CS 6475 Course Portfolio

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Fall 2024

Assignment 1: Camera Obscura

Created a black room to verify some concepts in Camera Obscura.
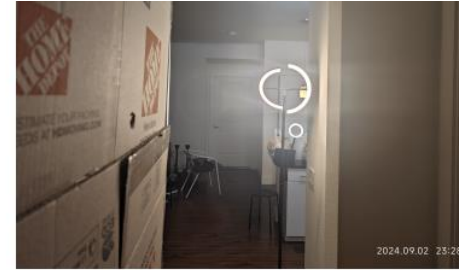
Verified Concepts:

- Larger pinhole would create a brighter overall exposure in the picture

- Larger pinhole would reduce the clarity of the scene

- Larger pinhole would increase the size of characteristic line in the picture

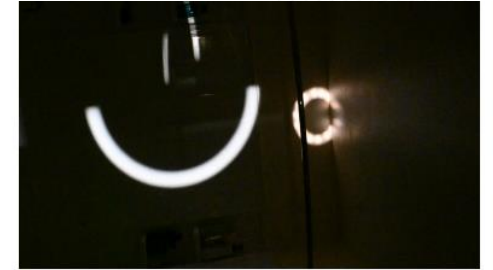Location: My bathroom

Additional Support： Chunhao Wang

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(a) Scene

(b) Camera Obscura Setup

(a) Original Image 1

(b) Original Image 2

Assignment 2: Pyramid Blending

Implemented a Pyramid Blending Algorithm to seamlessly blend two pictures.

References:

"The Laplacian Pyramid as a Compact Image Code" (Burt and Adelson; 1983)

"A Multiresolution Spline With Application to Image Mosaics" (Burt and Adelson; 1983)
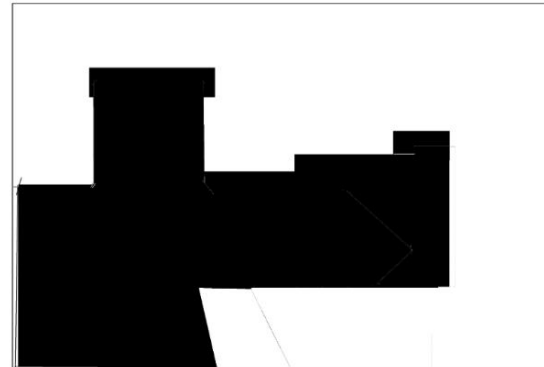
Location: Treasure Island, California
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(a) Black Image

(a) White Image

(b) Completed Mask

(b) Final Blended Image

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Assignment 3: Panoramas

Implemented an Algorithm to align & blend together a series of images into a panorama
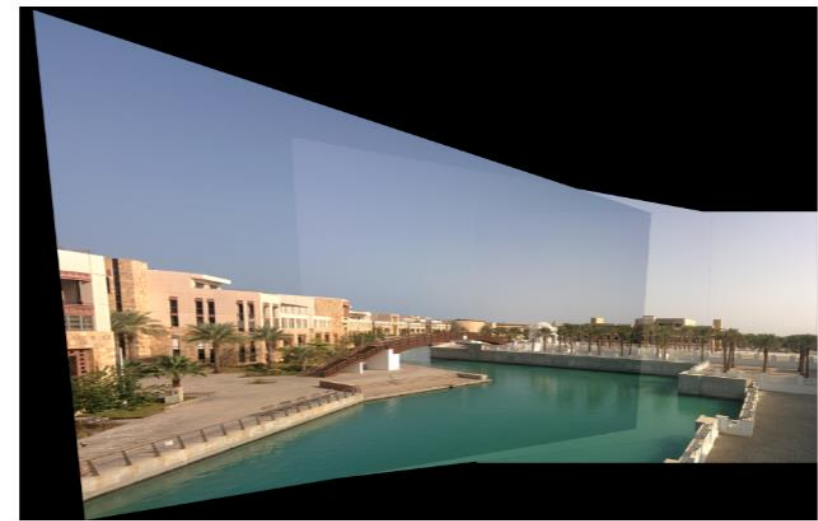
Result:
- Sample image (a) from the sample input
- My images(b) from my personal Image

References:

- Chapter 9.1: Szeliski, R. (2010). Computer Vision: Algorithms and Applications. Springer.

Location: Mt. Shasta, California
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(a) Results: Sample images panorama from my code (UNCROPPED!)

(b) Results: My original images panorama

Fig. 1: Panorama Results (UNCROPPED!)

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Assignment 4: HDR

Implemented four different High Dynamic Range Imaging Algorithms to generate picture with full details in bright and dark areas.

References:

Chapter 10.2: Szeliski, R. (2010). Computer Vision: Algorithms and Applications

"Contrast Enhancement Through Localized Histogram Equalization", Bob Cromwell

"Fast Image/Video Contrast Enhancement Based on WTHE", Q Wang & R Ward

Report Full Link: Here

Fig. 1: basicHDR

Fig. 2: heHDR

Fig. 3: wtheHDR

Fig. 4: colorHDR

Assignment 5: Video Textures

Implemented <u>video textures</u> (infinitely looping pieces of video). These are basically gifs with very smooth transitions on a wave video

Result:
- Sample video (Fig 1&2) from the sample candle
- My video (Fig 3) from my personal video

References:

- <u>"Video Textures"</u> (Schödl, A., Szeliski, R., Salesin, D., & Essa, I.)

Report Full Link: <u>Here</u>
Link to Results: <u>Link</u>
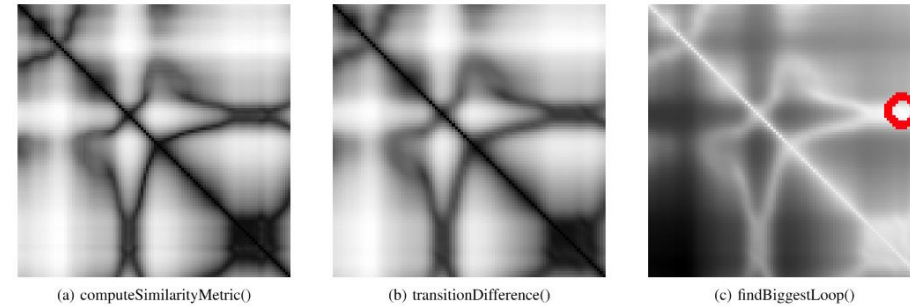

(a) computeSimilarityMetric()   (b) transitionDifference()   (c) findBiggestLoop()

Fig. 1: Sample Candle - Transition Matrices

(a) frame39   (b) frame91
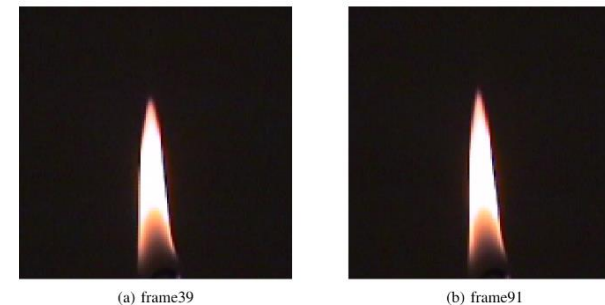
Fig. 2: Sample Candle - Start and End Frames

(a) 0018.png   (b) 0192.png

Fig. 4: Original Best Input - Start and End Frames

Project 1 Object Removal

Replicated the results of a published paper by object removal Algorithm. The Basic idea is to find the closest priority node in the image and substitute it.

Reference:

- Criminisi, A., Perez, P., & Toyama, K. (2004). Region Filling and Object Removal by Exemplar-Based Image Inpainting. IEEE Transactions on Image Processing, 13(9).

Report Full Link: Here
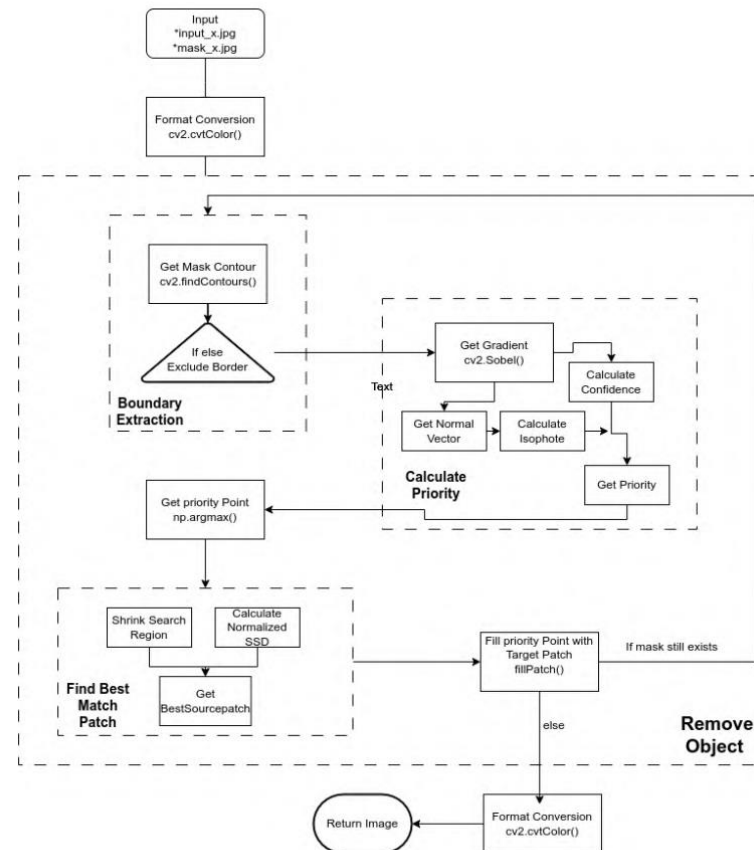
A. Pipeline Flowchart

Fig. 1: Computational Pipeline

B. Original Set 2

Exposure (s)	Aperture	ISO
1/125	f/8	64

(a) Input 2

(b) Mask 2

(c) Result 2

Fig. 5: Original Set 2

Project 2 Seam Carving

Replicated the results of a published paper called content-based Seam Carving to expand or corp image.

The basic idea is to find the lowest energy seam in the image and delete/replicate it.

Reference:

- Shai Avidan, Ariel Shamir. Seam Carving for Content-Aware Image Resizing. (2007)

- Micheal Rubinstein, Ariel Shamir, Shai Avidan. Improved Seam Carving for Video Retargeting. (2008)

Report Full Link: Here

A. Backwards Energy Seam Removal (2007): Conwy

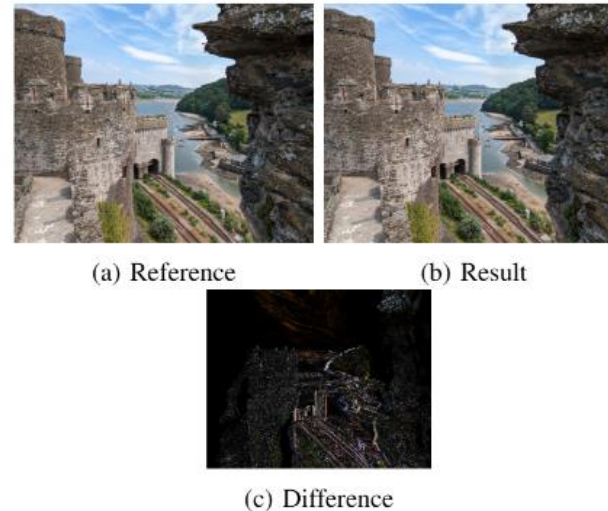(a) Reference   (b) Result

(c) Difference

Fig. 1: Backwards Energy Seam Removal (2007): Conwy

Comparison	Metric1	Metric2
conwy backward energy vs. comp	0.93194747	0.932375

B. Backwards Energy Seam Insertion (2007): Fig. 8 Dolphin

(a) Reference with seam visual   (b) Result with seam visual

(c) Reference: Insert Seam   (d) Result: Insert Seam

(e) Reference: Difference   (f) Result: Difference

(g) Reference: Double Insertion   (h) Result: Double Insertion
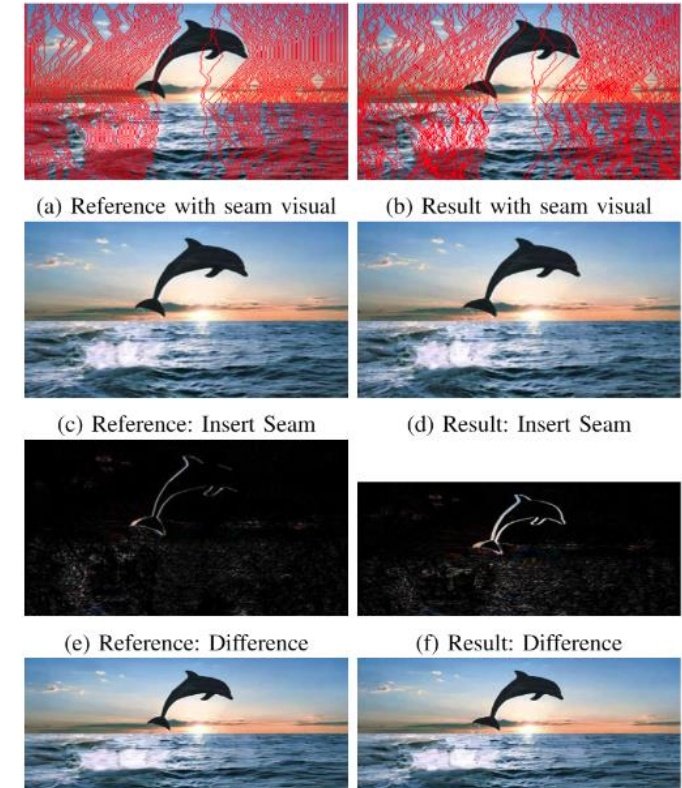
Fig. 2: Backwards Energy Seam Insertion (2007): Dolphin

Comparison	Metric1	Metric2
res_dolphin_back_ins vs. comp	0.9770457	0.977226
res_dolphin_back_double vs. comp	0.92746484	0.9280744

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