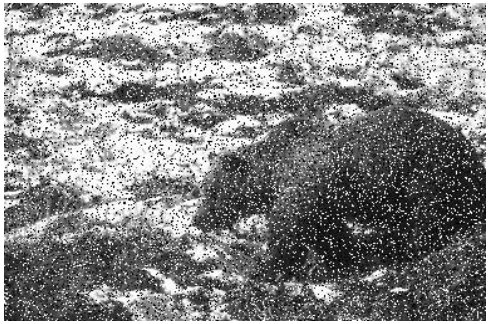
P-HGRMS: A parallel hypergraph based root mean square algorithm for Image Denoising

Tejaswi Agarwal, Saurabh Jha and Rajesh Kanna
School of Computing Science and Engineering,
Vellore Institute of Technology, Chennai, India

Motivation: Designing an appropriate algorithm for image neighbourhood hypergraph model to remove noise and compare its effectiveness with the existing model which had limitations such as expensive computation, existence of residual generation of noisy pixels.

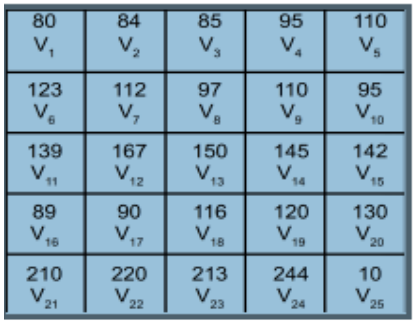
Original Image



20 % noise

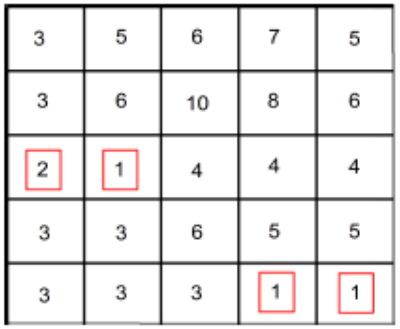
Denoised Image using P-HGRMS

The P-HGRMS model

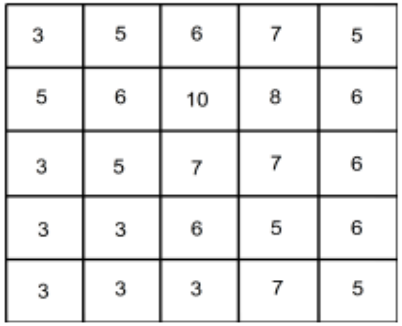


1. Input Image
Set, Geometrical parameter =15
Topological parameter =2

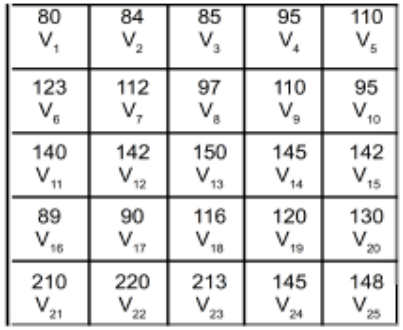
2. Construct Image neighbourhood hypergraph. Not all hyperedges marked here.



3. Find cardinality and mark isolated hyperedges with cardinality less than 3



5. Continue from step 2. At this stage no isolated hyperedges were found. So STOP.



4. $f(x,y) = \sqrt{\frac{1}{mn}\sum_{s,t}(g(s,t))^2} \quad (s,t) \in S_{x,y}$

Results:

- Maintains noise removal efficiency of the existing algorithm
- Outperforms the existing implementation by 6x-18x in terms computation efficiency.