Improved Algorithm for Spatial Resolution for an image using Kernel Regression and K-Mean

SONIA RANI

Student

SUS Tangori

Abstract: ***In existing technique only using the concept of vector optimization to enhance the resolution of an image from low to high, which is not give satisfying and accurate results which are very time consuming as well. For the cure, the previous shortcomings we introduce a new proposed algorithm for image resolution. In our proposed result, we make a combination of clustering techniques and regression functions to enhance an image in digital image processing. In our research, we made the clusters of low-resolution features from an image and collect in a cluster of similar type. With the use clustering we easily find exact, we use the kernel regression for convert a low-resolution image to high-resolution image and improve the accuracy of the image and it less time consuming. Which give us better result as compare to the previous technique.***

1.Introduction:

Digital image processing is a famous method in computer vision of image detection and image recognition. When someone capture an image from a high-speed vehicle or a fast moving camera then the image is not clear. It is very hard to capture a image with clear quality. In other words, we can say if we try to capture a video from moving vehicle or make a video of moving object or human it is not easy to give a exact and enhanced image which is not effected from any cause. This capturing image decrease the image quality as well decrease the image resolution. With low resolution, we cannot see a clear picture. Image effect from either pixel, spatial or other type of low resolution. For improving the resolution of an image as well enhance the image we use the K-means and Kernel regression function for improvement the video resolution. For enhancement of an image, we first try to make a cluster of similar type of low-resolution pixels from an image. For clustering, we use the K-MEANS clustering technique and after make the clusters of an low-resolution pixels we use kernel regression function to enhance the image quality as well enhance the low resolution pixels to high resolution and make a clear image which high quality image and without effect the any type of noise in an image.

Keywords: Digital image processing, low resolution image, K-MEANS clustering, Kernel regression, image enhancement, pixel resolution

2. Image Resolution:

Image Resolution known as number of pixels or we can say dots in an image that comprise the image. The image quality depends on the pixels of an image. A pixel always is in the form of P(x,y). Image enhancement means how pixel enhancement. An image is bunches of pixels which make a RGB, grey level image which is clear and easily understand the content of an image as well increase the visibility of an image. Image resolution is improve with the improvement of the pixel in an image

Figure 2.1

1. **Spatial Resolution:** Spatial image Resolution of an image is different from the pixel resolution of an image. This spatial resolution does not depend upon the pixel of an image it depends upon the whole features, which affect the image quality. Coz if we zoom an image the quality of an image decreases with decrease the image pixel quality.

   Spatial image resolution depends upon the following features of an image, which is use on different devices to measure the spatial resolution.

- Dots per inch (DPI): This resolution measurement used in computer monitors.
- Lines per inch (LPI): When we want to give print command on laser print then use the lines per inch resolution on an image.
- Pixels per inch (PPI): This measurement is use for measure the picture resolution on mobiles, tablets etc.

Figure 2.2

(Compare the original image and enhanced image)

3.Review of Literature

Various authors in the past have done studies related to high-resolution image from high-speed video. Few studies reviewed by me concerning my research proposal as follows:

1. Mahmood Amiri et. al[2019] proposed a method of in which an image quality improved by using Triangular patches technique. Which only improve the triangular part from the image rest parts blur this is major drawback of this research.

2. Ping xiang Li et.al proposed a method for image enhancement is sub pixel filtering algorithm. But it only improve the major pixel which are large in size but the some part of image having small pixels which are not enhanced by this algorithm.

3. Jing Ge et. al: Searched a new algorithm that is disparity algorithm which is use to improve the image resolution. It improves the resolution but some hidden parts are missing in this technique.

4.Ankit .K Jain et al: searched an algorithm which is use to recover the lost frequency of the fast moving video images. When a object is moving and try to make a video then image quality is also decrease the frequency. This researcher tried to improve the frequency but he failed in his research coz it not an easy task.

5.Jing Zhang et. al found a method which tackle with point estimation of an image and improve the image quality also we can say it try to enhanced the image quality with point estimation of an image pixels which make the clusters of an image .

6.Inês Oliveira et.al researched to find a way to extract the content from an video image. Content extraction is one of the hard tasks from an image, which is capture from an running object or from an video image. This researcher tried to extract the content from the video image by using toolkit "VIDEOCELL" that is use for content extraction.

7.Ashna Jain et.al This researcher focuses on the automated video signal detection for vehicle on road. It tried to improve the noise of a symbol, which can take vehicle sensor automatically. This all set up is use for direction controller.

8.Aabhas mathur et.al researched a new algorithm, which used for noise reduction in MRI image. An image is collection of pixels when extra pixels added in an image then noise creates in an image. To reduce the noise from an image they used a new algorithm PNLM, this algorithm only use for noise reduction from an image.

9.C. Mythili et. al found a technique for color image noise reduction from an colored image. With the enhancement in color noise, automatically improve the image quality. They use the different linear and non- linear techniqsues for noise reduction. The conclusion of this research the non-linear fuzzy set is most useful for the noise reduction with also improve the image quality.

10.Zhifei Zhang found a new technique for noise reduction, noise measurement and removal techniques. He found the different technique for noise measurement for filter based technique, block based and filter based technique and he found the latest approaches for reduction, measurement of noise by deep learning and sparse coding.

11.Hlaing Htake researched the algorithms for noise reduction in pre-processing on an image. He used the mean filter, which only remove the few number of noisy pixels. He used the median filtering algorithm for noise reduction to reduce the near pixels. Median algorithm reduces the noise without affecting the sharpness of an image. However, this median algorithm only improves the noise of the nearer pixels.

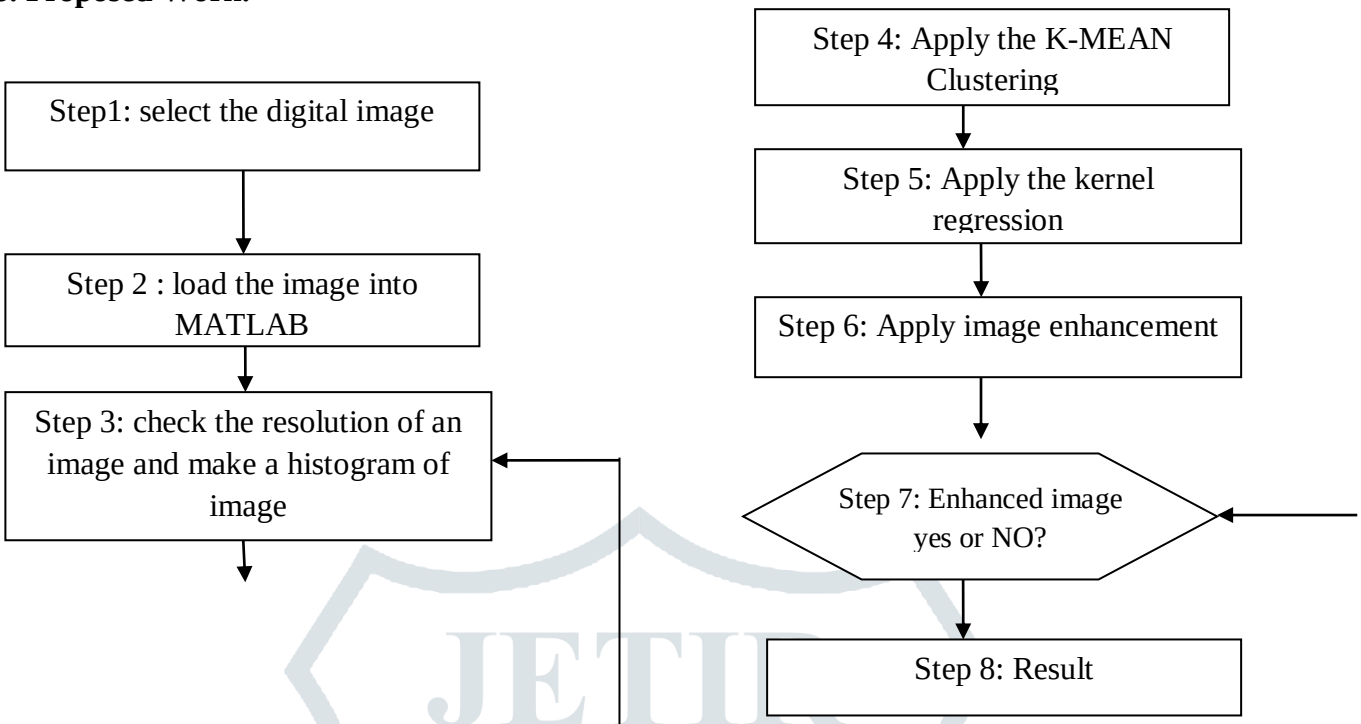
12.Abdalla Mohamed Hambal researched a noise reduction algorithm based on type of noise corrupting. They used different filtering algorithms for image enhancement and noise reduction. They used different algorithms like ground filtering, median filtering and pepper salt filtering for the noise reduction of an image. They concluded the median filtering is goof but it also reduce the pixel quality and increase the complexity of an image.

4.Problem Formulation

In problem formulation, we discuss the problems of the existing technique:

- **Hidden parts**: Existing technique only converts the low quality image into high quality image but not improve the hidden parts of the image.
- **Non-Rigid Registration**: This registration is use when two images want to compare in exiting technique this is use for enhancement, which not give the exact result. This only transforms a particular type of instance. This type of registration not gives the exact result.
- **Pixel resolution:** Existing method only improves the pixel resolution of an image but this technique not improves the spatial and temporal resolution, which is important for video resolution point of view.
- **Triangular patch extraction:** Triangular patch extraction is a technique which is use to make boundary of row resolution area and after making apply the enhance algorithm on it. However, this extraction technique not applies on every low-resolution image it only applied on those pixels which is clearly showing low-resolution image.

5. Proposed Work:



6. Techniques

In this, we are talking about the techniques, which are, use to solve the problem of low resolution. In our research, we mainly use the two techniques to solve a particular problem.

Clustering

In clustering, we are making the clusters of similar features. There are various kind of clustering technique for solve the problem. However, in this research we are using K-MEANS Clustering.

K-MEANS Clustering: This algorithm used to solve the clustering. K-means clustering is a simple technique, which is use to group items into k clusters. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters)

fixed a priori. This algorithm is one of the simplest and high-speed execution algorithms.

1) Randomly select *'c'* cluster centers.

2) Calculate the distance between each data point and cluster centers.

3) Assign the data point to the cluster center whose distance from the cluster center is minimum of all the cluster centers.

4) Recalculate the new cluster center using

5.2.2 Kernel Regression: With Kernel Regression function, we can do denoising the image, interpolation of an image.[15]

"KernelReg" for representing the kernel function

"KernelReg color" for RGB type data

Commands for representing kernel regression in MATLAB

[z, zx, zy] = KernelReg(frames, r, mvs, ref, Q, h, ktype, kfunc, ksize, it, wsize)

where z, zx, and zy are the output values: estimated images, estimated vertical gradient images and estimated horizontal gradient images, respectively

There are several sample codes using the "KernelReg" function,

- . Gaussian noise removal ("Lena denoise.m")
- Compression artifact reduction ("Pepper deblock.m")
- Film grain removal ("JFK denoise.m")
- image (film grain noise)
  - Image upscale ("Lena upscale.m")
  - Image fusion ("tank8 fusion.m")
  - Color super-resolution ("ady10 super-resolution.m")

Results and Discussion

In this research, we had worked on the pixels of the image, hidden pixels, pixels resolution of an image for the improvement of the spatial of the image with the help of K-MEANS and Kernel algorithm for enhancement the image.

In figure 6.1, we make the clusters of the pixels of the image. These clusters help to improve the data that distributed into different places of similar type. For the exact collection of the pixels of similar type into clusters, we use K-MEANS clustering Algorithm

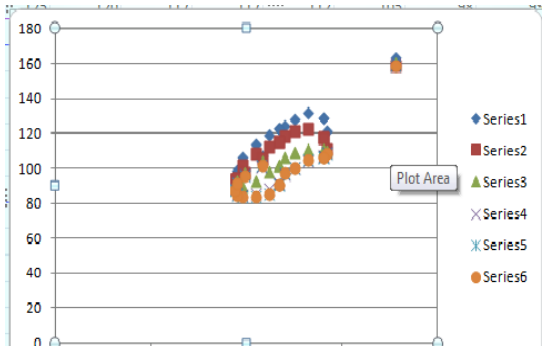


Figure 6.1 K-MEANS CLUSTERING

In next Figure 6.2 we show the variables of Ground algorithm which is a existing technique which used by the previous algorithm and how to enhance and get the better results.

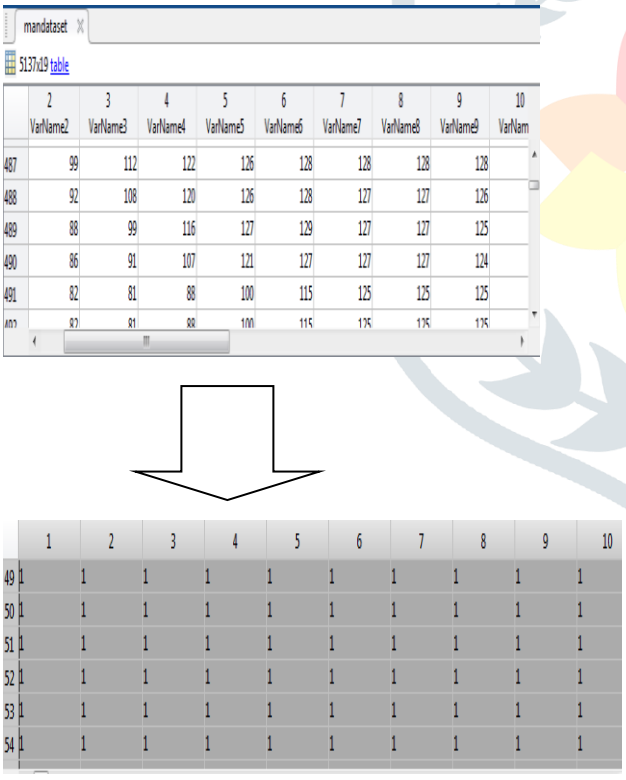


Figure 6.2 (From existing to proposed technique

In figure 6.3, we show the time average of the algorithm with the help of the amplitude of an image. This figure show that the new algorithm take consistent time for any time of problem that is face in the dataset with is enhance by the algorithm of the previous researcher. In previous technique, time changed with the pixel change but because of making clusters, the time requirement decreases.

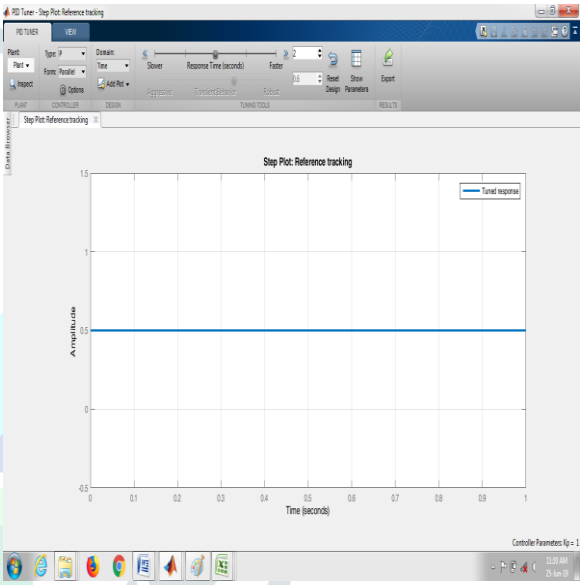


Figure 6.3 Time consistency of the proposed algorithm

In this figure 6.4, we showed the frequency of the data which improved with the by the kernel algorithm with the frequency it also improve the data FPE and Fit value of the image. With the enhancement of these factors image improved. And it showed the clear image as compare of the previous image which is implemented form the

combination of kernel and k-means clustering algorithm.

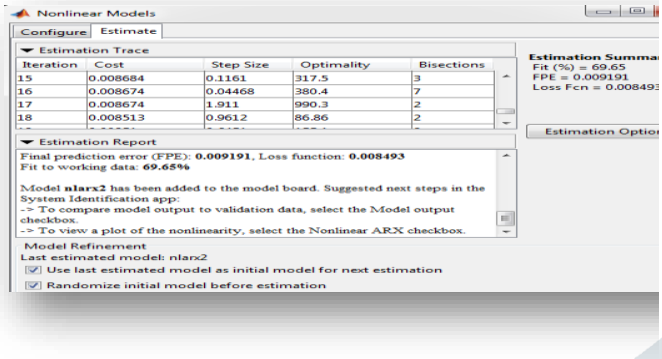


Figure 6.4 improved FPE and fit of the image

In figure 6.5 showed the we show the improve frequency of that data that we improve by using kernel algorithm and K-MEANS Algorithm. In this, we show the comparison between the proposed technique and exiting technique enhanced image.

Figure 6.5 using Combination of K-MEANS and Kernel Algorithm

The next image from the existing technique which used ground algorithm for enhancement of the algorithm.

Figure 6.6 Existing technique by using Ground Algorithm

7.Conclusion and Future Scope

7.1 Conclusion In this research, we improve the low-resolution image with the help of K-MEANS and Kernel Regression Function. In exiting research they only changes the pixel resolution by using triangular function which make a boundary which part actual change and convert from low to high-resolution but after changing a particular part of an image some hidden parts are pending to improve which are not extracted by the existing technique which did not give the enhanced image result. We can say that image is not high-resolution image. For the shortcomings of existing technique, we introduce

new algorithm, which is combination of K-MEANS and Kernel Regression function. Which improve the boundary of low-resolution pixels with the help of K-MEANS clustering which make the clear collection of low resolution and histogram show the exact image of what resolution of image having in their pixels. It give us more enhanced image which having high resolution. It will also decrease the time consumption during the period of change from low-resolution image to High-resolution image.

7.2 Future scope: This research totally based on future facts like when we capture a picture from moving vehicle or other moving object then the captured picture blurred all the time. Alternatively, large number of noise created in the picture for the enhancement of that type of video picture, which is low-resolution, this algorithm is very useful which is easy to understand and less time consuming.

In today's world, the digital image is essential need for the enhancement of digital image. This algorithm gives us useful and accurate result of our problem

References:

1. ***Mahmood Amiri, Alireza Ahmadyfard, Vahid Abolghasemi "A fast video super resolution for facial image" Image Communication 70 (2019) 259–270***
2. ***sPingxiang Li, Huanfeng Shen, Liangpei Zhang "A METHOD OF IMAGE RESOLUTION ENHANCEMENT BASED ON THE MATCHING TECHNIQUE" State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University, Wuhan 430079, China. (pxli64@163.com)***
3. ***Jing ge 2015/07/28" A resolution enhancement algorithm for an asymmetric resolution stereo video"EURASIP Journal on Image and Video Processing***
4. ***"Video super-resolution for mixed resolution stereo" Ankit K. Jain ; Truong Q. Nguyen***
5. ***"A simultaneous method for 3D video super-resolution and high-quality depth estimation"Jing Zhang ; Yang Cao ; Zengfu Wang***
6. ***A Decision Based Unsymmetrical Trimmed Modified Winsorized Mean Filter for the Removal of High Density***

Salt and Pepper Noise in Images and Videos☆ Author: K.Vasanth[a]T.G.Manjunath[b]S. NirmalRaj[a]

7. *Sukhjinder Kaur "Noise Types and Various Removal Techniques" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 2, February 2015*
8. *" An efficient mixed noise removal technique from gray scale images using noisy pixel modification technique" Jayasree M. ; N. K. Narayanan*
9. *Haris Suka Dyatmika, Katmoko Ari Sambodo "Noise removal using thresholding and segmentation for random noise Sentinel-1 data"*
10. *Vol-2 Issue-3 2016 IJARIIE-ISSN(O)-2395-4396 2438 www.ijariie.com 1895 "Multiple Kernel Regression Based Image Resolution for JPEG Images" 1Archi Prajapati, 2Mr. Jay Amin 1 Student of Master in Engineering, 2Asst. Professor Computer Department 1Computer Engineering, 1 LJIET, Ahmedabad, India*
11. *IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 16, NO. 2, FEBRUARY 2007 349 "Kernel Regression for Image Processing and Reconstructionzz" Hiroyuki Takeda, Student Member, IEEE, Sina Farsiu, Member, IEEE, and Peyman Milanfar, Senior Member, IEEE*
12. *December 2015, Volume 2, Issue 12 JETIR (ISSN-2349-5162) JETIR1512012 Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org 71 Multiple Kernel Regression Based Image Resolution for JPEG Images 1ArchiPrajapati, 2Mr. Jay Amin 1 Student of Master in Engineering, 2Asst. Professor Computer Department*
13. *Mohammad Moinul Islam, Vijayan K. Asari, Mohammed Nazrul Islam, and Mohammad A. Karim Department of Electrical and Computer Engineering, Old Dominion University, Norfolk, VA {misla001,vasari,mislam,mkarim}@odu.edu*

14. ***Mathematical Problems in Engineering Volume 2016, Article ID 5245948, 13 pages http://dx.doi.org/10.1155/2016/5245948 "A Residual-Based Kernel Regression Method for Image Denoising" Jiefei Wang,[1] Yupeng Chen,[1] Tao Li,[1] Jian Lu,[1] and Lixin Shen College of Mathematics and Statistics, Shenzhen University, Shenzhen 518060, China, Department of Mathematics, Syracuse University, Syracuse, NY 13244, USA***

15. ***UNIVERSITY OF CALIFORNIA SANTA CRUZ KERNEL REGRESSION FOR IMAGE PROCESSING AND RECONSTRUCTION by Hiroyuki Takeda***

https://www.tutorialspoint.com/dip/spatial_resolution.htm