

Computational Photography - CS 445

Project 5: Video Stitching and Processing

by

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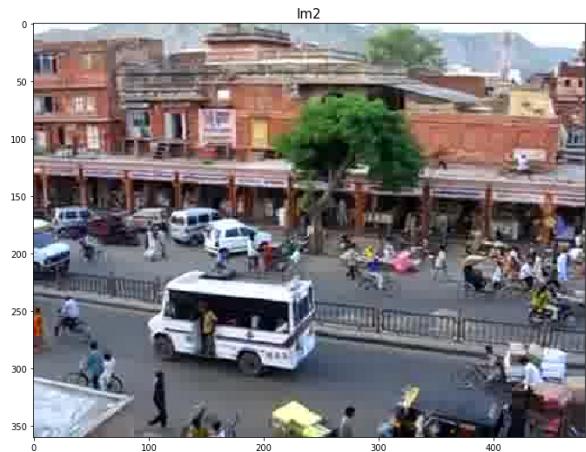
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Deliverables

Part 1: Stitch two key frames [25 pts]

Normalized DCT was used to generate Homography

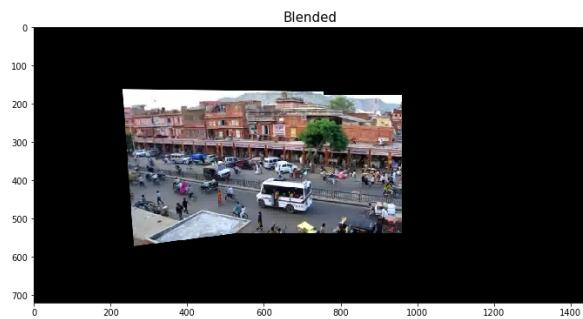
Input Frames

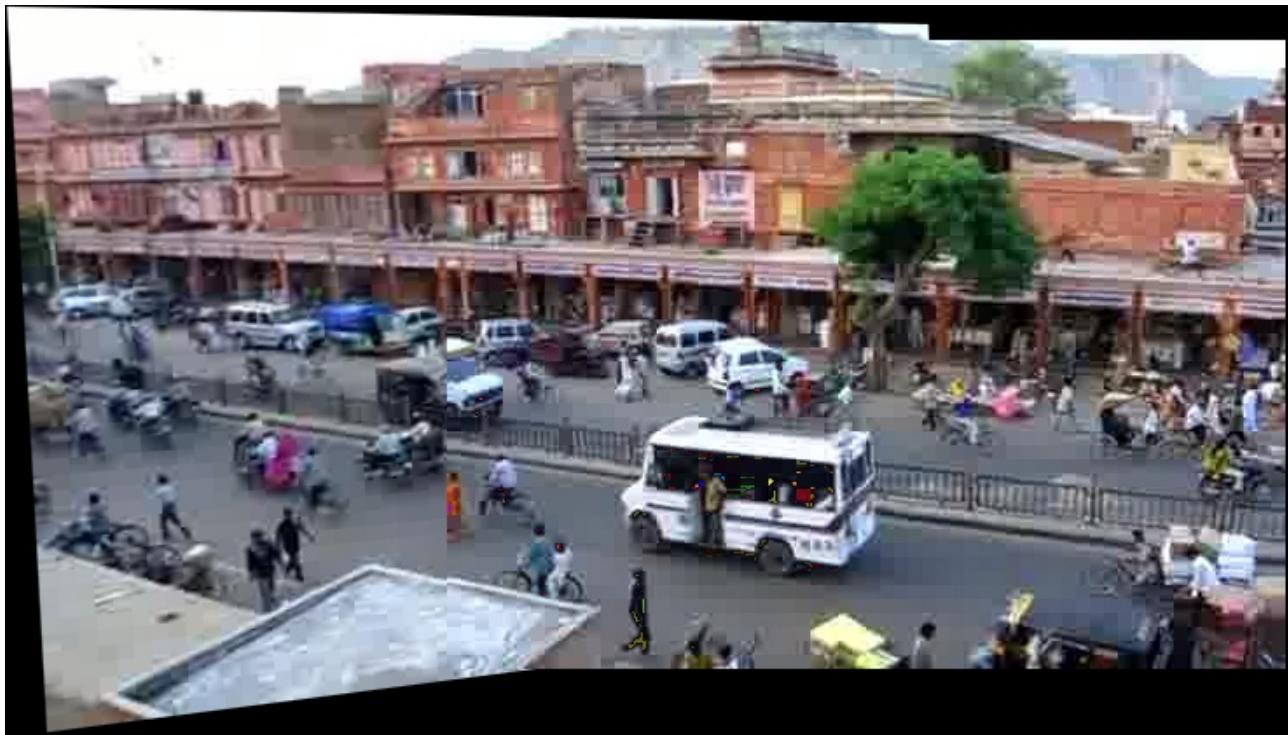


Homography Verification:



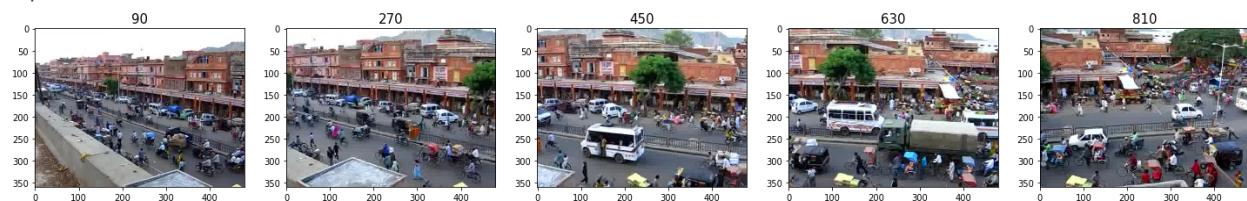
Blended and Trimmed



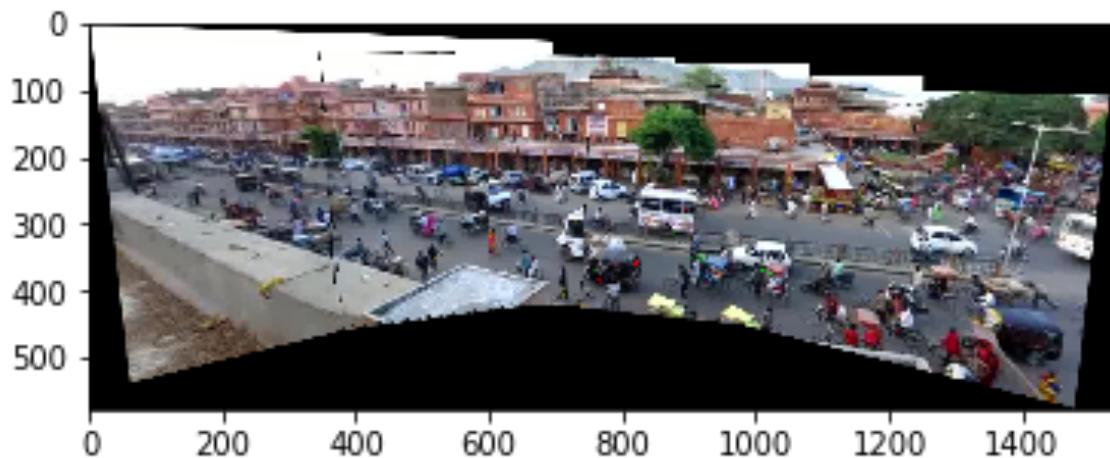


Part 2: Panorama using five key frames [10 pts]

Inputs



Panorama



Part 3: Map the video to the reference plane [15 pts]

- Using 450 as reference for all frames generated a very shaky video as towards the edges there is very little overlap
- To avoid that, transitive property was used for computing Homography
- 2 Steps projection was done with reference frame 90, 450 and 810
- The original canvas size was not enough to capture the coordinates so larger canvas size was used
- For frames 0-90, projection of 90 with 450 as reference frame was used to generate homography
- For frames 810-900, projection of 810 with 450 as reference frame was used to generate homography
- This gives stable result

YouTube Link

Video with 450 as reference, looks very shaky

<https://www.youtube.com/watch?v=C5uPl6fyQoQ>

Final results

<https://www.youtube.com/watch?v=fONIZ7TEehE>

Improvements

There is still some shakiness in the final results. More interim references with larger overlap between frames can be used to make homography calculation more stable

Part 4: Create background panorama [15 pts]

- Given the projections generated in Part 3 span across wider surface of the canvas, filtered out all 0 pixels to avoid darkening across the edges
- Calculated MEDIAN and MEAN for each pixel across all frames

Background Panorama Using MEAN pixel value



Background Panorama using MEDIAN pixel value



Part 5: Create background movie [10 pts]

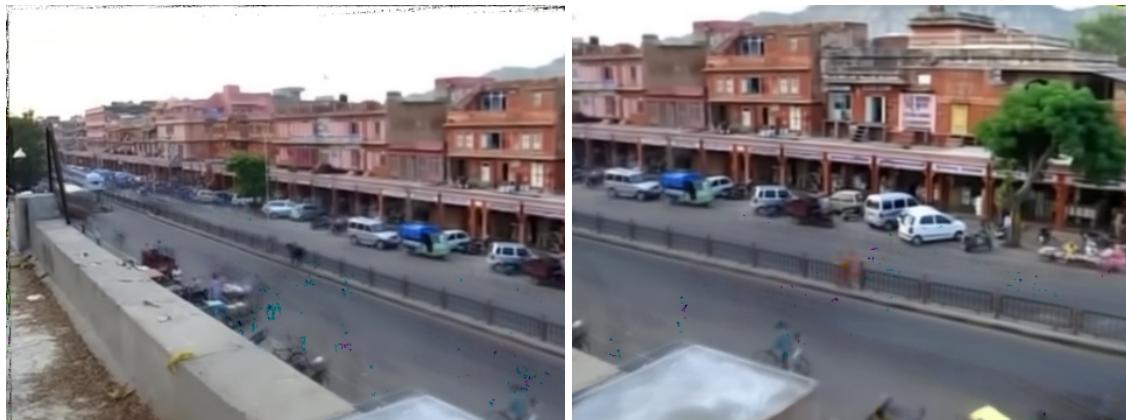
Background movie created using Background Image with MEDIAN value as reference image and masking the remaining section of projected images

- Reference Image: BACKGROUND PANORAMA with MEDIAN
- Used frame projections to map BG Panorama to projected frame
- Used Inverse Homography to get original coordinates
- Used provided util function to generate the video
-
- Same steps repeated with BACKGROUND PANORAMA with MEAN
- Results with MEDIAN and slightly better

YouTube Link

1. Video generated with background panorama generated with MEDIAN
<https://www.youtube.com/watch?v=SQg7WFT3oIE>

Sample Frames



2. Video generated with background panorama generated with MEAN
<https://www.youtube.com/watch?v=ZHn10YQH8ks>

Sample Frames



Part 6: Create foreground movie [15 pts]

- Calculated histogram to find most frequent colors in the background panorama
- Same steps as step 5 to generate background mapped to original coordinates
- Applied Gaussian Filter with size 5 and sigma 20 to both the Original Frame and Background Projection
- Used Difference of Gaussian with Threshold 25 to select pixels significantly different than the background
- Used a color with intensity 75 for background area
- Filtered out most frequent intensities from each channel to ignore BG areas
- Used provided util function to generate the video

YouTube Link

https://www.youtube.com/watch?v=HFH0gXdcI_Y

Sample Frames

