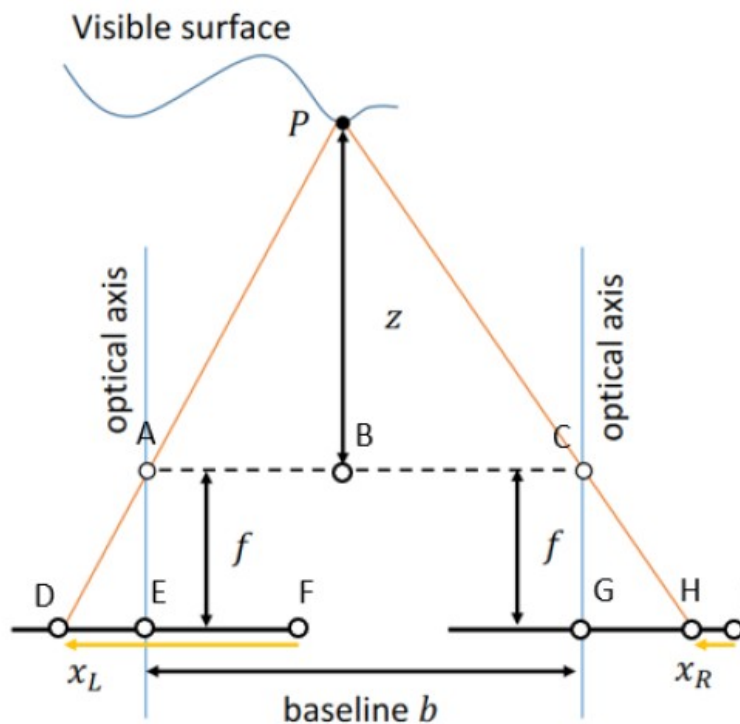


Computer Vision HW4 Report

R08921040 徐均筑

- Part 1
- Let $d = x_L - x_R$
- Prove $d = \frac{f \cdot b}{z}$ (hint: similar triangles)
- Write down your proof.



$$\begin{aligned}
 d = x_L - x_R &= \overline{DF} - \overline{HI} = (\overline{DE} + \overline{EF}) - (\overline{GI} - \overline{GH}) = \overline{DE} + \overline{GH} \quad (\because \overline{EF} = \overline{GI}) \\
 &= f \times \left(\frac{\overline{DE}}{\overline{AE}} + \frac{\overline{GH}}{\overline{CG}} \right) = f \times \left(\frac{\overline{AB}}{\overline{PB}} + \frac{\overline{BC}}{\overline{PB}} \right), (\because \triangle ADE \sim \triangle PAB \text{ and } \triangle CGH \sim \triangle PBC) \\
 &= f \times \frac{\overline{AC}}{z} = \frac{f \times b}{z}
 \end{aligned}$$

- Part 2

- Explain your algorithm in terms of the standard 4-step pipeline.

1. Cost computation:

For each pixel, the census costs for each possible match are calculated.

2. Cost aggregation:

Apply cost-volume filtering. In this case, we choose bilateral filter with kernel size 9.

3. Disparity optimization:

Simply choose the label of the lowest cost at each pixel.

4. Disparity refinement:

- (1) Left-right consistency check:

Detect mismatch points and occlusion points.

- (2) Hole filling:

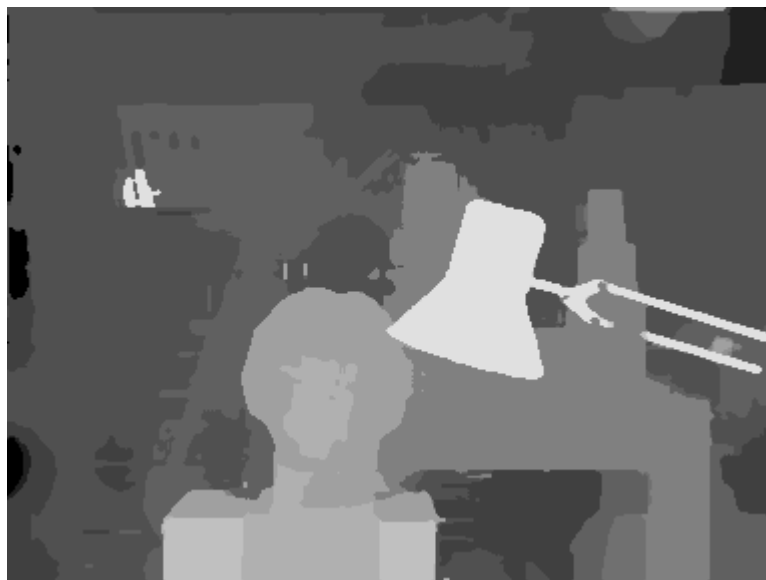
First, search for the closest valid candidate points along some specific directions. For a mismatch point, replace its label with the label of the candidate with the most similar color. As for a occlusion point, replace its label with the label of the closest candidate.

- (3) filtering:

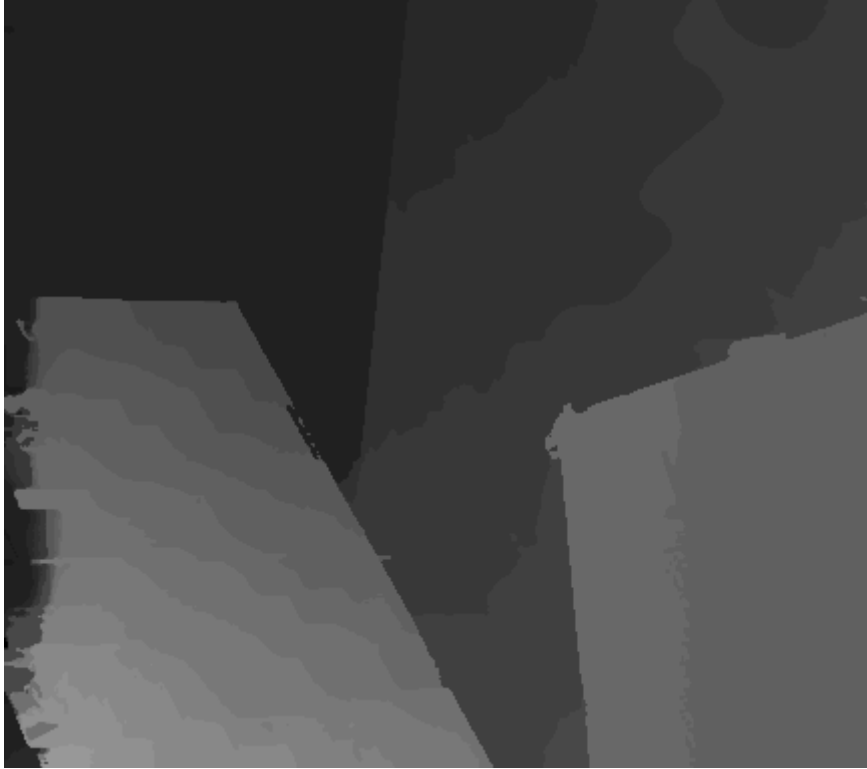
Apply weighted median filter twice and median filter once to get more accurate and smoother result.

- Show your output disparity maps in the report.

Tsukuba



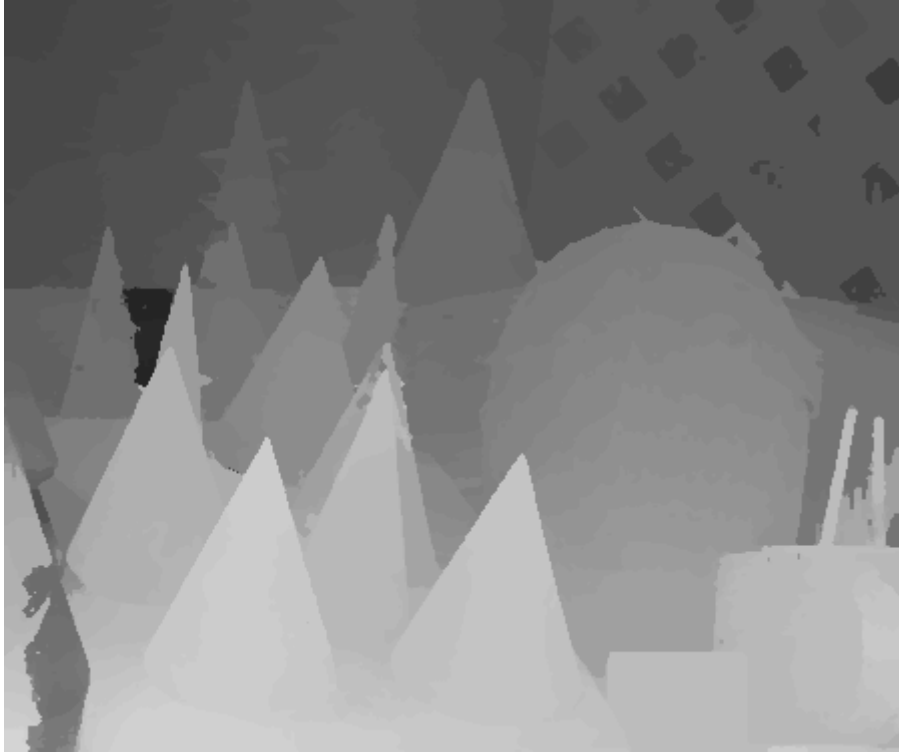
Venus



Teddy



Cones



- Show your bad pixel ratio of each disparity maps in the report.

```
-----evaluate-----  
[Bad Pixel Ratio]  
Tsukuba: 2.96%  
Venus: 2.84%  
Teddy: 15.17%  
Cones: 9.94%  
Average: 7.73%
```

- Your reference papers or websites.

Ma et al. Constant time weighted median filtering for stereo matching and beyond. In ICCV 2013.

<https://www.itread01.com/content/1548533730.html>