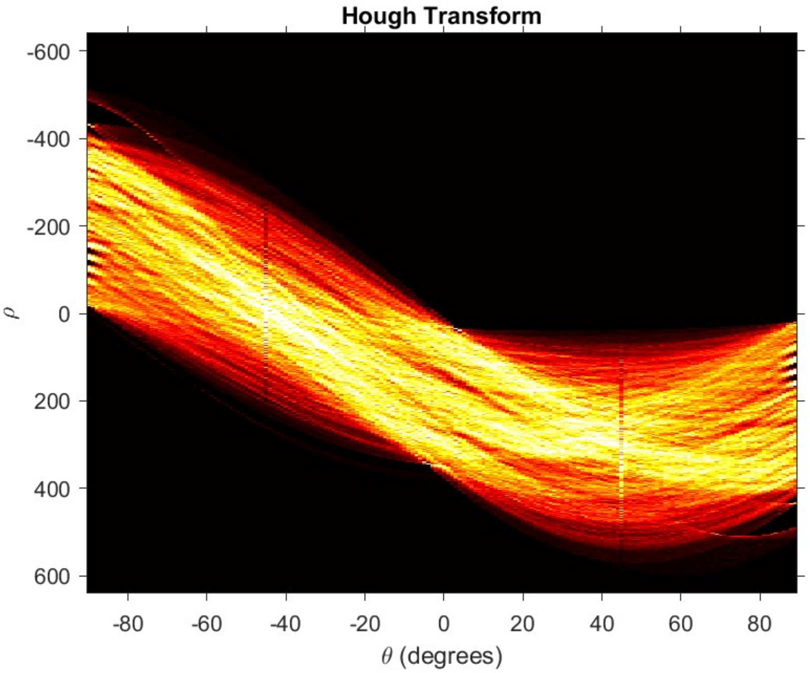


Figure 2: Hough Transform of Input Image 1

3 Relevant Line Identification

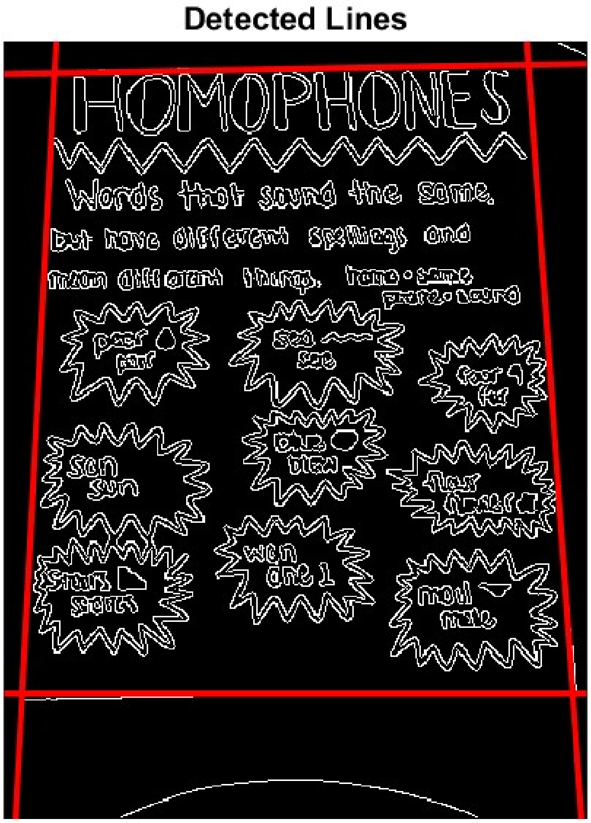


Figure 3: Detected Lines of Input Image 1

How points were extracted from Hough Transform and the selected lines superimposed on edge image

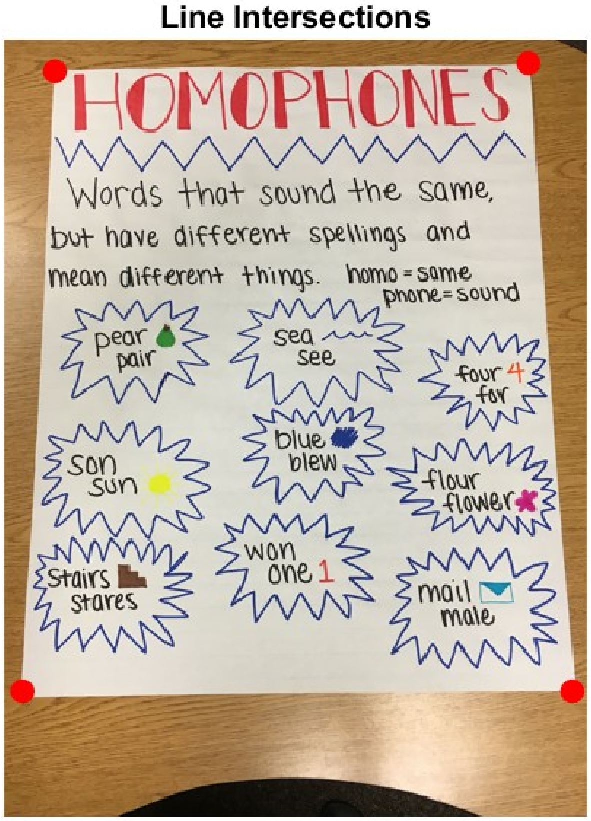
1. **Thresholding:** The Hough transform output was weighted with a filter in order to select the candidate lines of interest out of the rest of the image. This specified threshold helped, as it excluded all lines that were not necessary and only vital lines arrived at to make the judgment.

2. **Local Maxima Detection:** Using a fixed window size, we look for local maxima in the thresholded Hough transform space. This involved iterating through the Hough space to find points that had a local maximum in the specified window size. Such local maxima were candidates for lines.

3. **Application of Constraints:** Given the nature of the problem, that is finding the four edges of a piece of paper, we applied certain constraints to select the relevant lines from potential candidates. Constraints that we used include the angles, lengths, and any other geometric property that best characterizes the edges of the paper.

After the lines are selected based on the above process, we superimpose them on the edge image through plotting them using their parameters—that is, rho and theta, or slope-intercept forms. This superimposition gave a clear visualization of the detected lines over the original edge image and conveyed the identification of the edges. This ensured that only relevant lines corresponding to the edges of the paper get selected and displayed for the following steps of finding intersections and rectification.

4 Line Intersections



HOMOPHONES

Words that sound the same, but have different spellings and mean different things. homo = same phone = sound

pear pair

sea see

four 4 for

son sun

blue blew

flour flower

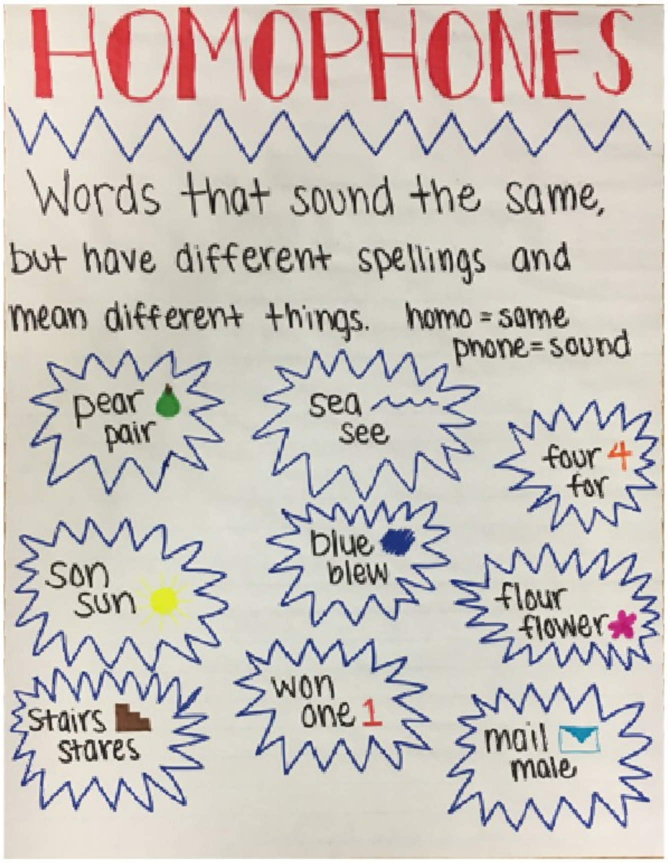
stairs stares

won one 1

mail male

Figure 4: Line Intersections of Input Image 1

5 Image Rectification



Rectified Image

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Figure 5: Image Rectification of Input Image 1

6 Another Example

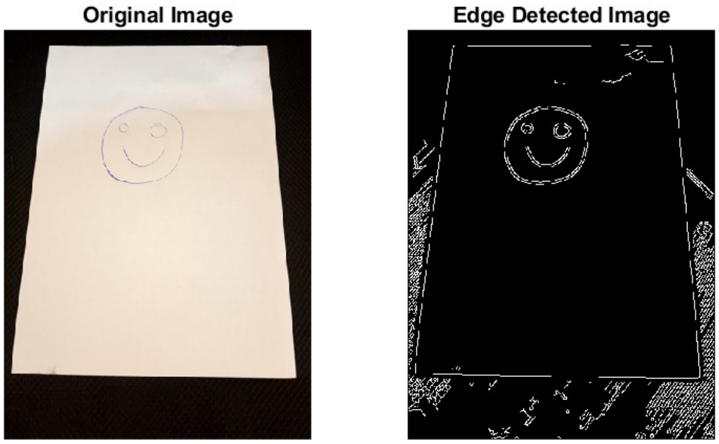

Figure 6: Input Image 2 with edge detected

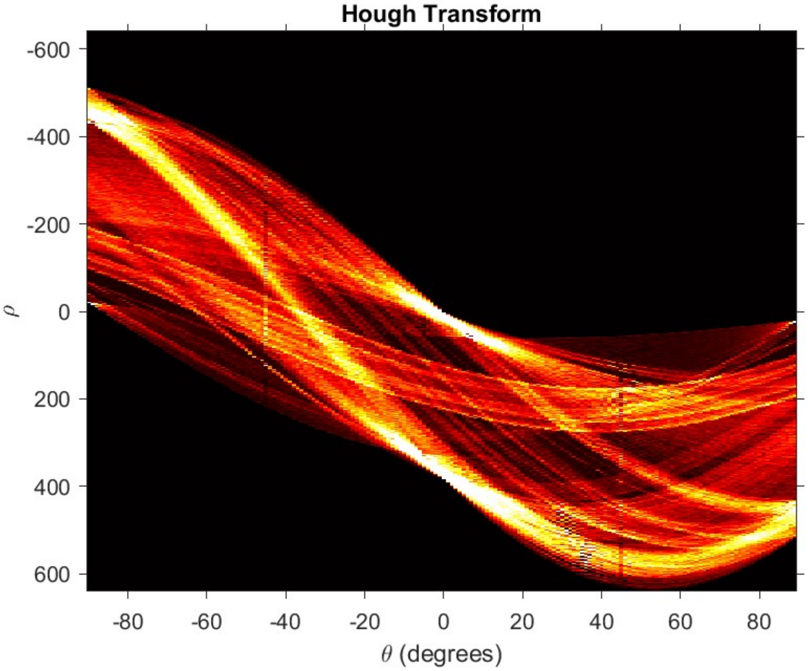

Figure 7: Hough Transform of Input Image 2

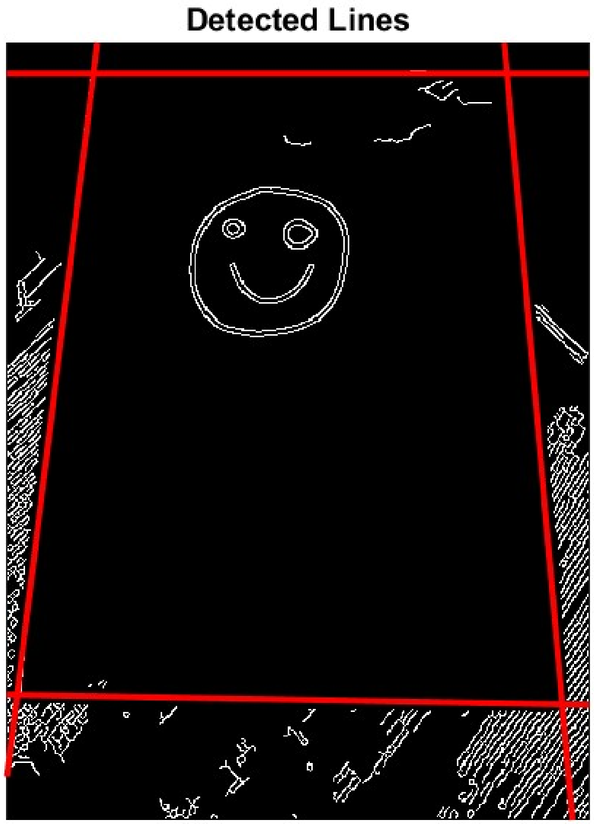

Figure 8: Detected Lines of Input Image 2

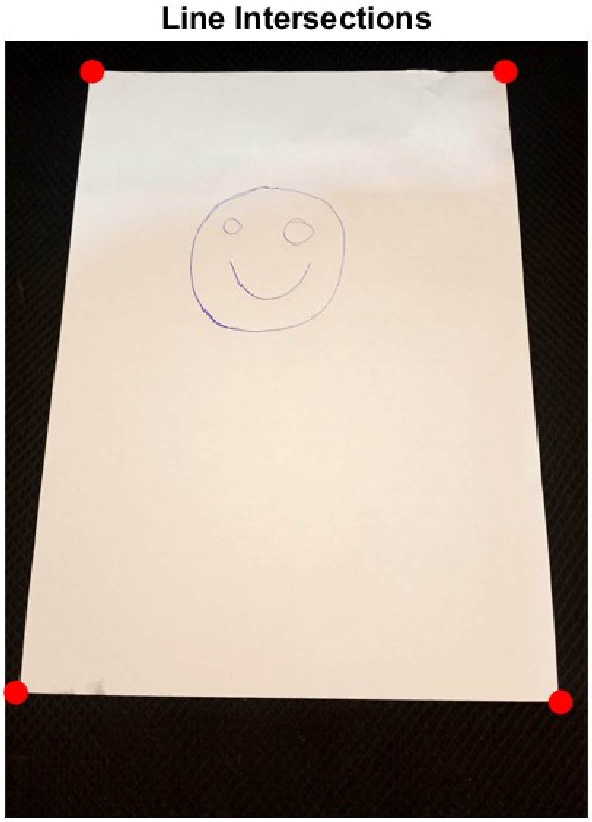

Figure 9: Line Intersections of Input Image 2

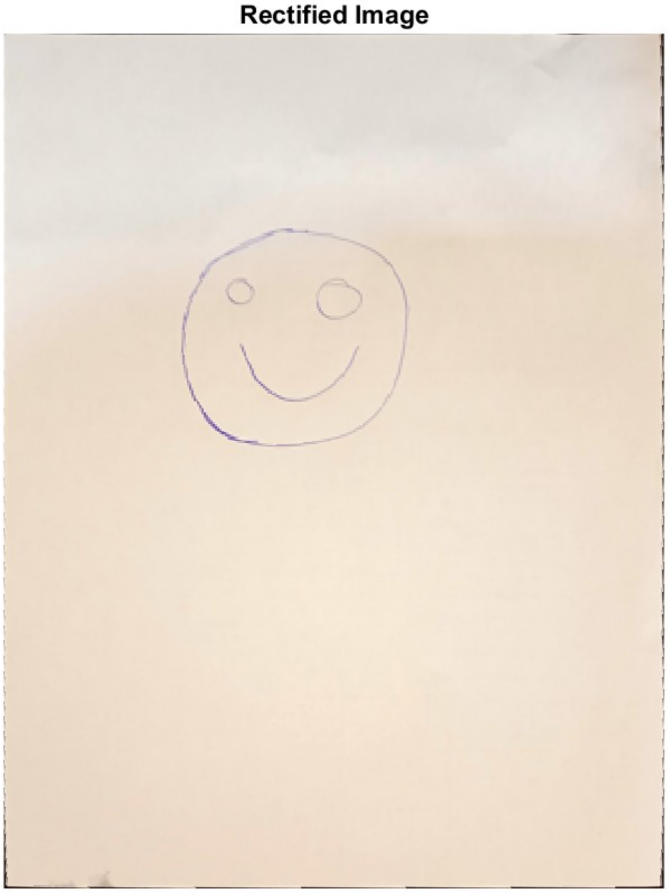

Figure 10: Image Rectification of Input Image 2