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Dynamic Textured Image Enhancement

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Abstract: ***The rapid development of multimedia and network technologies, delivering and sharing multimedia contents through the Internet and heterogeneous devices has become more and more popular. As they are limited by the channel bandwidth and storage capability, videos distributed over the Internet may exist in low-quality versions. The problem of hallucinating the missing high-resolution (HR) details of a low-resolution (LR) video while maintaining the temporal coherence of the hallucinated HR details by using dynamic texture synthesis (DTS)*** *Dynamic textures are image sequences with visual pattern repetition in time and space, such as smoke, flames, moving objects and so on. Dynamic texture synthesis is to provide a continuous and infinitely varying stream of images by doing operations on dynamic textures.* ***To achieve high-quality reconstruction of HR details for a LR video, a texture-synthesis-based video super-resolution method, in which a novel DTS scheme is used to render the reconstructed HR details in a time coherent way, so as to effectively address the temporal incoherence problem caused by traditional texture synthesis based image SR methods. Further in order to reduce the complexity of the above method, only performs the DTS-based SR on a selected set of key-frames, while the HR details of the remaining non-key-frames are simply predicted using the bi-directional overlapped block motion compensation.***
Keywords: Dynamic texture synthesis, video super resolution, video upscaling, image super resolution, interpolation.

I. INTRODUCTION

The most well-known video corruptions are downscaling and pressure. We concentrate on examining video super-determination (SR) for a video corrupted by downscaling. Related applications incorporate determination upgrade of the video caught by an asset restricted cell phone or an ease reconnaissance gadget. Upgrade of video resolutions would be valuable for a few further applications, for example, face, activity, or question acknowledgment, conduct investigation, and video recovery. In most computerized imaging applications, high determination pictures or recordings are generally wanted for later picture handling and investigation. The want for high picture determination comes from two foremost application regions: change of pictorial data for human translation; and helping portrayal for programmed machine observation. Picture determination portrays the points of interest contained in a picture, the higher the determination, the more picture subtle elements. The determination of an advanced picture can be arranged in various ways: pixel determination. spatial determination, otherworldly determination, fleeting determination, and radiometric determination.

The computerized picture is made out of limited number of components each of them has specific area and esteem. These components are alluded to as picture components called as pixels and handling every one of them prompts advanced picture preparing. Enthusiasm for advanced picture handling strategies comes from following key application territories which are

Improvement of pictorial data for human understanding.

Processing of picture information for capacity, transmission.

Representation for self-sufficient machine observation.

Enhancing picture quality has dependably been an issue of picture preparing. Improving the nature of picture is a persistent progressing process. For a few applications it winds up plainly basic to have best nature of picture, for example, in legal division, where keeping in mind the end goal to recover most extreme conceivable data picture must be expanded as far as size. For instance at times in scientific examinations either criminal face or in video observation a licenses number plate, expanded picture measure separates minute data implanted in the picture.

Single picture super-determination is the procedure by which a solitary low determination picture is extended spatially to a higher determination picture. Alongside the first data intrinsic in a low determination picture, super-determination requires extra data (i.e. new pixel esteems for new pixels) to contribute with the goal that the missing data that is required to make the high-determination picture is given. The way toward deciding the estimations of the missing data is the essence of our concern.

Super-determination (SR) are strategies that build high-determination (HR) pictures from a few watched low-determination (LR) pictures, along these lines expanding the high recurrence parts and evacuating the corruptions caused by the imaging procedure of the low determination camera. The fundamental thought behind SR is to consolidate the non-excess data contained in various low-determination casings to produce a high-determination picture. A firmly related method with SR is the single picture insertion

approach, which can be additionally used to expand the picture estimate. Nonetheless, since there is no extra data gave, the nature of the single picture insertion is especially constrained because of the not well postured nature of the issue, and the lost recurrence parts can't be recouped. In the SR setting, be that as it may, different low-determination perceptions are accessible for remaking, improving the issue obliged. The non-repetitive data contained document in the these LR pictures is normally presented by sub pixel moves between them. These sub pixel movements may happen because of uncontrolled movements between the imaging framework and scene, e.g., developments of articles, or because of controlled movements, e.g., the satellite imaging framework circles the earth with predefined speed and way. Each low-determination outline is a crushed, associated perception of the genuine scene. SR is conceivable just if there exists sub pixel movements between these low determination casings, and therefore the badly postured upsampling issue can be better adapted. In the imaging procedure, the camera catches a few LR outlines, which are down tested from the HR scene with sub pixel moves between each other. SR development turns around this procedure by adjusting the LR perceptions to sub pixel exactness and consolidating them into a HR picture lattice (addition), accordingly beating the imaging confinement of the camera.

A. Image Super Resolution:

Most SR techniques in the writing were primarily intended for picture SR. The objective of picture SR is to recuperate a high-determination (HR) picture from one or different LR input pictures, which is basically a badly postured reverse issue. There are mostly two classifications of methodologies for picture SR: (I)customary methodologies and (ii) model/learning-based methodologies. In the customary methodologies, one sub-classification is remaking based techniques, where an arrangement of LR pictures of a similar scene are lined up with sub-pixel precision to create a HR picture. The other sub-classification of the conventional methodologies is outline introduction, which ordinarily create over-smoothing pictures with ringing and barbed ancient rarities. The model/learning-based strategies fantasize the high recurrence points of interest of a LR picture in view of the co-event earlier amongst LR and HR picture fixes in a preparation set, which has demonstrated to give significantly better subtle elements contrasted with customary methodologies.

B. Video Super Resolution

Video super-determination goes for abusing also the data from different pictures. Ordinarily, the pictures are connected by means of optical stream and continuous picture distorting. Most video SR strategies depend for the most part on movement estimation for inserting LR outlines between two key-outlines (generally thought to be of high determination) in a video, what's more, a video SR calculation was to interject a subjective edge in a LR video from scantily examined HR key-outlines which are thought to be constantly accessible for a LR video input. Then again, model/learning-based methods have been proposed for video SR. The movement remunerated mistake is substantial, an info LR fix is spatially upscaled utilizing the lexicon gained from the LR/HR key-outline match. In versatile regularization and learning-based SR were coordinated for web video SR by taking in an arrangement of LR/HR fix sets.

II. LITERATURE SURVEY

Super-determination imaging (SR) is a class of strategies that improve the determination of an imaging framework. The focal point of Super-Resolution (SR) is to create a higher determination picture from bring down determination pictures. High determination picture offers a high pixel thickness and along these lines more insights about the first scene. Numerous applications require zooming of a particular zone of enthusiasm for the picture wherein high determination ends up plainly fundamental, e.g. surveillance, legal and satellite imaging applications. The fundamental testing issue in Video SR will be SR for dynamic textural data. another sort of medium, called a video surface, which has qualities somewhere close to those of a photo and a video. A video surface gives a persistent boundlessly fluctuating stream of pictures. While the individual edges of a video surface might be rehashed occasionally, the video grouping all in all is never rehashed exactly. Video surfaces can be utilized as a part of place of advanced photographs to imbue a static picture with dynamic qualities and unequivocal action[2]. A novel non-nearby iterative back projection (NLIBP) calculation for picture growth. The iterative back-projection (IBP) method achieve the HR picture introduction and de-obscuring all the while. Its fundamental thought is that the recreated HR picture from the debased LR picture should deliver the same watched LR picture if going it through the same obscuring and down examining process. The IBP system can limit the remaking blunder by iteratively back anticipating the recreation mistake into the reproduced picture. Nonetheless, the IBP procedures frequently create many "jaggy" and "ringing" curios around edges [1]. A video super-determination calculation to add a self-assertive edge in a low determination video succession from in adequately existing high determination key casings. Initial, a

progressive square based movement estimation is performed between an information and low determination key-outlines. In the event that the movement repaid blunder is little, at that point an info low determination fix is transiently super-settled by means of bi-directional covered piece movement pay. Something else, the information fix is spatially super-settled utilizing the lexicon that has been as of now gained from the low determination and its comparing high determination key-outline pair. A SR technique with a particular approach which does not require preparing nor suggests likelihood appropriations. We expect that key casings at a high determination are accessible to help us to super-resolve the video outlines. In this sense, we say our technique is semi super determination (SSR), i.e. we accomplish higher determination with the guide of other high determination pictures. Our SSR age plan can be utilized as a part of uses like video coders with spatial adaptability and even now and again for worldly scalability[3]. A TS-based SR (TS-SR) conspire that up scales a picture by means of surface mind flight. This strategy translates a LR picture as a tiling of unmistakable surfaces and each of which is coordinated to a model fix in a database of applicable surfaces, stretched out from the model based approach. In spite of the fact that TS-SR can recreate fine HR. textural points of interest, the model based TS is tedious, making the SR of entire video through TS-SR computationally exceptionally costly [4]. To accomplish fantastic recreation of HR points of interest for a LR video, we propose a surface union (TS)- based video SR technique, in which a novel DTS plot is proposed to render the reproduced HR points of interest in a transiently cognizant manner, which viably addresses the worldly confusion issue caused by customary TS-based picture SR techniques [5].

III.PROPOSED METHOD

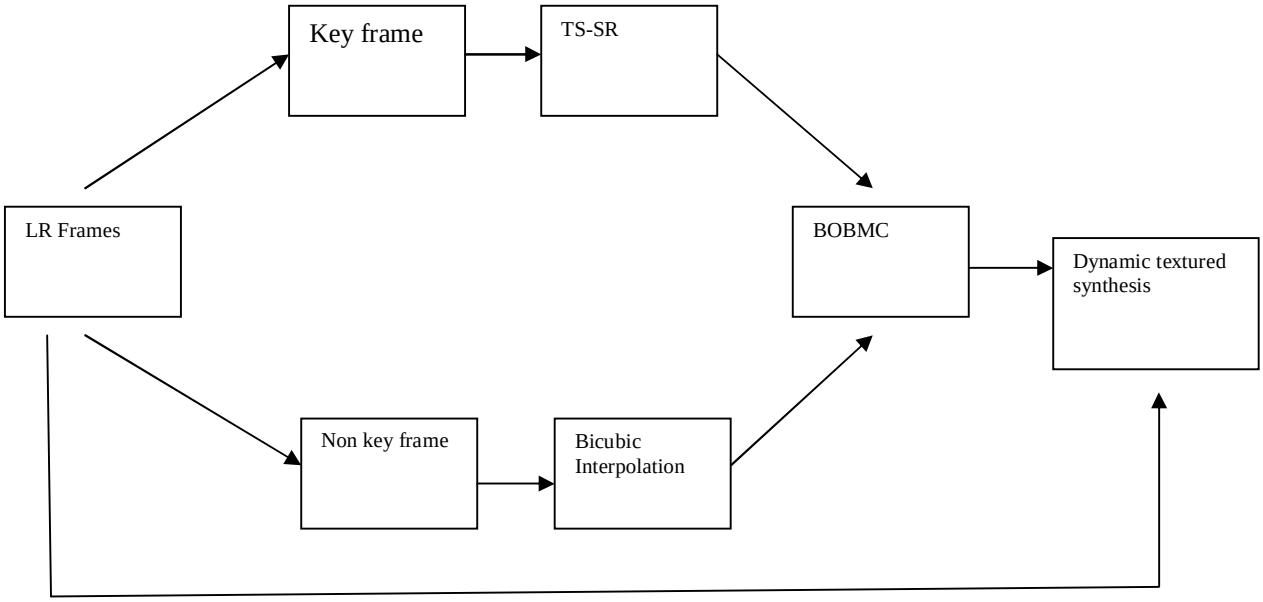

Fig. 1 Block diagram of proposed method

Block diagram of the proposed video super-resolution framework is shown above. The input m Low Resolution (LR) frames are sampled from original LR video with interval. Then, the m LR frames are super-resolved using Texture Synthesis Super-Resolution (TS-SR) technique. Bi-directional Overlapped Block Motion Compensation (BOBMC) is then used to compensate the m SR frames according to the interpolated n LR frames. Finally, the motion compensated n SR frames are rendered using the proposed DTS-SR to obtain the final n SR frames.

A. Texture synthesis

Texture synthesis is the process of algorithmically constructing a large digital image from a small digital sample image by taking advantage of its structural content. Texture synthesis can be used to fill in holes in images, create large non-repetitive background images and expand small pictures

B. Motion compensation

Motion compensation is an algorithmic technique used to predict a frame in a video, given the previous and/or future frames by accounting for motion of the camera and/or objects in the video. It is employed in the encoding of video data for video compression.

Motion compensation describes a picture in terms of the transformation of a reference picture to the current picture. The reference picture may be previous in time or even from the future. When images can be accurately synthesized from previously transmitted/stored images, the compression efficiency can be improved.

C. Dynamic texture synthesis

Dynamic textures are image sequences with visual pattern repetition in time and space, such as smoke, flames, and moving objects and so on. Dynamic texture synthesis is to provide a continuous and infinitely varying stream of images by doing operations on dynamic textures.

D. Bi-cubic interpolation

Bi-cubic interpolation method is somewhat complicated than bilinear interpolation. In bi-cubic interpolation sixteen nearest neighbor of a pixel have been considered. The intensity value assigned to point (x, y) is obtained using the Equation 1,

$$v(x,y) = \sum_{i=0}^{3}\sum_{j=0}^{3} a_{ij}x^i y^j \qquad (1)$$

Where the sixteen coefficients are determined from the sixteen equations in sixteen unknowns that can be written using the sixteen nearest neighbors of point (x,y). Generally, bi-cubic interpolation does a better job of preserving fine detail than its bilinear counterpart. Bi-cubic interpolation is the standard used in commercial image editing programs, such as Adobe Photoshop and Corel Photo-paint. Our plan first partitions the info LR video Frames into key-frames and non-key-frames, with a settled (or dynamic) interim length between two progressive key-frames. Every LR key-frames is upscaled utilizing patch based TS-SR. At that point, individual non-key-frames between two progressive key-frames are first upscaled by bicubic, trailed by BOBMC to additionally interject their HR points of interest from the two stay key-frames. All things considered outlines are upscaled, the proposed DTS-SR is connected to refine the HR points of interest in order to keep up the worldly consistency between neighboring casings in the HR video. The principle commitment of this paper is two-crease: (I) we propose a productive system which can fantasize outwardly fine and satisfying HR textural subtle elements of a LR video in a costefficient way; and (ii) our novel DTS-based SR (DTS-SR) technique can well keep up the transient intelligence in the daydreamed HR video by taking in the surface progression from the info LR video. This issue, to the best of our learning, was not very much concentrated some time recently.

IV. RESULT

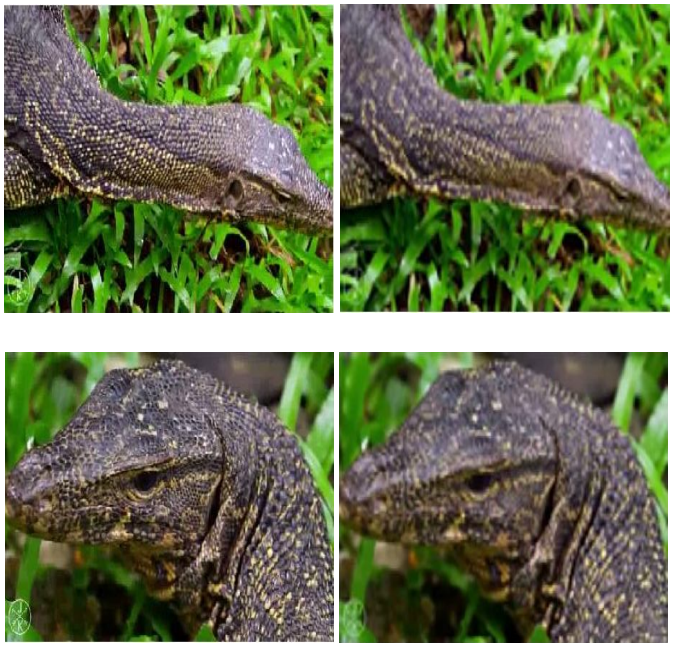

Fig 2.Orignal input image and its corresponding interpolated image

Fig.2 shows the original input image and the output interpolated image. There are various interpolation technique. Interpolation transforms a discrete matrix into a continuous image. It is process of fitting the data with a continuous function and re-samples the function at finer intervals as per need. Hence interpolation is the process by which we estimate an image value at a location in between image pixels. It has been proved that bicubic interpolation gives much superior result.

V. CONCLUSIONS

A Image SR framework via dynamic texture synthesis to effectively enhance the resolution of a LR image while maintaining the temporal coherence of the reconstructed HR image. Bi-directional overlapped block motion compensation method to reconstruct the HR details of each non-key-frame between two successive anchor key-frames. To address the problem of temporal incoherence artifacts, we have proposed a self-learning-based DTS-based refinement scheme to render the upscaled image based on the temporal dynamics learned from the input LR image. Our experimental results demonstrate that the proposed method outperforms the state-of-the-art super resolution methods in terms of visual quality of reconstructed video both subjectively and objectively with reasonable computational complexity.

VI. ACKNOWLEDGMENT

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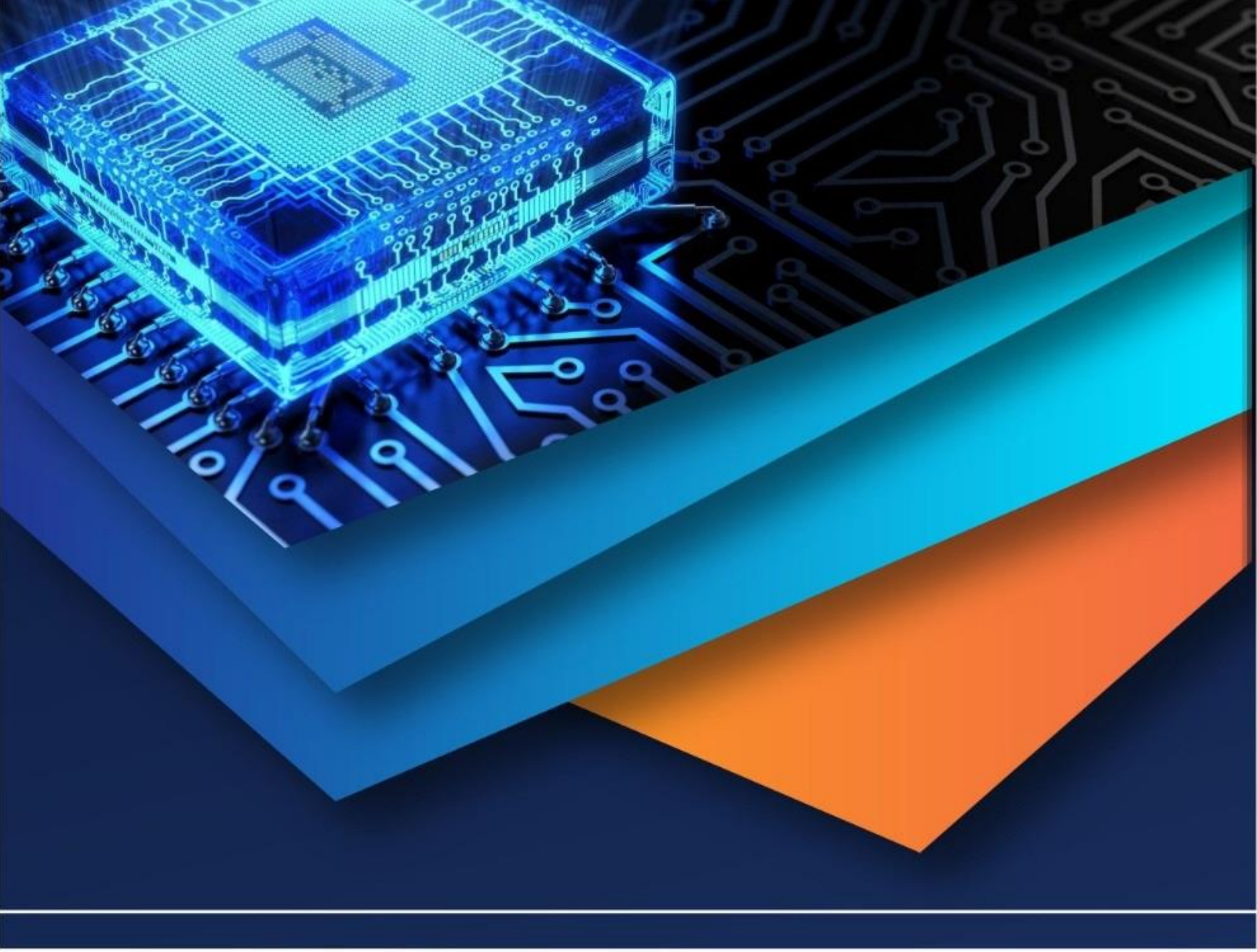

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