Generation of Bird's-eye view for dashcam video by Vanishing point detection

CSE-344 Computer Vision
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Dataset Description

The dashcam video is taken from following link A3 Autobahn

It consists of dashcam footage obtained from a car driving on the A3 Autobahn in Germany, sometime during the autumn months.

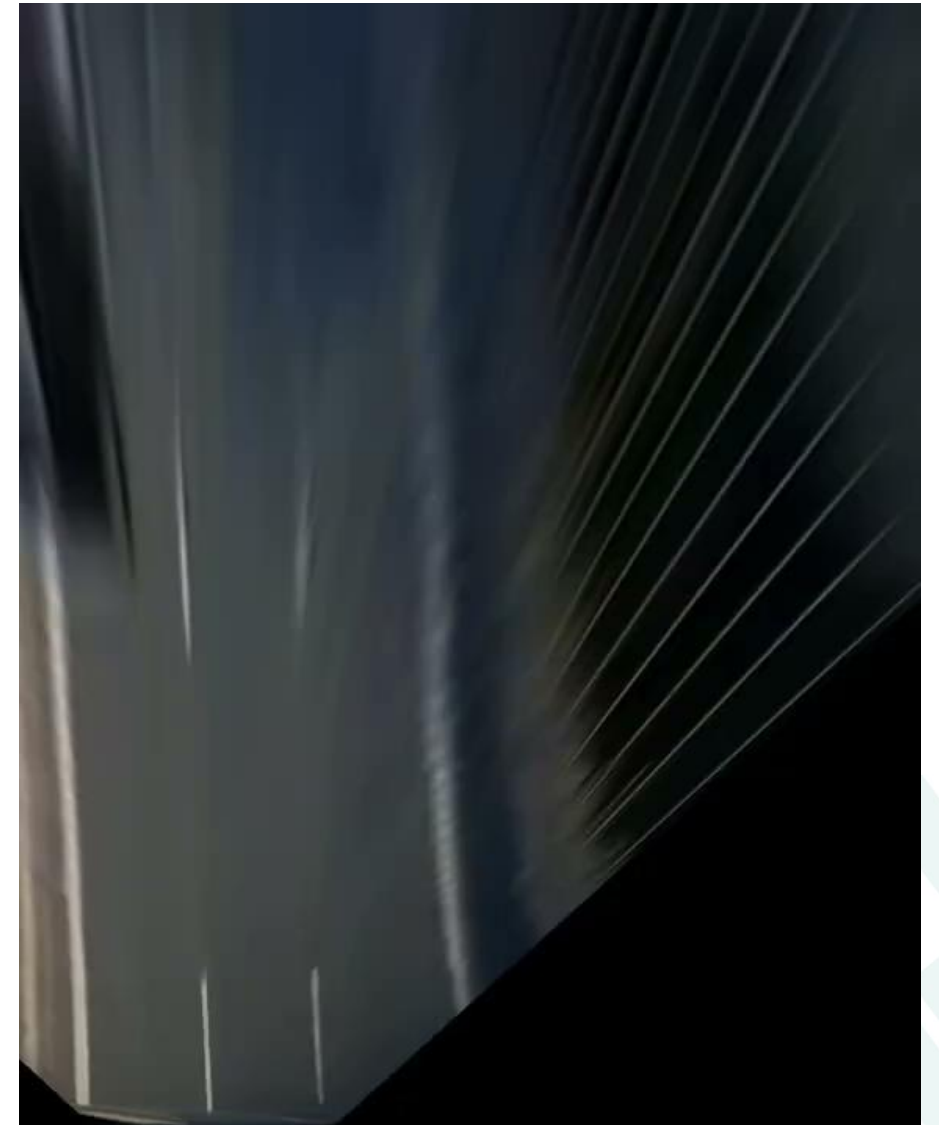The A3 is an autobahn (German Federal Motorway) consisting of 3 lanes in each direction.

Demonstration

Collected frames with vanishing points

Collected frames after generating Bird's-eye view ->

Methodology

The method can be split in 2 parts: Detection of vanishing lines, and generation of projective correction matrix.
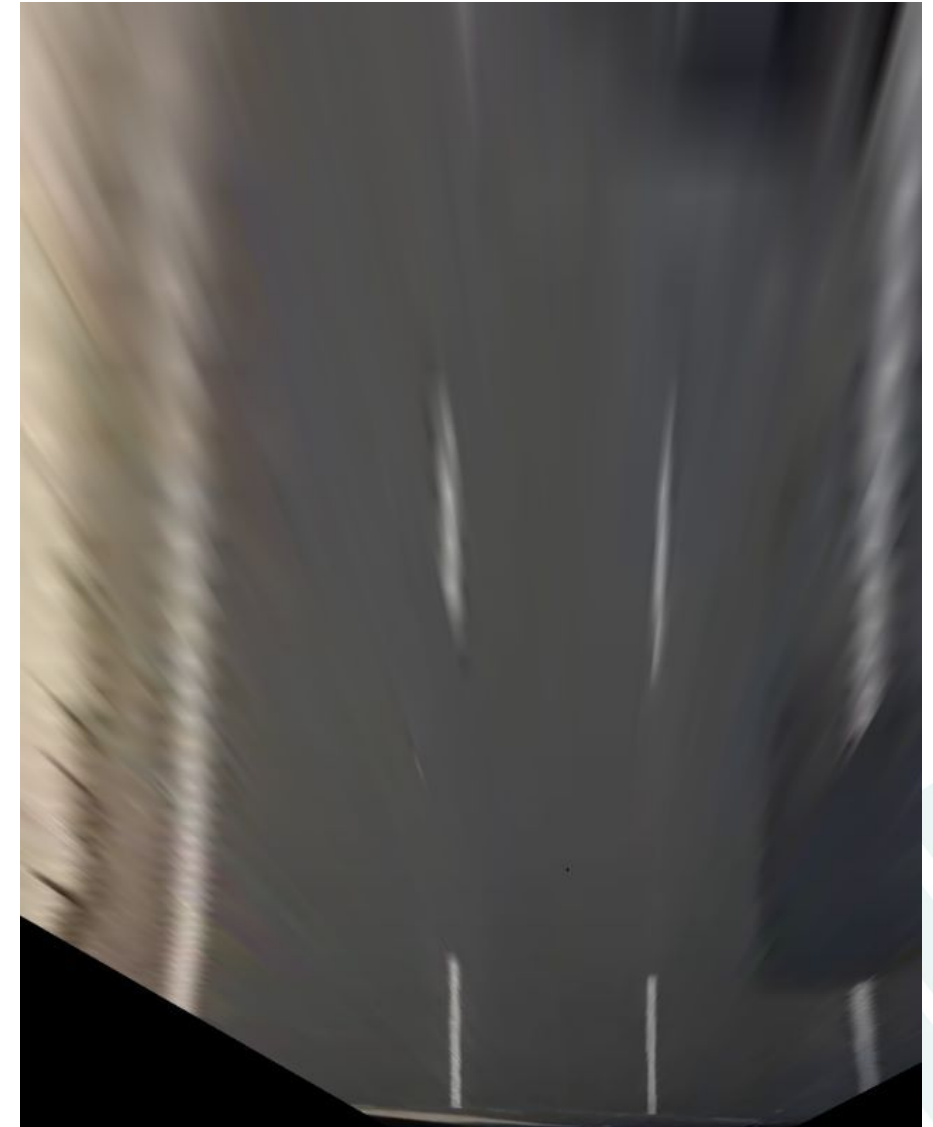
Detection of Vanishing points:

1. Smoothing using 5x5 Gaussian kernel
2. Canny Edge detection to find line edges
3. Finding Lines using Hough Transform
4. Filtering extracted lines.
5. Find intersection of filtered lines to find vanishing points

<- Set of unfiltered lines (obtained from Kitti dataset) link

Methodology

Steps for Projective correction

1. Find 4 points lying on set of parallel (projected) lines detected.
2. Map above 4 points to 4 points lying on 2 parallel (true) lines
3. Use RANSAC to find homography between the above 2 corresponding point sets.
4. Transform the entire image using above homography
5. Translate and scale obtained image to find the final Birds-eye view

Results: the good
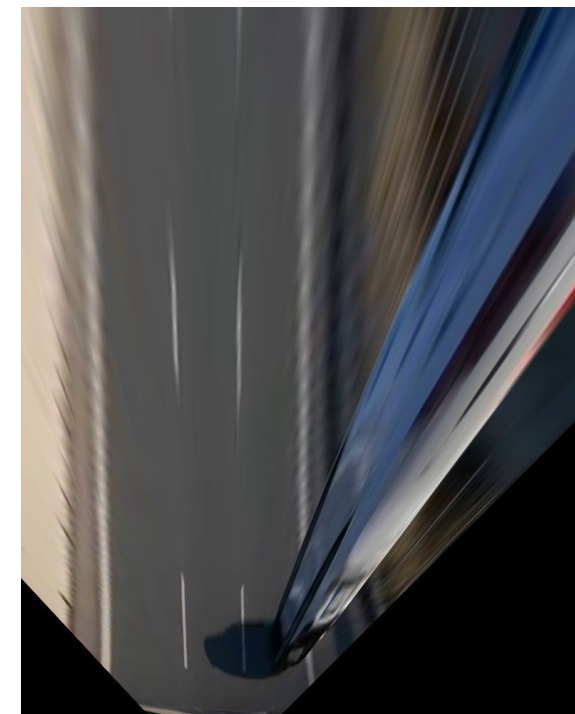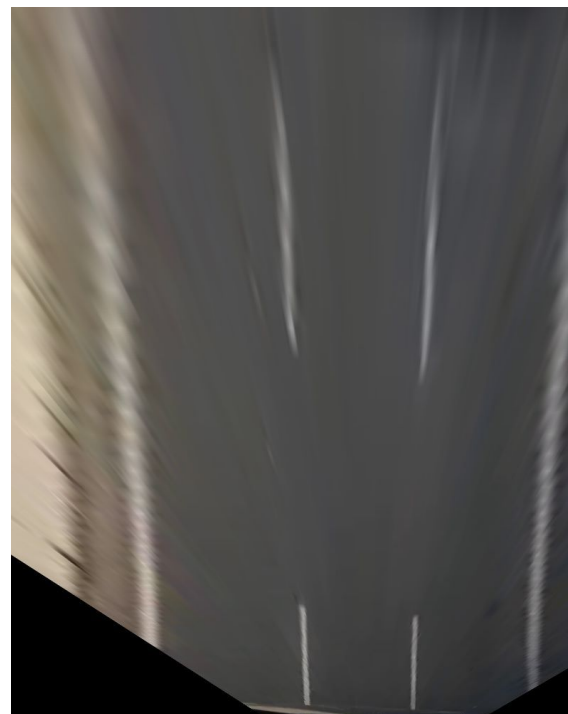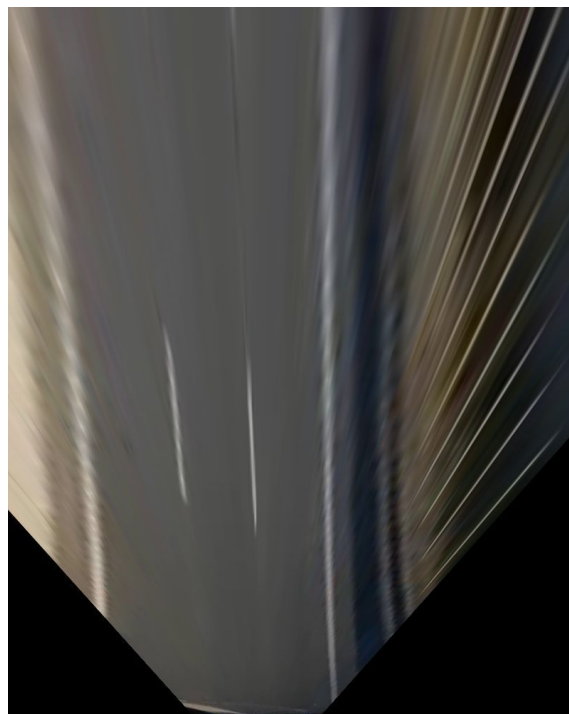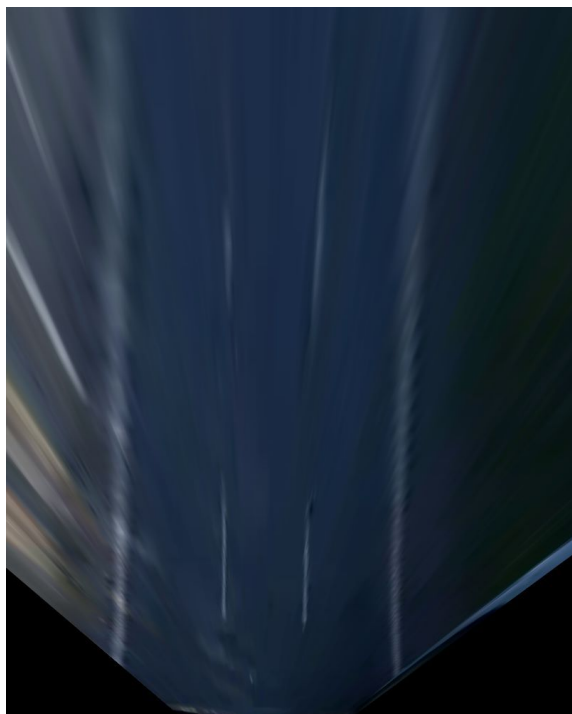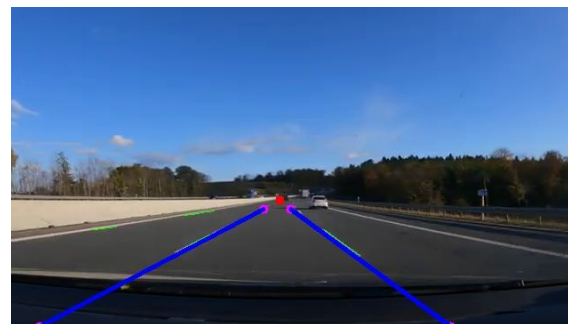
Results: the bad

The truck on the left creates the strongest lines

Most of the images with "incorrect" detection of vanishing points are those which have a foreign object in the view (a car, truck, poles, overhead signs).

As visible, the lines detected are not parallel, and therefore their intersection is not a vanishing point.

The top of the truck presents creates lines that are not parallel

The top of the small van/truck becomes the most voted line

Erroneous case: the dash of the vehicle itself becomes the most voted line

Results: and the ugly

For samples where detected lines are not parallel, the "corrected" images no longer give a Bird's-eye view of the road.

In each case, they focus on the object where they intersection point lies.

Such cases need to be detected and removed, and can be a topic of further study for the project.
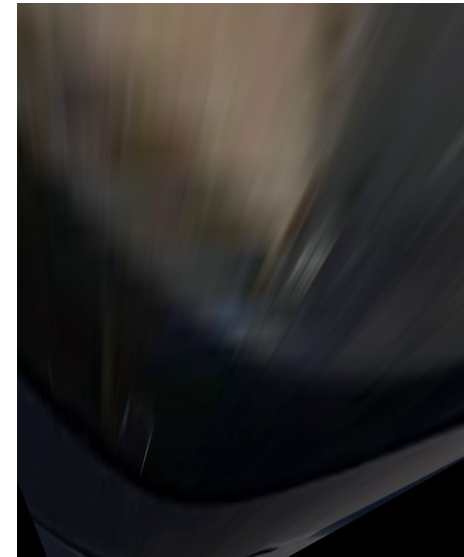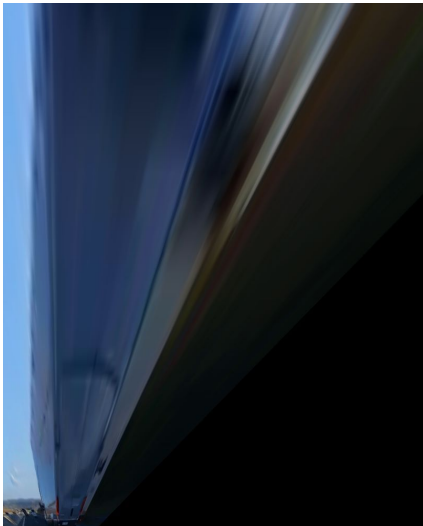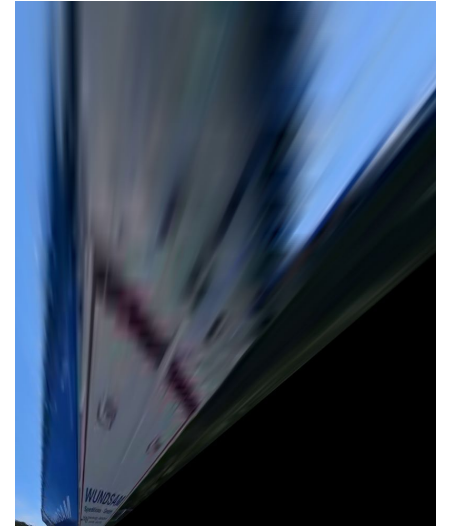
Individual Contribution

Jatin Kumar Sharma: Finding homography using lines detected

Srijan Arora: video pipeline, correction of obtained image to obtain views, result and error analysis.

Prachi: Hough transform for line detection

(contributions are fluid, and everyone pitched in to help the other out in their respective tasks)

References

The embedded videos can be found here:

1. [Video after correction](#)
2. [Video with detected vanishing points](#)
3. [Original video](#)