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Research Article

Enhancing the Quality of Bio-Medical Video using Super Resolution

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Abstract: Medical imaging or videoing is an important diagnosis instrument to determine the presence of certain diseases. Therefore increasing the video resolution should significantly improve the diagnosis ability for corrective treatment. Furthermore, a better resolution may substantially improve automatic detection and image segmentation results. Despite the advances in acquisition technology and the show of optimized reconstruction algorithms, it is not easy to gain an approach at a desired resolution what is coming to one to imaging environments, the limitations of terrestrial imaging systems as well as quality-limiting factors a well known as Noise and Blur. An answer for this issue is the utilization of Super Resolution (SR) systems which can be utilized for handling of such images and hence videos. This paper depends on the remaking of low resolution videos to high resolution video. Thus, obtaining the high resolution video. Performance of this method was evaluated by means of objective image quality criteria PSNR, MSE, SSIM and MSSIM to determine the algorithm for Medical videos.
Keywords: Biomedical Video, blurring, Gaussian filter, super resolution.

Introduction

Picture and video handling has been produced quickly as an essential research field at present, since requested by different and various ranges of uses, for example, in science, antiquarianism, prescription, spaceflight, and show industry [1]. Video is an electronic medium for the recording, duplicating, playback, broadcasting, and show of moving visual media. Video frameworks change incredibly in the determination of the show and invigorate rate. Video can be carried on an assortment of media, including radio communicate, tapes, DVDs, PC records and so forth. The utilization of computerized strategies in video made advanced video, which permitted higher quality and, in the long run, much lower taken a toll than before simple innovation.

The quantity of still pictures per unit of time of video reaches from six or eight casings for each second (edge/s) for old mechanical cameras to at least 120 edges for each second for new expert cameras [2].

Video quality can be measured commonly formal measurements acknowledge PSNR or by all of scholarly sound tape quality by the office of master perception [3]. The subjective sound tape nature of a sound tape handling strategy is assessed as takes after:

- Choose the video groupings (the source) to deal with for testing.
- Choose the settings of the course to deal with (the Speculative Reference Circuits).
- Choose a show strategy for and soon thereafter to uncover video successions to specialists and to draw their evaluations.
- Invite an overwhelming number of specialists, superiorly.
- Carry false testing.
- Calculate the better than average stamps independently in light of the specialists' appraisals [4].

Pictures and video improvement [5] is a standout amongst the most essential and intriguing territory of video preparing. We as of now have various preparing calculations and modules to upgrade pictures. For all that, these calculations or modules are typically blemished. Exceptionable outcomes could be created, on the off chance that they didn't tune suitably. In down to earth, the preparing module frequently has been settled or acts as a coordinated calculation. We have to repair them on the ground of the ways out preparing modules.

Quality Upgradation Technique

Quality upgrades and picture reclamation both plan to get picture change. Picture improvement [6] procedures are meaning to adjust characteristics of a picture and make it more appropriate for various applications while Image rebuilding systems concentrate on re-establishing a picture debased by obscuring, commotion or coding antiquities, down-examining, geometry mutilation, and so on. An extensive number of picture handling methodologies are accessible for the two perspectives [7], and the calculations are typically intended for particular applications.

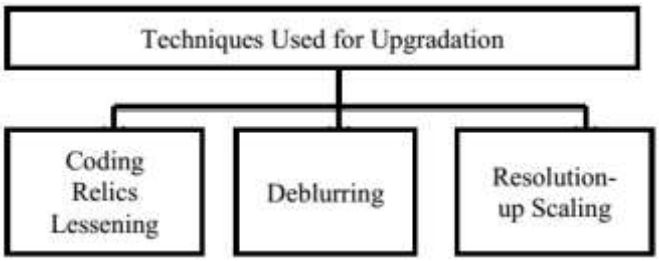

Fig.1. Types of enhancement

Coding Relics Lessening

In spatial space, mitigating direct channels, for example, averaging channel and smoothing nonlinear channels including middle channel is utilized [8]. For instance, averaging channels depends on reassign every pixel area with the normal estimation of its neighbours in a preset channel gap. Thusly, sharp moves in dim levels (or power) are lessened. In recurrence area, sharp moves in force, for example, square, commotion or coding relics, normally present as high recurrence content in Fourier change. Along these lines Low pass channels can be utilized as smoothing channels to diminish them. Three sorts of low pass channels were considered to take care of this issue. They are thought, Gaussian and Butterworth. Be that as it may, sought detail, for example, edges, might be smoothed in the meantime. To show signs of improvement results, edge-versatile technique ought to be included.

Deblurring

Deblurring is otherwise called sharpness improvement [9]. Honing is the inverse operation of obscuring. In spatial space, while for obscuring, we utilize averaging strategy, we could utilize numerical models to do separation for honing. By and large, detail-honing spatial channels depend on first subordinate or second subsidiaries.

Resolution up-scaling

Resolution up-scaling or resolution up change is changing over a picture with low resolution into higher resolution [5]. In spatial space, premise technique for this application is expanding the quantity of the pixels by utilizing picture interjection which we will say in subsection 2. The vast majority of the summed up insertion procedures are direct resolution up scaling calculation.

Super Resolution

Super-resolution imaging (SR) is a class of strategies that improve the resolution of an imaging framework. In some SR strategies—named optical SR—the diffraction furthest reaches of frameworks is risen above, while in others—geometrical SR—the resolution of computerized imaging sensors is improved [10]. Super-resolution imaging methods are utilized as a part of general picture handling and all the while video preparing.

There are both single-casing and various edge variations of SR [2]. Numerous edge SR utilizes the sub-pixel moves between different low resolution pictures of a similar scene. It makes an enhanced resolution picture melding data from all low resolution pictures, and the made higher resolution pictures are better portrayals of the scene. Single-casing SR strategies endeavour to amplify the picture without presenting obscure. These techniques utilize different parts of the low resolution pictures, or other inconsequential pictures, to think about what the high-resolution picture ought to resemble. Calculations can likewise be partitioned by their area: recurrence or space. Initially, super-resolution strategies functioned admirably just on greyscale pictures.

Fig.2 shows the Classification of super-resolution algorithms from the point of view of applications.

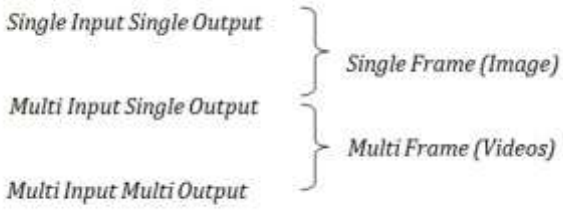

Fig. 2 Frames can be classified into this category.

Fig.2 shows the Classification of super-resolution algorithms from the point of view of applications. Expanding the resolution of the medicinal video brings about bringing down the flag signal to noise proportion as well as expanding the output time. The resolution of MRI [5] pictures is enhanced by acquiring a high resolution picture from a grouping of low resolution pictures utilizing the super-resolution recreation approach. Picture reclamation is a vital stride in the recreation procedure, the last appearance and the nature of the reproduced picture and along these lines the video depend enormously on the rebuilding strategy utilized. We assessed the execution of the rebuilding strategies utilized as a part of the reproduction. For that we use Gaussian filtration. The Gaussian filter is used to blur and remove unwanted detail and noise. Channel is a system for changing or enhances the picture quality simply like sharpness and splendor. For instance we would filter be able to a picture to accentuate fancy elements or expel undesired elements. Picture handling operation execute with separating incorporate smoothing, honing, pressure what's more, edge upgrade. A similar thought is connected in picture handling territory to expel the undesirable component. Advanced channel assumes a noteworthy part in picture preparing. It for the most part utilized to smother either the high frequencies in the picture smoothing the picture or the low frequencies upgrading or recognizing edges in the picture.

Literature Survey

Mohammad Moinul Islam et. al. [11] worked upon Super-Resolution Enhancement Technique for Low Resolution Video. This paper presents a kernel regression approach to reconstruct a high resolution image from several low resolution video frames. The performance of the proposed algorithm is evaluated with several grayscale and color video streams and found successful when compared to other state of the art techniques.

Masato Shimizu et. al. [12] worked on Super-Resolution for X-ray Images. In this paper, they have proposed a super-resolution system for X-ray images that utilizes TV regularization, a shock filter, and a median filter. In addition, they have proposed a novel measurement algorithm for treatment of RA using X-ray images generated by our proposed super-resolution system

Mitra Basu [13] studied Gaussian-Based Edge-Detection Methods. In this paper, he discussed the various features of this operator that make it the filter of choice in the area of edge detection. Despite these desirable features of the Gaussian filter, edge detection algorithms which use it suffer from many problems. He reviewed several linear and nonlinear Gaussian-based edge detection methods.

Anurag Verma and Abhishek Mishra [14] worked on Image Compression using Gaussian Smoothing Filter and Median Filter. It is based on data compression using efficient data compression algorithm. In this paper we use Gaussian filter as sharping tool and median filter as compression tool.

Dr. S. Pannirselvam and P. Raajan [15] worked on An Efficient Finger Print Enhancement Filtering Technique with High Boost Gaussian Filter (HBG). In this paper they used the high boost filter and Gaussian filter for efficient finger print image quality. In their methodology the original is filtered using High Pass filter and the Gaussian filter for noise removal. Finally, High Boost filter is apply for better enhancement and the performance of the image quality is measured using Mean Squared Error (MSE) and Peak Signal Noise Ratio (PSNR).

Methodology

In this section, we will discuss about the proposed framework for the generation of high resolution video by using Super Resolution technique.

This proposed work follows the following step.

- Input Process
- Conversion
- Blurring
- Enhancement
- Reconstruction
- Testing

(a). Input process: An MRI Video is passed to system for enhancement is called Input or raw

input. In video processing, this input provide by any medical imaging device.

(b). Conversion: Direct raw input video contains low resolution frames and which impact on requirement to reconstruct those images. Thus, it is converted into the frames.

(c). Blurring. This step involves the blurring of video. As this process is applied to each frame of a video are getting blurred. This is done so as to show the much more quality enhancement of blurred frame.

(d). Enhancement: Now the blurred frames are enhanced using the Gaussian filter. This filter is used because it is a class of smoothing filter linearly with the weights chosen according to the Gaussian function.

(e). Reconstruction: After enhancement of each of the frame of a low resolution video, we get high resolution frames. This frame is arranged in such a manner that reconstructed to obtain a high resolution video.

(f) Testing: Enhanced frame, thus, are converted into video and this video get tested by calculating PSNR, mean SSIM and MSE which shows the reason behind the use of this method .

Fig.2 below shows the steps involved in the process flow of the proposed technique.

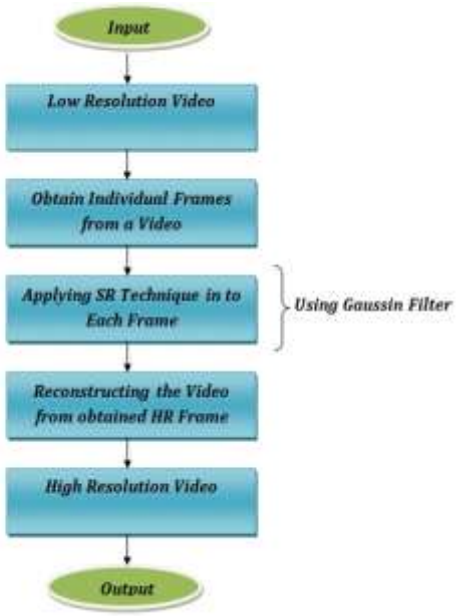

Fig. 3. Shows the propsoed methodology

Results

We have performed experiment by taking more than two MRI videos. It is of set of frames. The low resolution video is an input to the system which is having low quality sequence of image. This video is converted into no. of frames which gets blurred thus degrading more the quality of video and finally obtaining the highly resolute frames. This frame is thus arranged that forms the high resolution video.

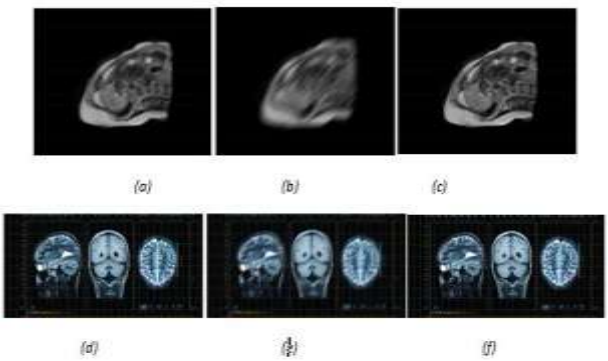

Fig. 4. Shows the two set of MRI input low resolution video (a) & (d), (b) & (e) shows the blurring step of frames and (c) & (e) is the high resolution video.

The Fig.4 is the view of a single frame of a video. Fig. 4(a) & 4(d) is the initial loaded frame into the system. Fig. 4(b) & 4(e) is the blurred frame and Fig. 4(c) & 4(f) are the final output of the system, it is the high resolution frame which gets converted into video after combining all obtained high resolution frame.

Table. 1.Shows the PSNR, Mean SSIM and MSE for different sets of videos using the proposed technique.

Video_ID	PSNR(db)	Mean SSIM	MSE
VID001	33.847	0.82	15.421
VID002	35.069	0.88	1.183
VID003	33.427	0.92	1.826
VID004	31.854	0.71	7.264
VID005	32.665	0.87	14.961

Table.1 shows the data about the videos obtained after performing Super Resolution to 5 different sets of videos. The system calculates Peak Signal to Noise Ratio (PSNR), Mean SSIM and Mean square Error (MSE) that shows the efficiency of the method which is much more as compared to other methods.

Conclusion

This paper used the Super Resolution technique to be used to overcome the problem of resolution. SR reconstruction allows overcoming the limits of the optical systems and improves the performance of the medical based image and video processing applications. By using Gaussian filter in super resolution algorithm; the resolution of low resolution bio medical video gets increased to high resolution video. Tests are performed in terms of PSNR, MSE and MSSIM thus shows that this performs better than other methods that are used in Super Resolution reconstruction.

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