

Fast Super-Resolution Using Weighted Median Filtering

BH.REKHA DEVI -201431212

APPIDI ABHINAV -201431218

Problem Statement

- A fast and 'non-iterative' method of image super-resolution based on weighted median filtering with Gaussian weights.

Introduction

- **Super-resolution** : Super-resolution is a technique that enhances the resolution of an image.
- In Super-resolution, several images of an object with subpixel shifts(low-resolution images) are used to construct a single high-resolution image.
- Main problem of Super-resolution is requirement of accurate motion estimation.
- But, in our approach, we implement a method stable enough to the errors of motion vectors estimation.

Implementation

The basic and simple averaging method is based on gaussian filtering.

- It gives image blur.

Second, can be implemented using median filtering

- It produces sharp edges, but it does not use spatial distribution.

Combining above two methods to Weighted Median filter with Gaussian weights.

- It produces sharp edges and also accounts for spatial distribution.

Weighted Median Filtering

- With a circle of defined radius (R) , we find all the pixels that lie inside the circle over all low resolution images.
- Calculate weight c_n for each pixel value w_n indexed with (x_n, y_n) inside the circle as follows :
 - $$c_n = \exp(-1 * ((x_n - i)^2 + (y_n - j)^2) / (2\sigma^2)) .$$
- Take pairs (w_n, c_n) and sort them in ascending order of w_n , and find value of 'm' from
 - $$\sum_{k=1}^{m-1} c_k \leq S/2 , \quad \sum_{k=1}^m c_k > S/2 , \quad S = \sum_k c_k .$$
- Take the corresponding value W_m as the result of weighted median averaging for that pixel.

cont..

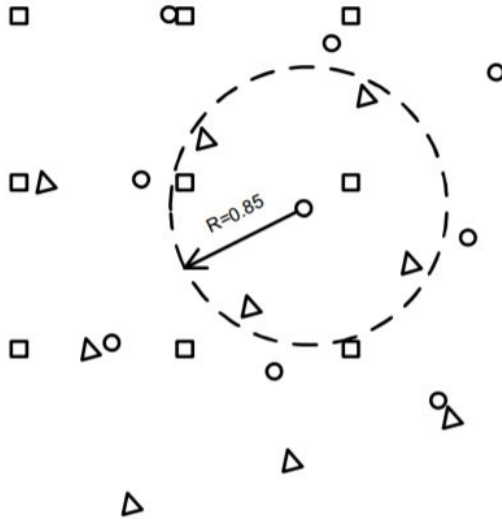
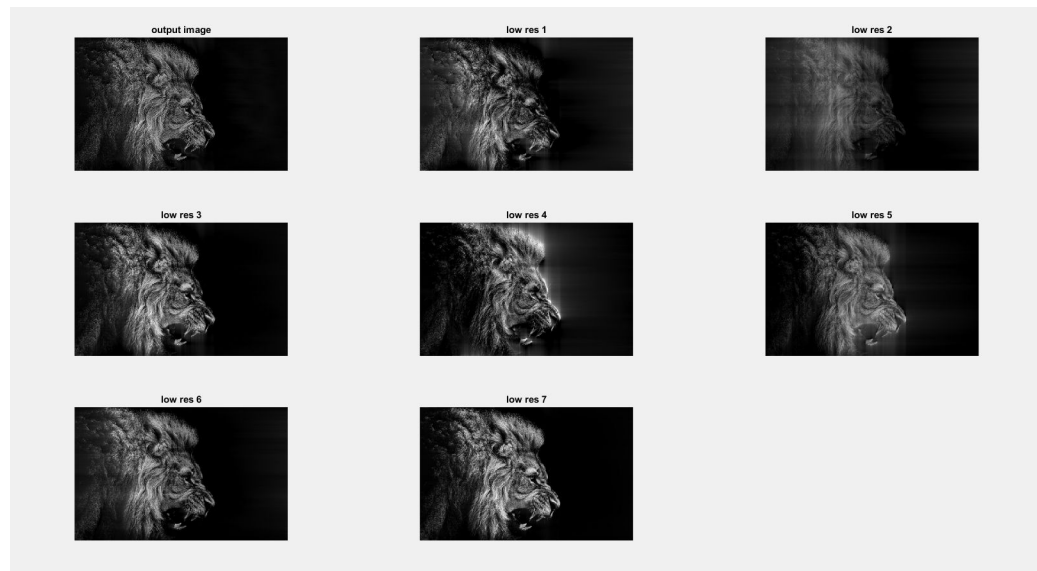


Image shows median filter for irregular samples. Samples for three different images are represented. The point in the centre of the circle is substituted by the median of all points in the circle, including itself.

Results



Output compared with all input images



Output super-resolution image

Conclusion

- Output image is enhanced in resolution compared to all input images.(enhancement depends on R and σ values.)
- The process is fast compared to other iterative or classical methods.(as the method is non-iterative.)
- Produces sharp edges in final resultant image because of the behaviour of median filtering.
- The method reduces the errors caused by inaccurate motion vectors.