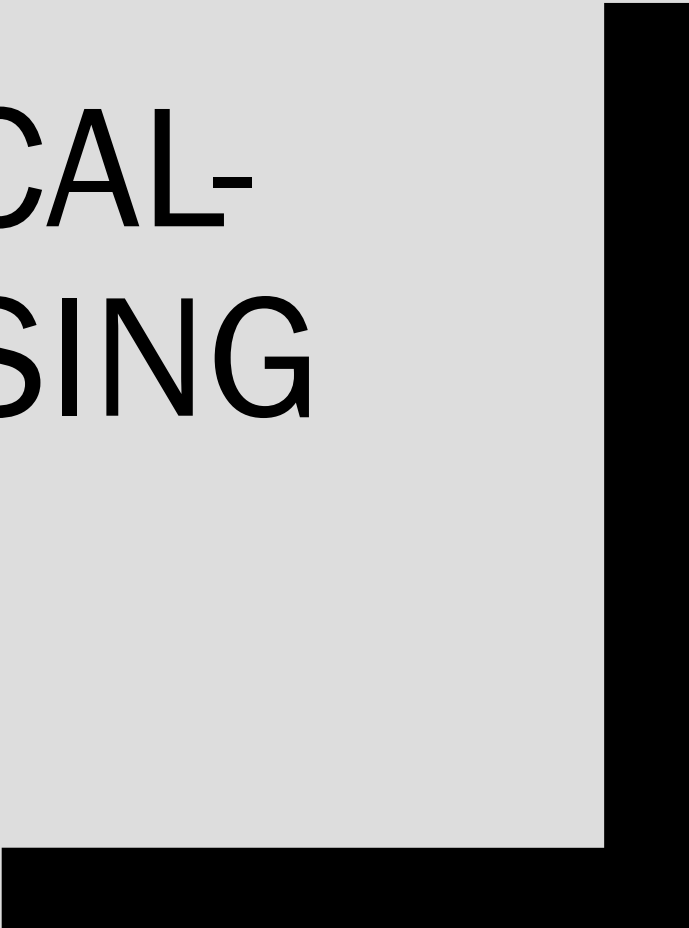# SEAMLESS FOCAL-STACK REFOCUSING

Group 10
R11945054 謝展睿
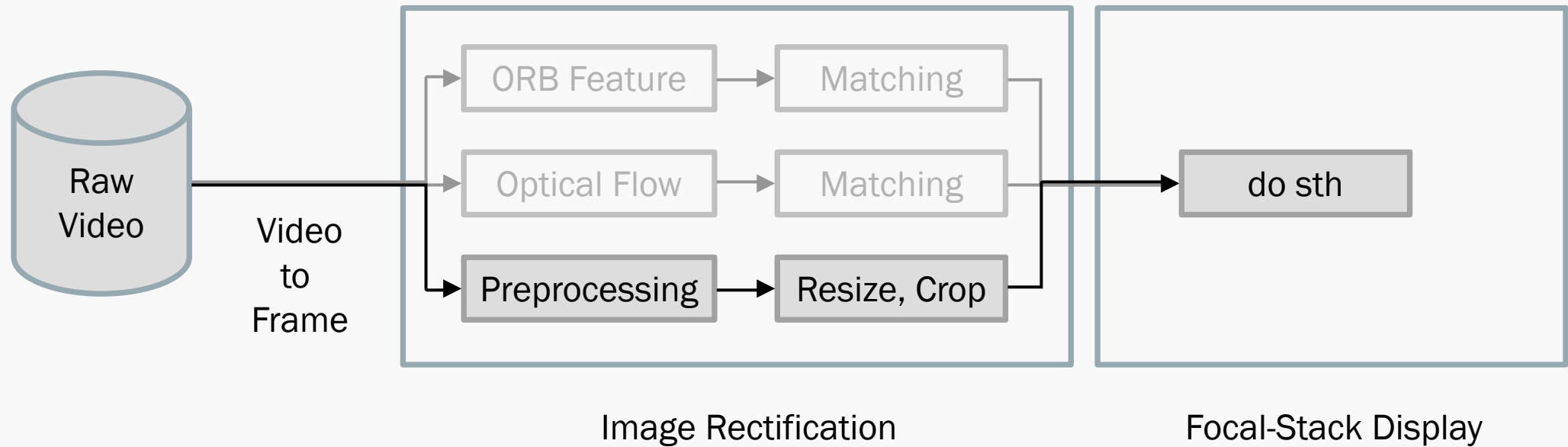R11945053 鄭詩妮
R11921038 江讀晉

Outline

- Introduction

- Methodology
  - Image Rectification
  - Foreground and Background Differentiation (tbd)
  - Sharpness Detection (tbd)

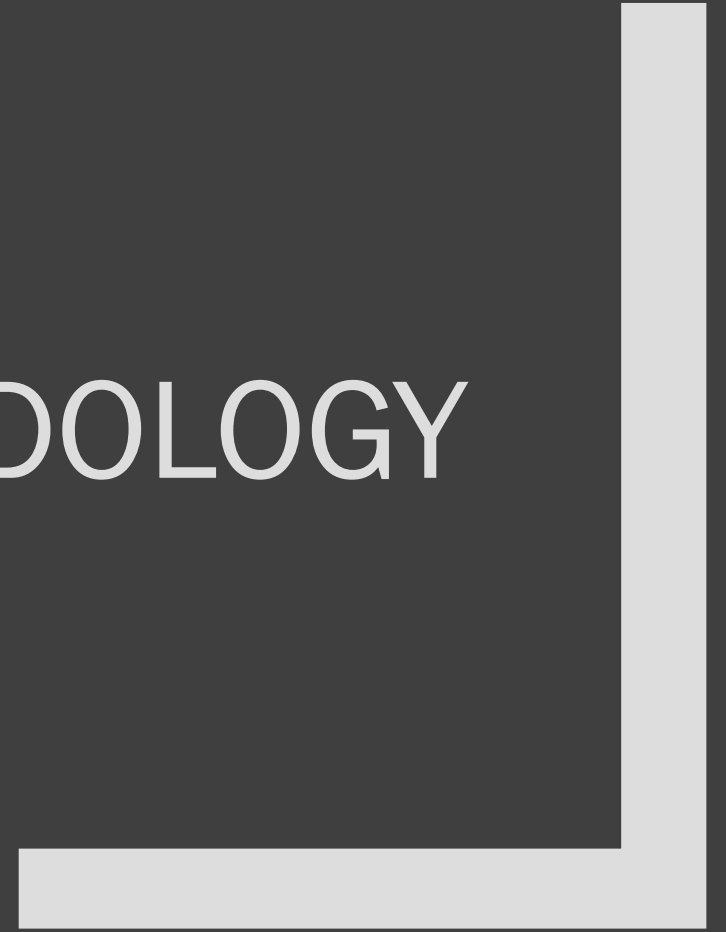- Experiment Results and Comparison

- Conclusion

INTRODUCTION

Flow Chart

- Topic: Seamless focal-stack refocusing

METHODOLOGY

Image Rectification

- **Method 1: ORB feature & brute-force matching**

  - Local feature: detection → description → matching

  - ORB (Oriented FAST and Rotated BRIEF) is a fusion of FAST keypoint detector and BRIEF descriptor.

  - Use matching points to find homography.

  - $\lambda_i \begin{bmatrix} u_i' \\ v_i' \\ 1 \end{bmatrix} = \begin{bmatrix} H_{11} & H_{12} & H_{13} \\ H_{21} & H_{22} & H_{23} \\ H_{31} & H_{32} & H_{33} \end{bmatrix} \begin{bmatrix} u_i \\ v_i \\ 1 \end{bmatrix}$

H
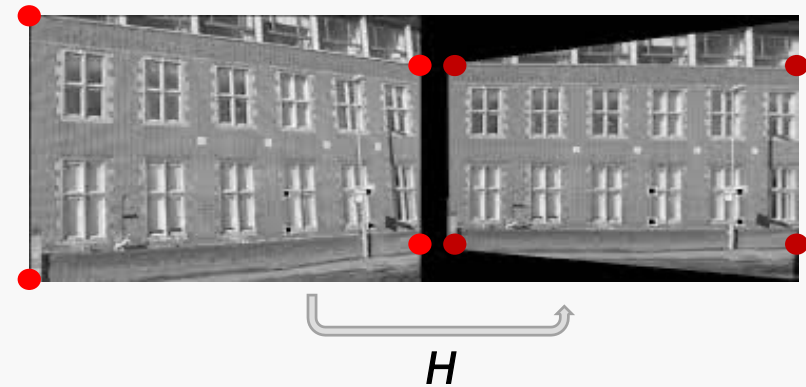
- **Method 2: optical flow & brute-force matching**

  - Optical flow is the pattern of apparent motion of image objects between two consecutive frames.

  - Similarly, find matching points of interest and compute homography.

Image Rectification

■ **Method 3: resizing and cropping**

    – Image preprocessing: Canny edge

    – Find the resize ratio which result in the least difference between two consecutive frames by grid search.

$$r^* = \operatorname*{argmin}_{r}\lVert ResizeCrop(edge_{k+1}, r) - edge_k\rVert_2$$

■ To be brief, find a proper method during the demonstration.

EXPERIMENT RESULTS & COMPARISONS

Image Rectification Comparison

Original
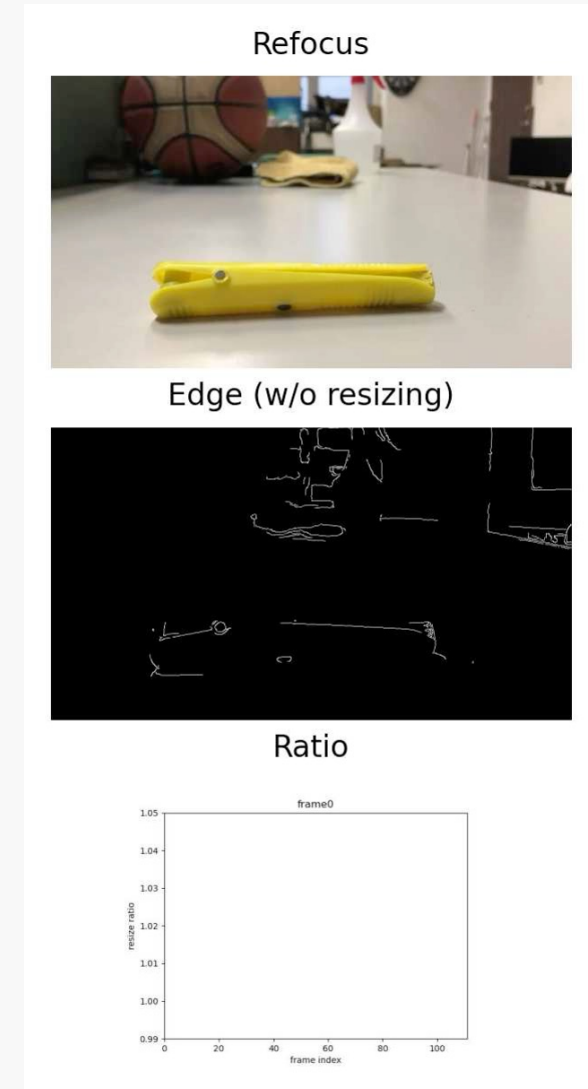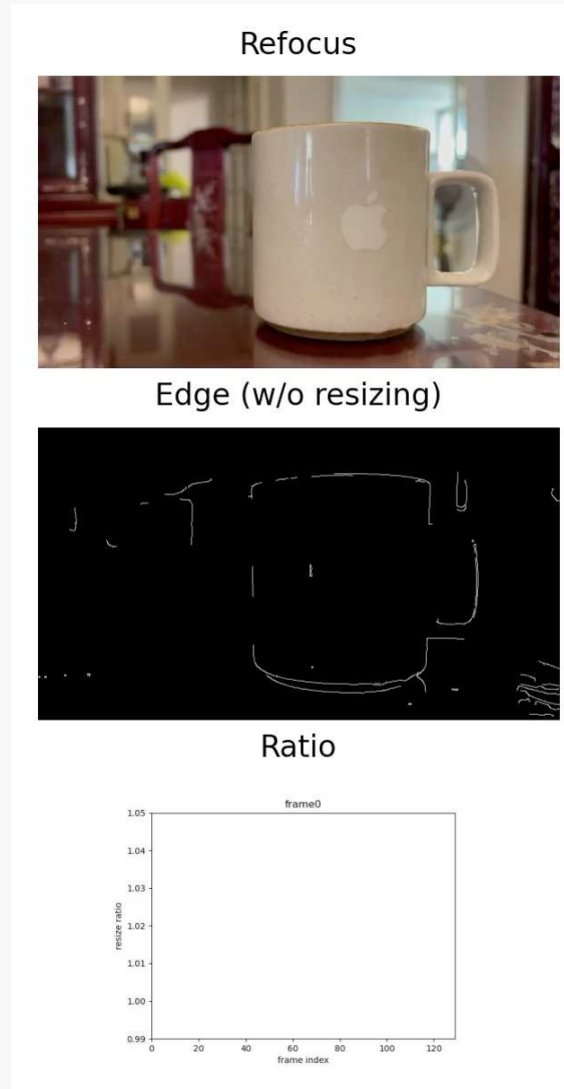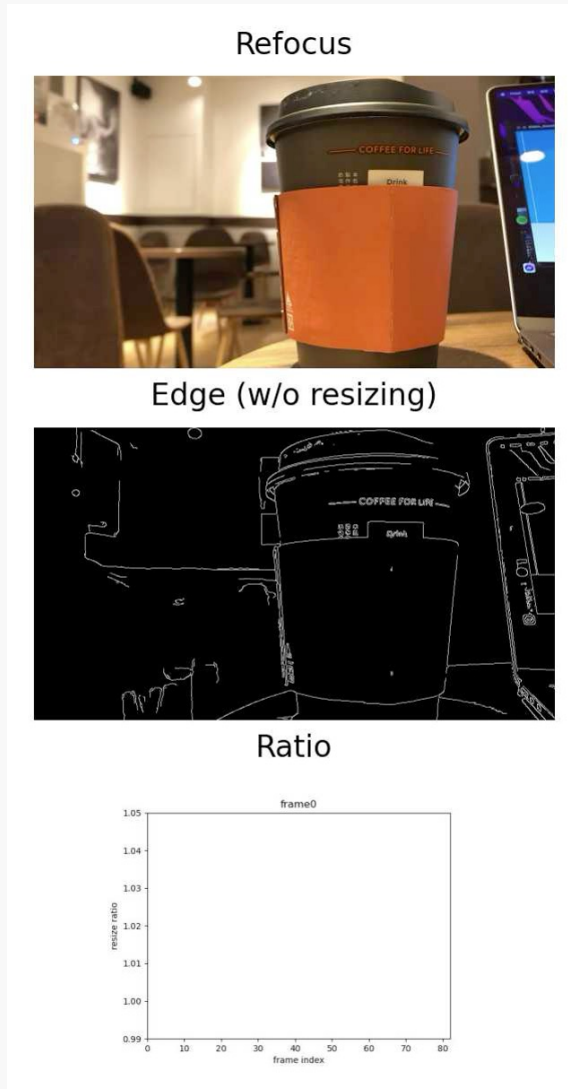
Refocus
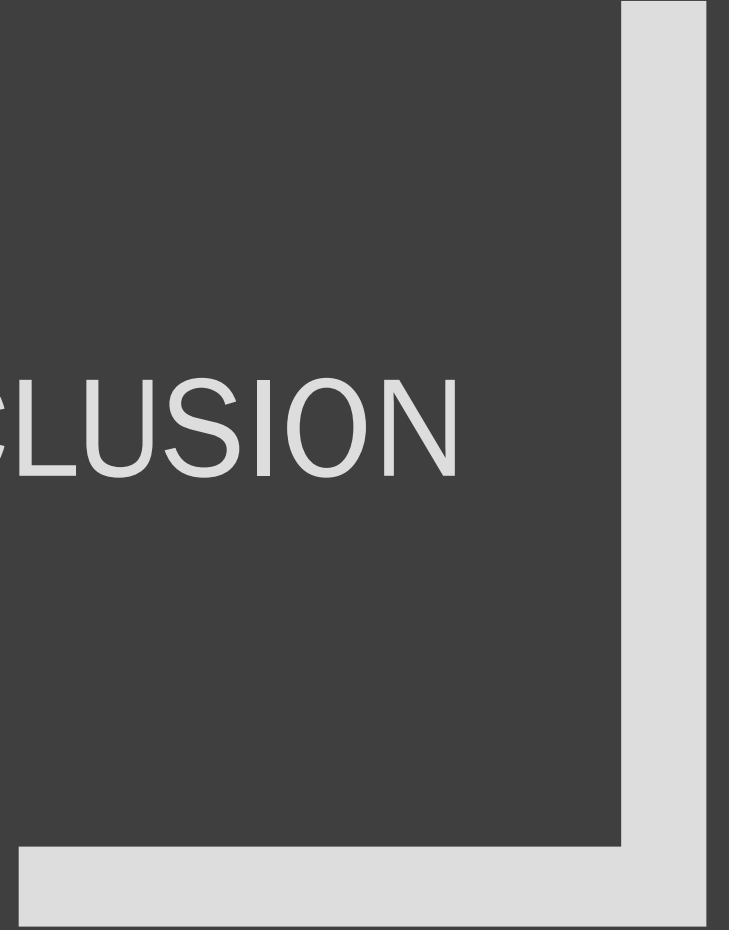
ORB Features

Optical Flow

- Observation:

  ORB feature, optical flow → not stable

- In summary, we utilize resizing and cropping method as demo.

Brief Demo: Stacks of Frame, Edge and Ratio

CONCLUSION

THANKS!

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