VIDEO DEINTERLACING WITH CONTROL GRID INTERPOLATION

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INTRODUCTION

- Video deinterlacing is a key technique in digital video processing, particularly with the widespread usage of LCD and plasma TVs.
- Though interlaced videos conserve transmission bandwidth, they are mainly suited for analog display units
- We propose a novel method switching algorithm to perform video interlacing.

Fig 1. Interlaced Videos

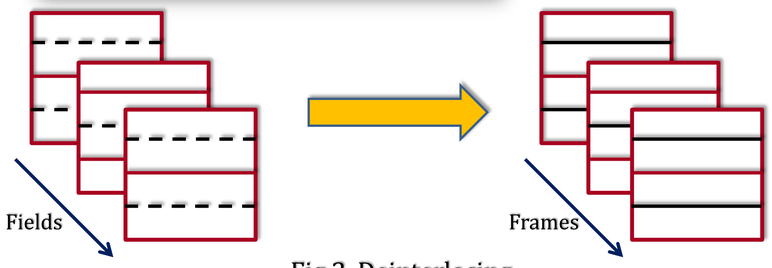

Fig 2. Deinterlacing

RELATED METHODS

- Deinterlacing is a well-studied topic. The last century has seen a lot of deinterlacing algorithms being proposed.

Linear deinterlacers:

a) Weave [1]. b) Line Average.
c) Vertical temporal Filter [2].

- Most Linear deinterlacers produce *serration* effects.

Fig 3. Serration Effects

Non-Linear deinterlacers:

a) Edge-based line average (ELA).
b) Spatio-temporal edge-based median filter [3].
c) Motion compensated video deinterlacing methods like content-adaptive vertical temporal filter [4].

- CAVTF is the one of the latest approaches on deinteralcing and we use CAVTF for benchmarking and comparison purposes. The benchmarking is performed using statistical relevance metric.

PROPOSED APPROACH

The proposed approach uses a method switching procedure, choosing a different interpolator for particular regions of the video. The model is described by the following equation:

$$\widehat{F}_n(i,j) = \begin{cases} F_n(i,j), & (j\ mod 2 = n\ mod 2) \\ \dfrac{F_{n-1}(i,j) + F_{n+1}(i,j)}{2}, & d_n(i,j) < t \\ \sum_m \sum_k F_{n+m}(i, j+k)\, h_m(k), & S_n(i,j) < b;\ d_n(i,j) \geq t \\ 1DCGI(i,j), & (otherwise) \end{cases}$$

In the above equation, each color represents a particular region of a video along with the choice of its interpolator.

Region 1:

- Region 1 interpolates for the static regions of the interlaced video using its temporal neighbors.
- To identify the static regions we find the absolute difference between the previous and current frames and threshold it to 1 bit.
- The interpolator used is the temporal line average.

Region 2:

- This region is characterized by the non-salient and non static regions of the video.
- The saliency map S_n is found using methods similar to those proposed in [5].
- The interpolator used is the spatio-temporal VTF.

Fig 4. Saliency Map for the *Mother* image.

Region 3:

- This region interpolates the salient region of the video using a purely spatial interpolator, the 1DCGI[6].
- 1DCGI estimates displacements α such that,

$$I(x+\alpha, y+1) = \frac{1}{2}[I(x,y) + I(x+2\alpha, y+2)].$$

- Interpolation is now performed along the displacement α.

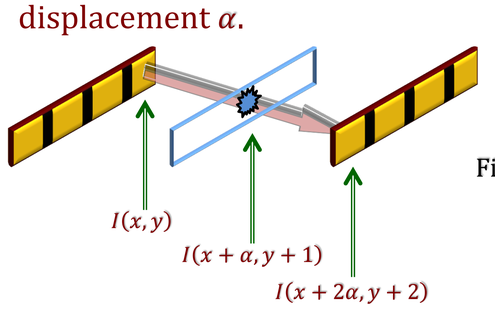

Fig 5. 1DCGI interpolator

EXPERIMENTAL RESULTS

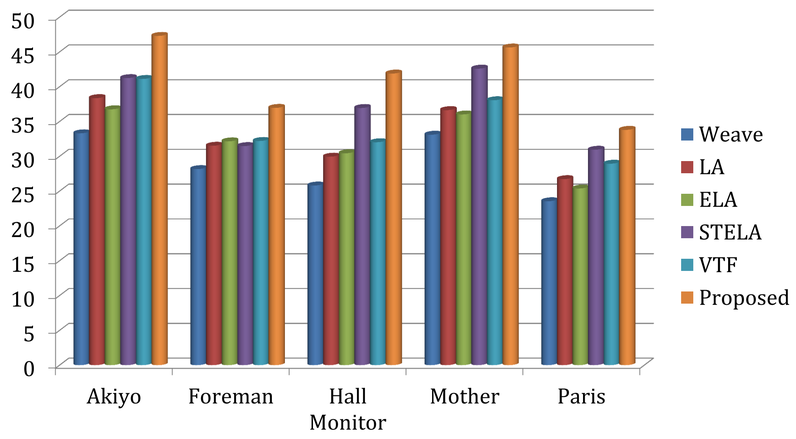

Fig 5. PSNR comparisons

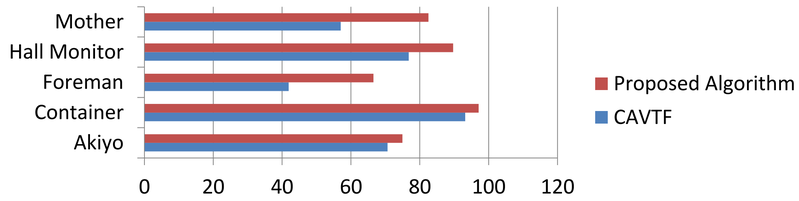

Fig 6. Statistical relevance comparison with CAVTF

Fig 6. STELA vs. Proposed.

CONCLUSION

- A method switching deinterlacing algorithm was proposed that tackles particular regions of a video with different interpolators.
- The results show that the proposed algorithm performs better than the state-of-the-art algorithms both in the PSNR sense and in the visual sense.

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