# A Review Paper on Video De-Interlacing Multiple Techniques

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***Abstract*—** In this paper present video interlacing de-interlacing and various techniques. Focus on the different techniques of video De-Interlacing that are Intra Field, Inter Field, Motion Adaptive, Motion Compensated De- interlacing and Spatio-Temporal Interpolation. De-Interlaced video use the full resolution of each scan so produced high quality image and remove flicker problem. Techniques are work on the scan line of object Intra Field techniques use pixels of the moving object, Inter Field works on stationary regions of object, Motion Adaptive works on the edge of the Object and Motion Compensation focus video sequence and brightness variation. Advantage of using De-interlacing technique is: Better Moving object image, no flickers and high vertical resolution.

***Keywords*-** *Spatio-Temporal, Interlacing, De-Interlacing, BMA, Motion*

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## I. INTRODUCTION

Video is electronic medium that display broadcast, playback, record of moving visual media. Video combines sequences of images and audio component and transmits a signal to a screen and processes in the order which the screen captures. Video can utilize graphics, picture and text that are use in various purpose as like entertain, education and other more. Video signal are two types that are: Interlaced and progressive.

Interlaced video signal contains two fields of video frame that captured at two different times. Video standards that use interlacing format are NTSC (National Television System Committee), PAL (Phase Alternative Line) and SECAM (Sequential Color Memory) etc. In interlaced video an image is drawn on the screen two separate fields First Field draw the information and second field fills remaining information of video fields. Half image of video appears on the screen at a time the other half of the image follows an instant later (1/60 sec, to be precise). Interlaced video source are shown with i letter that are: 480i, 1080i.

Progressive scan of video signal use for painting an image on screen where both even and odd line of video frame draw at a time in the sequential order. Progressive scan video source are with the p letter as like 480p, 720p etc. Example of progressive scan is CRT (Cathode Ray Tube) and computer monitor. It reduce flickering problem of image.

De- Interlacing is the convertor of video form interlaced format to progressive format. It is way of video image displayed on screen each line of a frame is drawn on screen one after the other line. The Method of displaying video image in contrast to interlaced image that draws all the odd lines after that draw all even lines in two different fields to make complete frame of image. De- interlacing reduce defect of video such as jagged effect, edge flicker, blurring, feathering and higher vertical resolution of the images.

De-Interlacing algorithm can be divided in the various categories that are: Spatial, Temporal, Motion Adaptive and Motion Compensated de- interlacing.

## II. REVIEWS

Soft Computing Techniques to solve video de- interlacing given, Neuro fuzzy logic- based system are able to model uncertainty and subjective concept in a better form than conventional methods. Image features: Motion, Edge and Picture repetition contains various uncertainties. Using the "divide-and-conquer" method algorithms applied on all three key features of Image- Motion, Edge and possible repetition of picture area. After applying fuzzy algorithm for all methods and measure performance of the algorithm, calculate average fuzzy and crisp values. Final Result has show better performance and complexity in areas of the image with small and large motion, with clear and unclear edges [1].

The Motion Compensation (MC) de-interlacing algorithms try to interpolate missing pixels along motion trajectory. MC method provides better result compare to others especially for sequence for large motion. Users have problem in various environment brightness variations such as abrupt illumination changes and camera operation (fade in/ out effects, camera iris adjustment, and camera flashes etc.). To reduce computational complexity give Fast Motion- Compensation algorithm that based on Cross entropy between two histograms of Successive frames [2]. MC methods classified into three parts:

a) Gradient- based approaches
b) Phase-correlation-based techniques and
c) Block Matching algorithm (BMAs).

Motion- Compensation algorithm employs coarse ( global) brightness compensation using decimated DC image and BMA frame classification method using cross entropy to reduce computational complexity [2], obtained results compare with

conventional algorithm in terms of the peak signal-to-noise ratio ( PSNR) and computational complexity. To maintain the PSNR performance video sequence can conations large brightness variation.

To improve subjective video quality and provide better objective video quality in video sequence apply true sub-pixel accurate motion vector algorithm on image key features motion- compensation. MC de-interlacing algorithm are most advanced type of de-interlacing to give accurate motion vectors, achieving best de-interlacing performance, computational complexity and the defects which are caused by erroneous motion vector use true sub-pixel accurate motion vector algorithm. New motion – compensation de-interlacing algorithm use forward, backward and bi-directional motion estimation that have accuracies of ¼ pixel and new strategy for motion vector reliability [3]. Experimental results demonstrate new motion- compensation de-interlacing algorithm that improve subjective video quality, make better objective video, true motion with sub-pixel accuracy.

The edge of an image objects can be identified by features such as area, perimeter, and shape. Edge Detection is important techniques that use in various application of digital image processing such as: medical image analysis, pattern recognition and computer vision. Digital morphology is part of image processing that used in filtering of image and analysis of structural elements. For shape of image apply mathematic operation on image, texture is the repletion of similar pattern in small region to identify the texture apply the unique grey level or color of each pixel. Image edge have uncertainty so with edge can deal using soft computing methods such as neural computing, fuzzy logic, adaptive neuro-fuzzy inference system, Genetic algorithms, Rough set theory and evolutionary computation [4]. Edge Detection techniques using soft computing approaches for hybrid and non-hybrid analysis of image edge.

Edges of an image are the key concept for improving the visual perception, in a nosy image to detect pixel of edge is not simple task so use fuzzy logic that provides mathematical framework to deal with this types of uncertainty. Using the Edge- Adaptive de-interlacing algorithm Edge-based Line Average (ELA) was successfully restoring edges avoiding the staircase effect known as annoying effect of linear spatial algorithm. Original ELA works with the 3+3 pixel from the upper and lower lines, ELA provide well performance when edge direction agree with the minimum difference of the local luminance vales in the neighborhood [5] otherwise error introduce and degrade image quality. Reasons behind accruing error: edges are not clear, image corrupted by noise and high number of details. ELA based 5+5 spatial algorithm offer good trade-off between complexity and performance. Fuzzy-ELA 5+5 Algorithm designed taking linguistically expressed, heuristic knowledge as a point of departure, exploiting the ability of fuzzy logic to cope with symbolic knowledge. To Detect Edge direction proposed two edge-adaptive de-interlacing algorithms using fuzzy logic. Fuzzy-ELA 5+5 H2 algorithms is superior to the other proposed algorithm (in term of quantitative PSNR values and qualitative visual sensation) in both clear and unclear edges.

De-Interlacing is revisited as a problem of assigning a sequence of interpolation methods to a sequence of missing pixel of an interlaced frame. Forward-Backward De-Interlacing algorithm provides transition from one interpolator to another as it moves from one missing pixels position to next one. De-interlacing algorithm use first-order Markov-chain on sequence of interpolator is: the next state depends on the current state. Estimation of the optimum sequence of interpolators requires definition of an efficient cost function for the cost of applying a sequence of interpolators to the corresponding sequence of missing pixels as well as a global optimization technique. Algorithm measure the fitness of an interpolator at a missing pixel, an approximation for transition matrix (TM) of the Markov-chain of the interpolator. In algorithm TM is a frame-variate matrix, the algorithm update TM for each frame automatically. Forward-Backward De-interlacing algorithm used to find the global optimum sequence of interpolators given the cost function defined and neighboring original pixels [6]. To solve estimation problem Forward-Backward algorithm need not to define and adjust any parameter for implementing algorithm.

Motion estimation method is not trivial especially when we do not have all pixels of the frame. Many MC de-interlacing methods suffer from the lack of high-precision motion vectors. Non Local-means (NL- means) is an image processing filter which assigns to each missing pixel a weighted combination of the neighboring pixel [7]. The weights are calculated according to the radiometric distance between the patches around the pixel being interpolated and the pixels in the neighborhood. NL-means technique used in various image processing applications: image de-noising, Video De-interlacing, view interpolation and frame rate up-conversion. Introduce an asymmetric NL-means approach as a solution for de-interlacing where for each missing pixel several patches around it are considered. Methods use to elevates the quality of the de-interlaced frame both PSNR and visual comparison and Varity of video sequences.

Through the image interpolation and super-resolution methods can be generate high quality, high resolution image/video from received low quality and low resolution image/video. There are various technologies of de-interlacing although the motion-compensation method is providing better

quality of the de-interlacing than the other methods. The spatial-domain based method is one of the cost-effective methods for the de-interlacing process. Besides, the up-scaling by super-resolution includes three major processes which are interpolation, de-blurring and de-noising [8]. To convert full HD 1080i video to 8k ultra HD video use two scheme that based on the de-interlacing to up-scaling techniques for spatial Edge-directed interpolation. First: pixel detector classifies the interlaced pixels into five modes, which tend to a smooth pixel, a vertical edge, a horizontal edge, a near horizontal edge, or an uncertain status. Second: de-interlacing scheme is applied to the up-scaling process. Results show that the proposed edge-oriented interpolation scheme provides better subjective results than the existed spatial-domain based methods for video post-processing. Proposed methods are the cost-effective and edge-directed interpolation based method for real-time applications.

## III. CONCLUSION

Video Interlacing is very useful for saving a lot of bandwidth which may help in faster transmission of data and also it provides a lot of clarity for the video frames if processed precisely.

In the above mention papers and the technique they have been using talks about clearing the repeated pixels in a continuation because of the row placing at even odd places. There have been lot of procedures to omit the repeated, the most conventional and the applicable is using the convolution matrix method which can produce better results than the frequency domain based algorithms.

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