Super-Resolution from a Single Image
CS663: Digital Image Processing

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Patch Recurrence [1]

- Patches in a natural image tend to recur redundantly within and across scales
- For every low-res patch, its matching patch is found in scaled down version of the same image and the parent patch of this matched patch in the original image becomes the high-res pair of the original low-res patch

(a) (b)

Figure: Figure (a) Low-Res/High-Res Pair (b) Destination Patch in scaled down version of the image

[1] Glasner, Daniel, Shai Bagon, and Michal Irani. "Super-resolution from a single image." Computer Vision, 2009 IEEE 12th International Conference on. IEEE, 2009.

Example Based Super-Resolution [2]

- For a given patch its adjoining pixels are also taken to find the nearest neighbour patch
- Since we care more about the high frequency data in a patch, it is mean normalized before finding destination patch

Figure: (*left to right*) Source Patch, Adjoining Boundary, Mean Normalized

[2] Freeman, William T., Thouis R. Jones, and Egon C. Pasztor. "Example-based super-resolution." Computer Graphics and Applications, IEEE 22.2 (2002): 56-65.

Example Based Super-Resolution

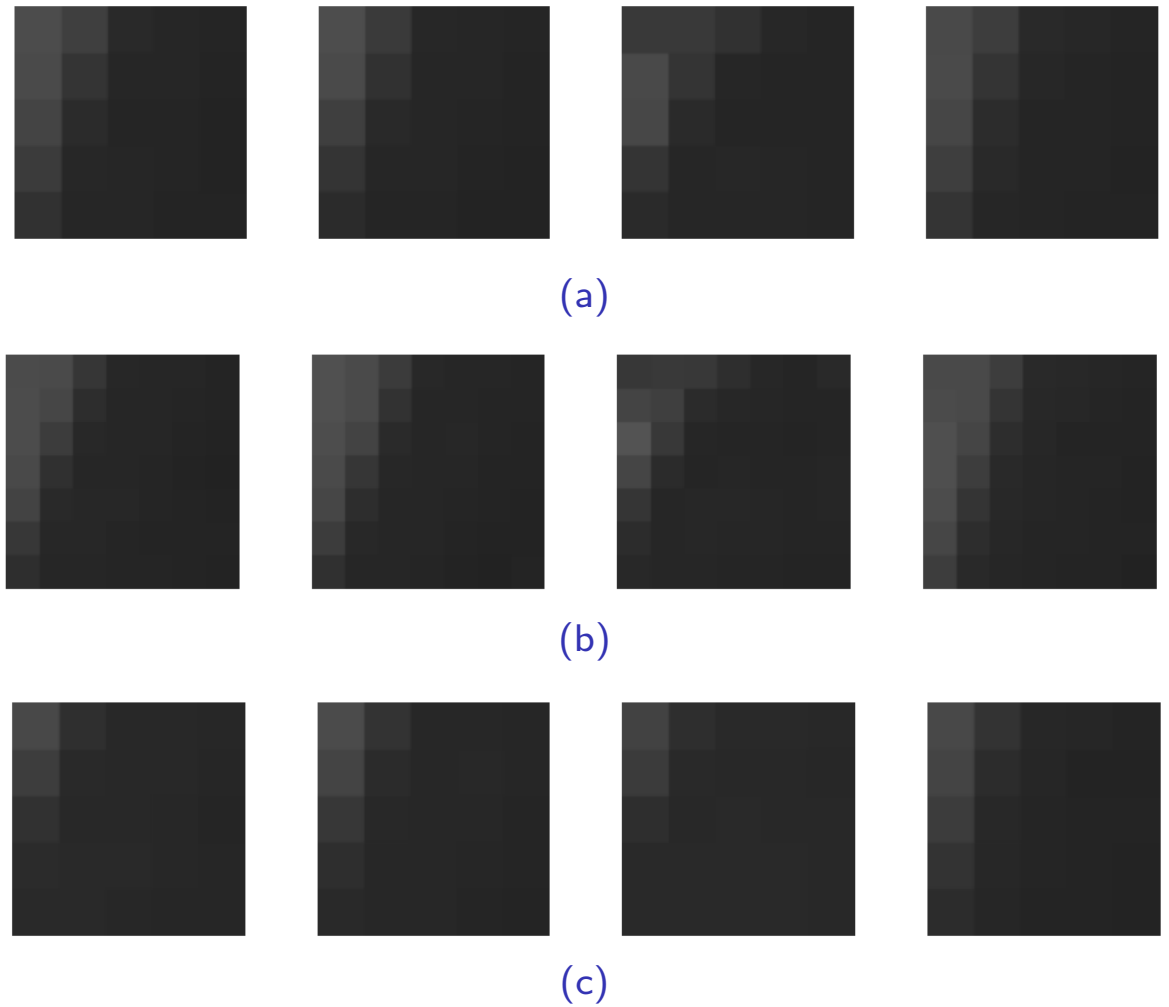
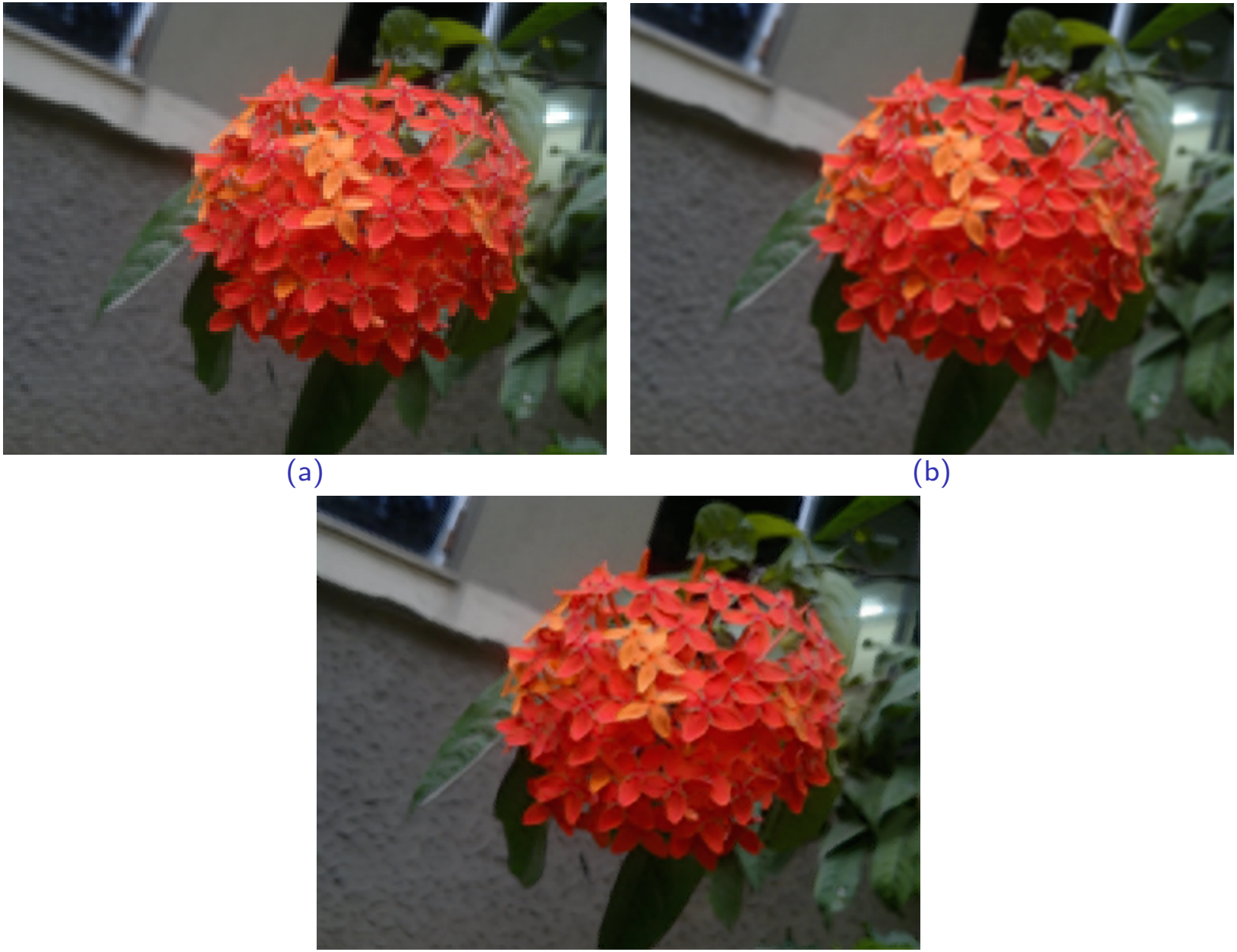


Figure: First Four Nearest (a) Destination Patch (b) High Resolution Patch (c) Resultant Patch

Test Image 1

Figure: Test Image



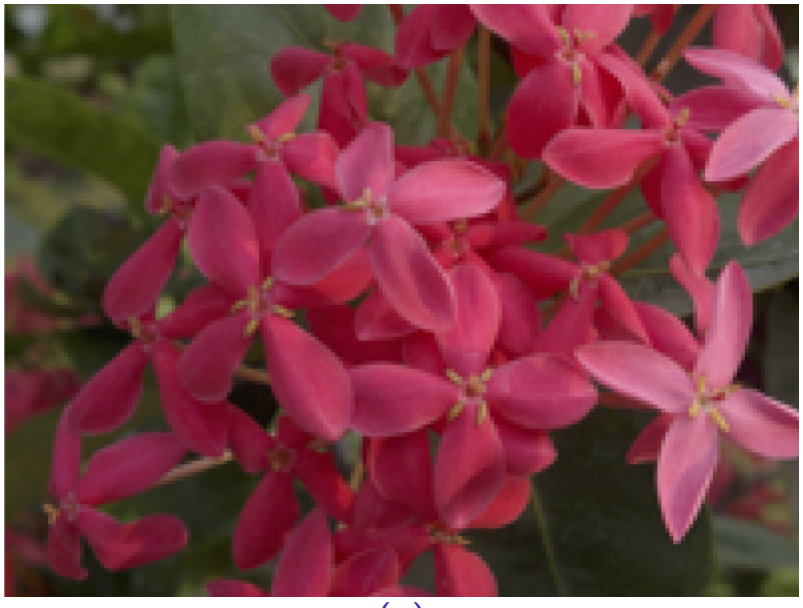
(a) (b)

(c)

Figure: (a) Nearest Neighbour (b) Bicubic Interpolation (c) Example-Based

Test Image 2

Figure: Test Image



(a)

(b)

(c)

Figure: (a) Nearest Neighbour (b) Bicubic Interpolation (c) Example-Based