Rectangling Panoramic Images via Warping

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Motivation

- Limitation of digital camera
- Make the scene more descriptive

Problem Definition

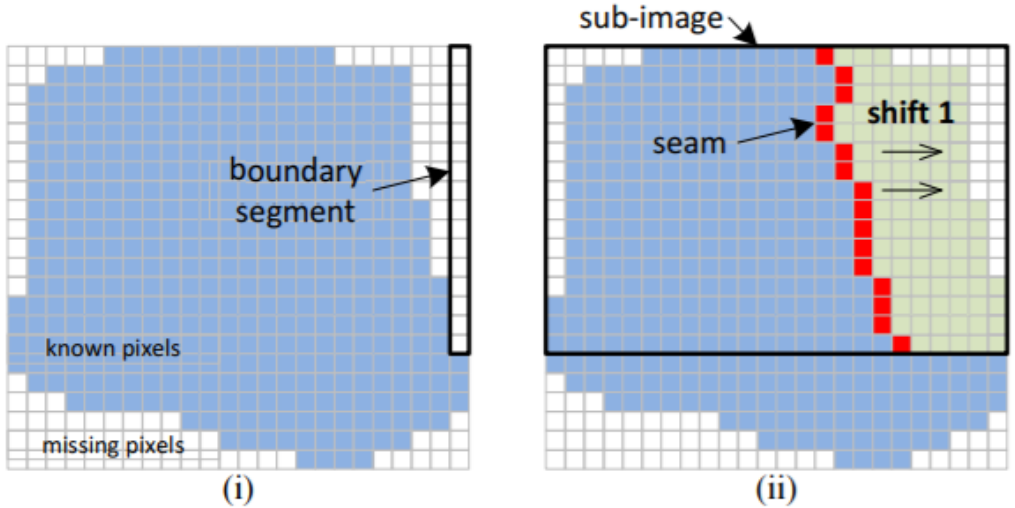
- How to find the feature points of an image
- Errors when matching the feature points
- Find a better method to warp the image to a rectangle region

Algorithm

- Step1. Find the feature points of all input images.
- Step2. Match the feature points of two consecutive images and merge them all into a big panorama.

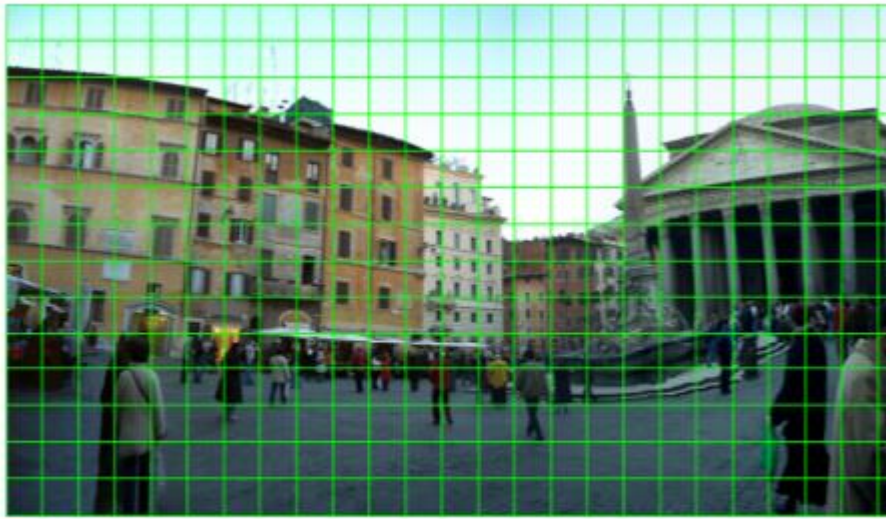
Algorithm

- Step3. Mesh-free Local warping: warp the image into a rectangle by **Seam Carving Algorithm**. That is a DP method to fill up all missing pixels.

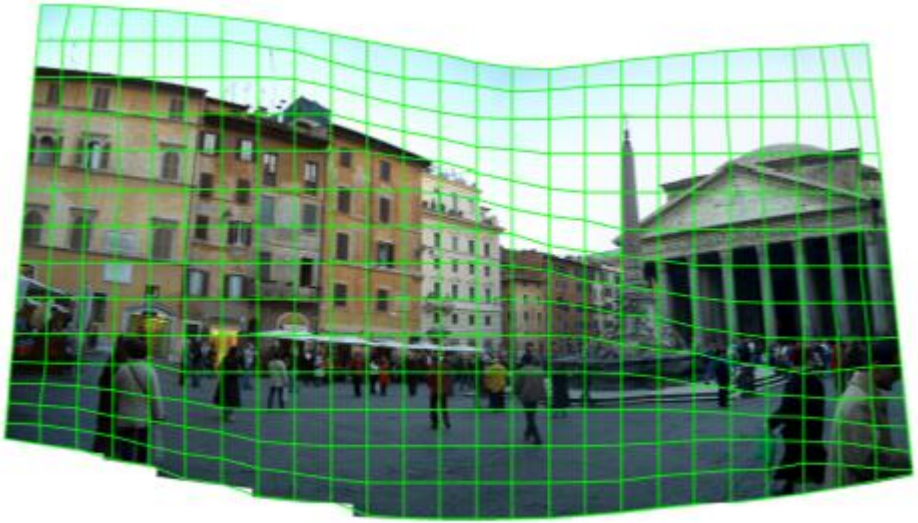


Algorithm

- Step4. Draw meshes on image in step 3 and warp it back to the original image. Record the translation of each mesh point.



(c) mesh on local warping result



(d) mesh warped backward

Algorithm

- Step5. Mesh-free Global warping: Optimize the energy of each mesh points by **alternating algorithm**. The energy function is:

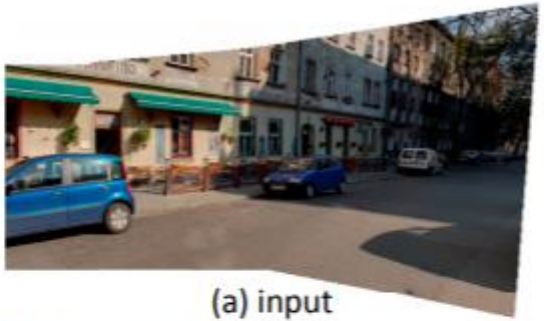
$$\mathrm{E}(\mathrm{v}, \{\theta_{\mathrm{m}}\}) = E_s(V) + \lambda_L E_L(\mathrm{V}, \{\theta_{\mathrm{m}}\}) + \lambda_B E_B(V)$$

V can be optimized by fixing θ_{m} and solving a linear system. θ_{m} can be optimized by fixing V and minimize:

$$\min_{\theta_m} \sum_{j \in bin(m)} \left\| C_j(\theta_m e_{q(j)} \right\|^2$$

Algorithm

- Step6. Stretch the image and post-processing.



(a) input

(b) warped to bounding box

(c) after stretching reduction

Expected Results - Image 1

Expected Results - Image 2

References

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