Project 2 – Cylindrical Panorama

1. Take pictures on a tripod (or handheld)
2. Warp images to spherical/cylindrical coordinates
3. Extract features
4. Align neighboring pairs using RANSAC
5. Write out list of neighboring translations
6. Correct for drift
7. Read in warped images and blend them
8. Crop the result and import into a viewer

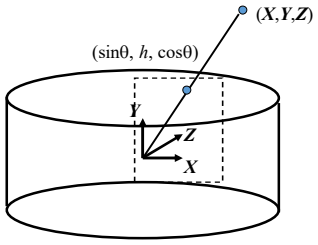
Code & Report Due to Nov. 15

Project 2 – Cylindrical Panorama

1. Take pictures on a tripod (or handheld)
2. Or download from staff.ustc.edu.cn/~xjchen99/teaching/Project 2.htm

Project 2 – Cylindrical Panorama

1. Warp images to spherical/cylindrical coordinates
   1. Backward warping
   2. Focal length estimation



Given focal length f and image center (x_c, yc)

$$
\begin{aligned}
\theta &= (x_{cyl} - x_c)/f \\
h &= (y_{cyl} - y_c)/f \\
\hat{x} &= \sin\theta \\
\hat{y} &= h \\
\hat{z} &= \cos\theta \\
x &= f\hat{x}/\hat{z} + x_c \\
y &= f\hat{y}/\hat{z} + y_c
\end{aligned}
$$

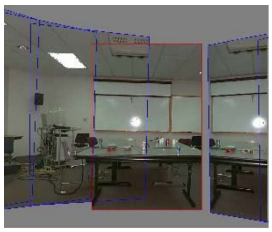
Project 2 – Cylindrical Panorama

3. Extract features
4. Align neighboring pairs using RANSAC
5. Write out list of neighboring translations

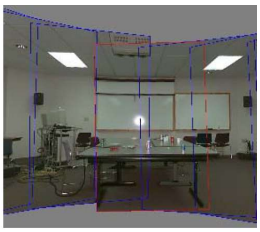
Project 2 – Cylindrical Panorama

6. Correct for drift

- Matching the first image and the last one
- Compute the gap angle θ_g
- Distribute the gap angle evenly across the whole sequence
  - Modify rotations by θ_g / N_{image}
  - Update focal length $f' = f(1 - \frac{\theta_g}{2\pi})$
- Only works for 1D panorama where the camera is continuously turning in the same direction



(a)
wrong focal length: $f = 510$



(b)
correct focal length $f = 468$

Project 2 – Cylindrical Panorama

7. Read in warped images and **blend** them

8. Crop the result and import into a viewer

Project 3: Object Detection

Report due to Dec. 13

- For **master students**
  - Test an existing algorithm for **object detection** on CoCo dataset
  - Reference: COCO test-dev Benchmark (Object Detection) | Papers With Code
    - **Algorthim Options:**
      - Any algorithm (with available code or implement yourself)
      - E.g. Faster RCNN, RetinaNet, YoLo, SSD, DETR
  - Required materials:
    - Show **the intermediate results** of the whole pipeline
      - Two-stage method: Region proposal results, class score maps, and final results
      - Single-stage method: objectness map, class score maps, and final results
      - DETR: self-attention maps for some reference points and final results
    - Experimental Analysis
      - **Three groups** of results: small objects, medium objects, and large objects
      - For **each group**, show: **10 images** of lower precision, **10 images** of higher precision