

Anamorphic Illusions

A quick demonstration:



Owen Lin, Yilin Ni

INTRODUCTION

We want to utilize warping techniques to create an effect that is similar to anamorphic illusion. Specifically, we have a moving camera, BUT under the assumption of plain surface, a homography can still be applied for transformation with appropriate mask.



TABLE OF CONTENTS

1

Corner Detection with ANMS

2

★ Automatic Masks Segmentation with SAM

3

★ SIFT Feature Descriptor

4

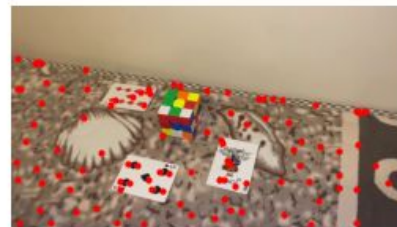
Feature Matching and RANSAC

5

★ Warping and Distance Blending

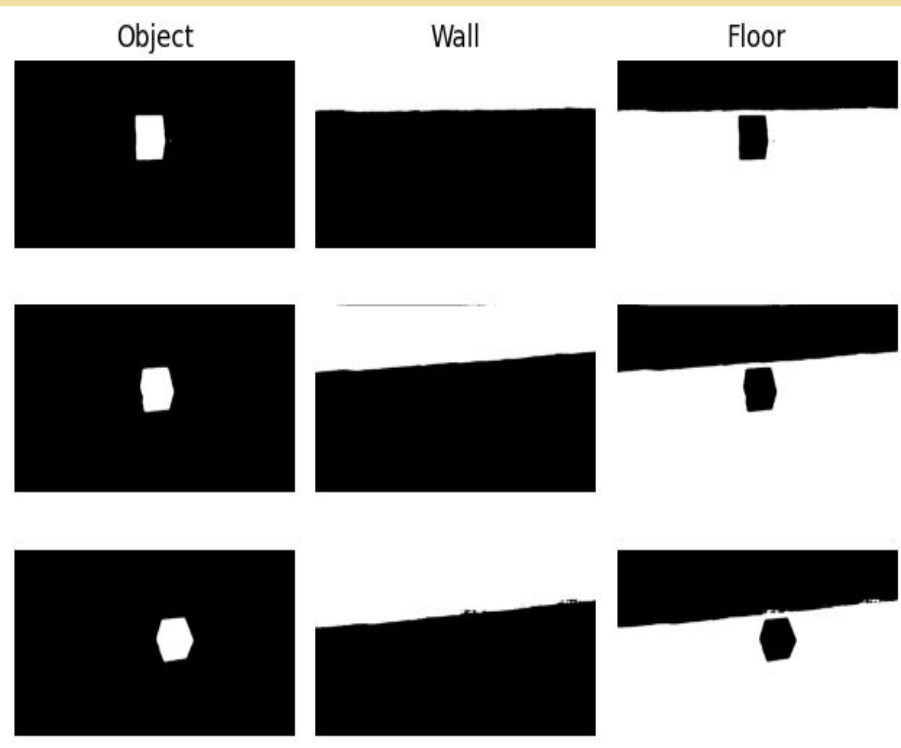
Corner Detection with ANMS

- Standard Harris Corner Detection
- Use Adaptive-Nonmaxial Suppression (ANMS) to reduce the number of corners while preserving their spatial distribution
- ANMS ranks corners by its “distance to the nearest stronger points” and retain the top n points



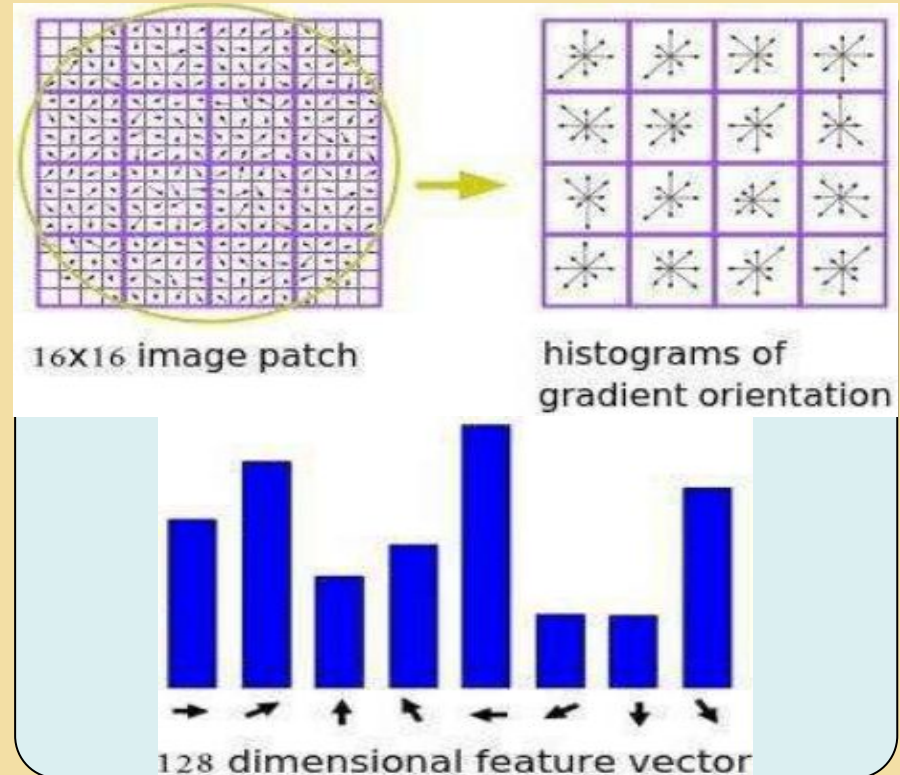
Mask Segmentation with SAM

- Segment Anything Model (SAM) is an advanced Segmentation Model developed by Meta
- The AutomaticMaskGenerator provides masks without labeling
 - Out of time to implement semantic segmentation
- Instead, we use bounding box to obtain the mask



SIFT Feature Descriptor

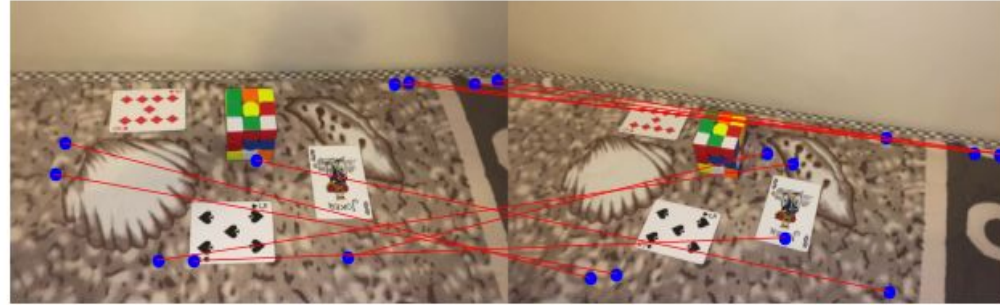
- Scale Invariant Feature Transform (SIFT) describes a local feature in a rotation invariant way
- Utilize gradient field around a feature. For each of the image patch make a histogram of gradient and stack the 16 patches



Feature Matching and RANSAC

- Feature Matching with Lowe's Ratio = 0.8 (tested empirically)
- Use Random Sample Consensus (RANSAC) to further reduce the matching features
- One success example is provide on the right hand side. Note that there were very few good corresponding points

Feature Matches After Lowe's Ratio



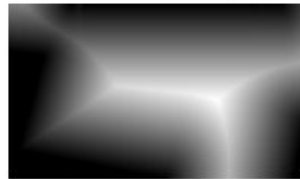
Feature Matches After RANSAC



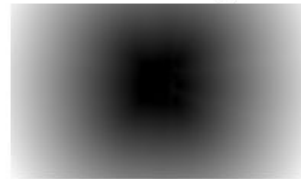
Warping and Distance Blending

- For warped frames, we use inverse warping and interpolate the color value from the original frame
- The warping only applies to the ground mask – including the cube
- For distance mask on original frame, choose the cube as the bounding mask
- $a1 = w1 / (w1 + w2)$
- $a2 = w2 / (w1 + w2)$

Distance Mask for Warped Frame



Distance Mask for Original Frame



Alpha Mask for Warped Frame



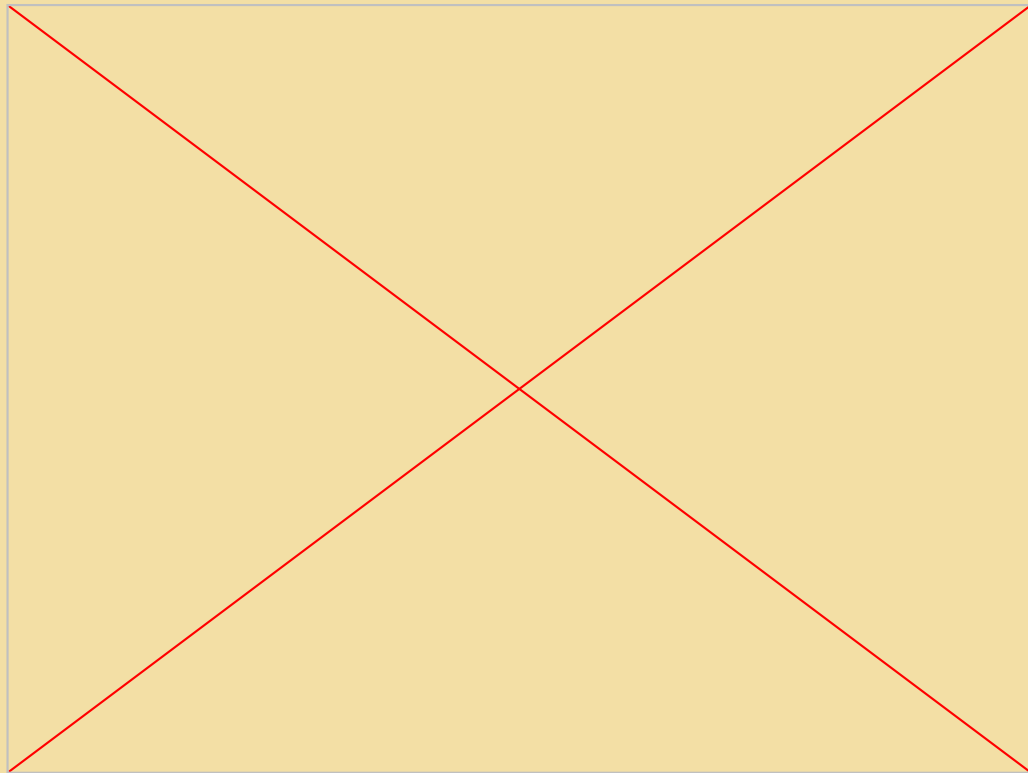
Alpha Mask for Original Frame

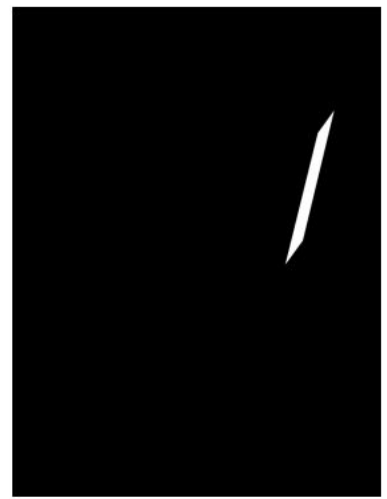
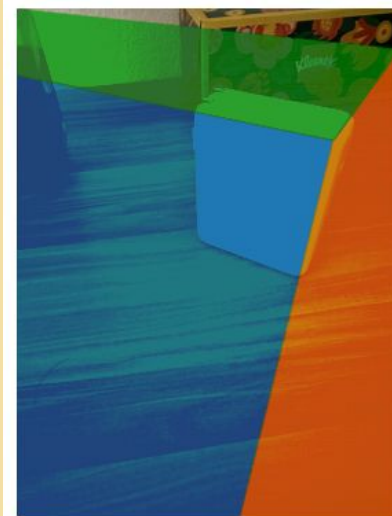
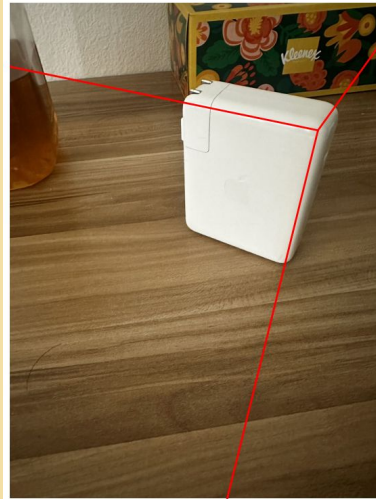
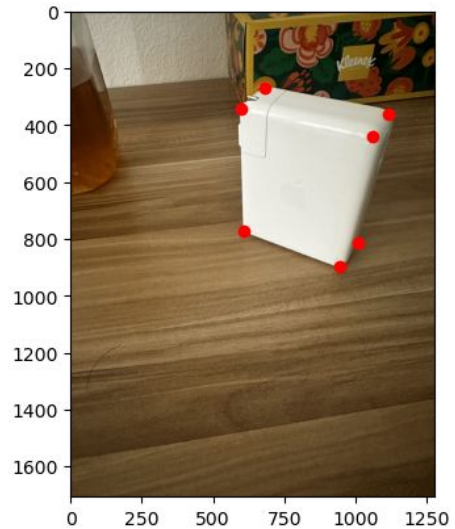


Blended Frame



Project Demonstration

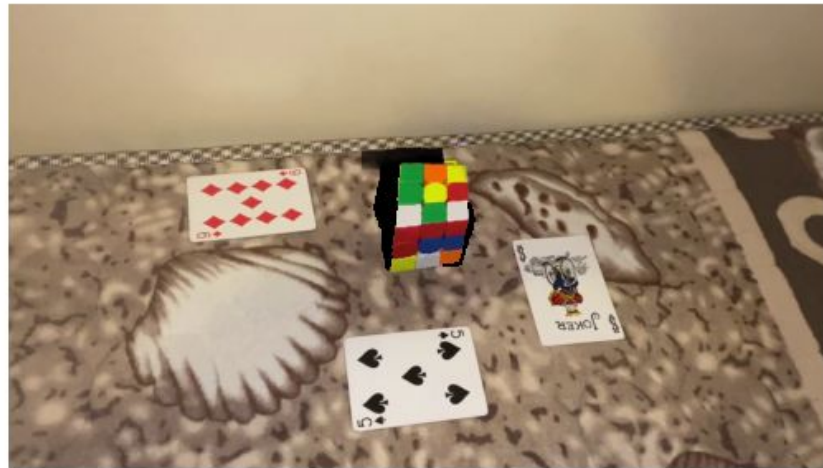


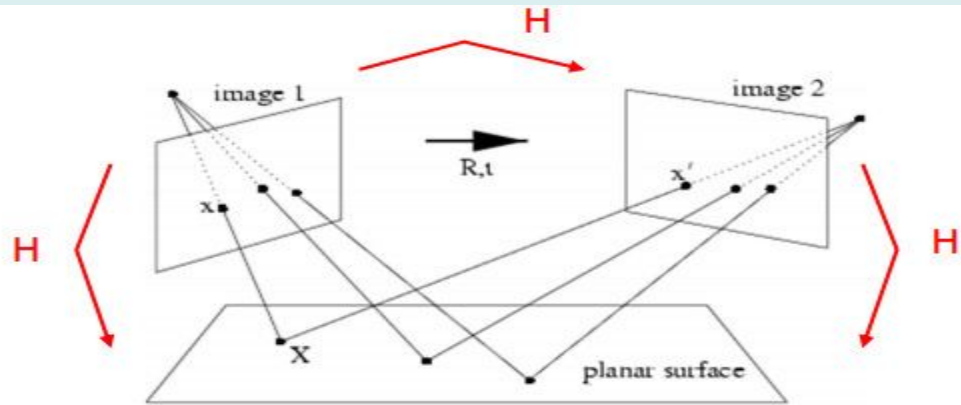
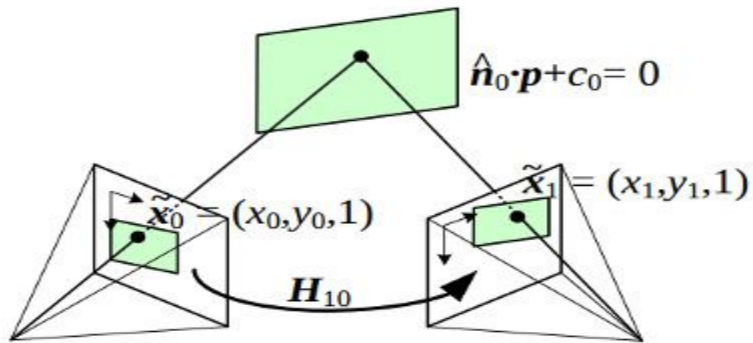


Summary and Failed Attempt

- Tried to use the forward face of the cube to find homography
- The expected result would be a **cube sheet** that is perpendicular to the ground.
- Fill the background (once occupied by the 3D volume of the cube) with texture synthesis
- Problem: Can't find a mask for the face of the cube – hard to make it video consistent

Blended Frame





THANK YOU

