

# Deinterlacing in Digital Video

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## 1 What is interlace?

When doing experiments on video processing, first of all, we need to import the digital video captured by camera into the computer. Unfortunately, we will always meet “interlacing” problems especially on motion videos, in which, the frames containing motion elements will normally look like Fig 1.

Why is that? First, let’s assume the video is captured in PAL standard, i.e. resolution is  $720 \times 576$  and framerate is 25fps. However, when camera records video, it actually records 50 pictures per second, and each of such picture is called a *field* which only has half of resolution, i.e.  $720 \times 288$ . Every two successive fields are weaved together to get one frame and such process is called *interlace*. Therefore, each frame is formed by two images recorded at two successive time periods, which can be illustrated by Fig 2.

## 2 How to deinterlace?

Here are some common methods to remove the artifacts caused by interlacing. Before going on, please make sure that you have following tools:

**Virtualdub** A free video capture/processing utility for 32-bit Windows platforms (95/98/ME/NT4/2000/XP) [1].

**Avisynth** A free and powerful tool for video post-production [2].

**Smart Deinterlace Filter** A free deinterlace filter for Virtualdub, and the latest version is 2.8 beta1 [3].

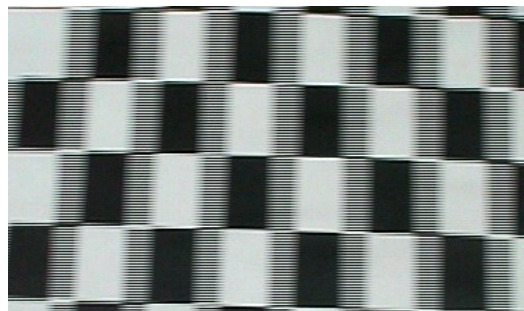


Figure 1: Example of interlacing problem. The image are “weaved” line by line, and the motion elements recorded on the even number lines and odd number lines don’t represent the motion of the same time. Such kind of artifact will seriously decrease the video quality, and meanwhile, heavily affect the experiment result.

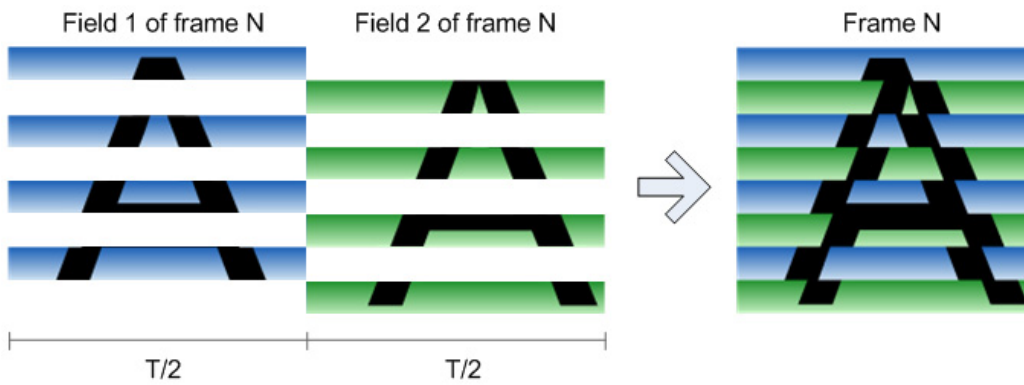
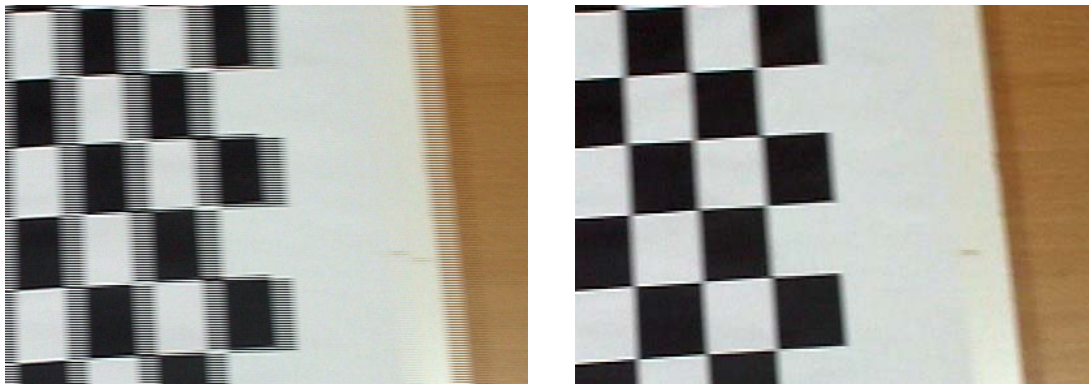


Figure 2: Illustration of interlacing. Here  $T = \frac{1}{\text{frame rate}}$  sec.



(a) Original frame

(b) Deinterlaced by dropping one field

Figure 3: Deinterlacing result of dropping one field

## 2.1 Dropping one field

Dropping one field and resize the remaining field to the full resolution is the most straight forward way. You can do it simply with Virtualdub:

1. Open your video with Virtualdub.
2. Add resize filter: in the main menu, select video → filter → add → resize, choose “nearest neighbor” and resize to  $720 \times 288$ .
3. Don't close the filter window, and add one more resize filter, choose “nearest neighbor” and resize to  $720 \times 576$ .
4. Check the result and export video.

Deinterlaced result is shown in Fig 3

## 2.2 Separating two fields [4]

Dropping one field means you have to lose one field of motion information, i.e. half of vertical resolution. Thus, another intuitive way is to keep all the fields and make each of them a frame, and at last, you will get a video with framerate of 50fps. This time, you need both Virtualdub and Avisynth.

1. Create a short script file as following and name it "example.avs".

```
AVISource("Yourmovie.avi")
separatefields
```

2. Open "example.avs" with Virtualdub, and you will find the fields of the video have been separated and tiled one by one.
3. Add resize filter: in the main menu, select video → filter → add → resize, choose "nearest neighbor" and resize to  $720 \times 576$ .
4. Check the result and export video, note the framerate of the new video should be 50fps.

Deinterlaced result is visually same as the method of dropping one field.

## 2.3 Using Smart Deinterlace Filter

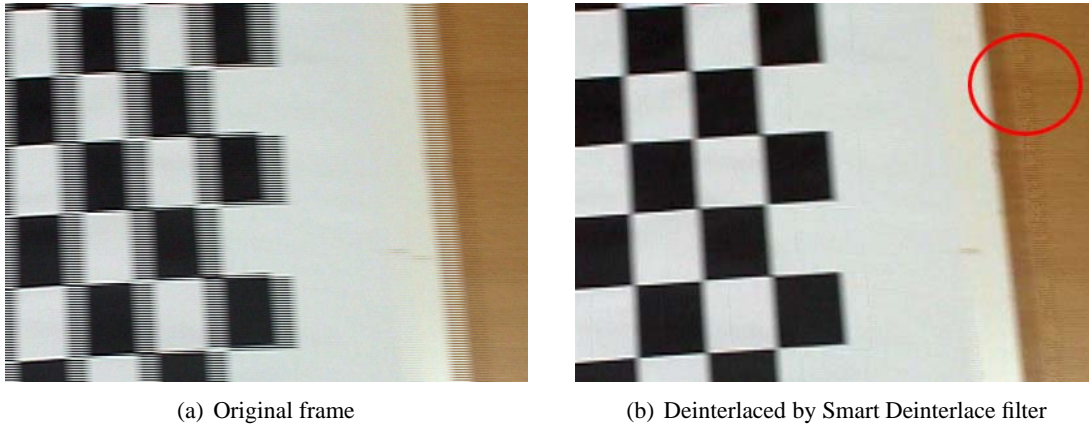
There are also many deinterlace filters, such as Smart Deinterlace filter invented by Donald Graft[3]. The filter interpolates the two fields into one frame, thus the final video has full resolution with 25fps.

1. Download and unzip the Smart Deinterlace filter and copy it to plugin folder of Virtualdub. The latest version of Smart Deinterlace filter is 2.8 beta1.
2. Open your video with Virtualdub.
3. Add Smart Deinterlace filter: in the main menu, select video → filter → add → smart deinterlace, and choose "Linear interpolate".
4. Check the result and export video.

Deinterlace result is shown in Fig 4

## 2.4 Comparison

The pros and cons of these 3 methods are listed in the Table 1.



(a) Original frame

(b) Deinterlaced by Smart Deinterlace filter

Figure 4: Deinterlacing result of Smart Deinterlace filter. Note that in the red circle area, there are some interlaced lines left, i.e. the frame is not fully deinterlaced.

Table 1: COMPARSION OF DEINTERLACING METHODS

Methods	Tools	Pros	Cons
Dropping one field	Virtualdub	<ul style="list-style-type: none"> <li>• Fully deinterlaced.</li> <li>• Video does not need to be converted to fields first.</li> <li>• Simple and fast.</li> </ul>	<ul style="list-style-type: none"> <li>• Losing half of motion information, so the video may not be as fluid as the original one.</li> <li>• Slightly blurred because of scaling in vertical direction.</li> </ul>
Seperating two fields	Virtualdub and Avisynth	<ul style="list-style-type: none"> <li>• Fully deinterlaced.</li> <li>• Very fast.</li> </ul>	<ul style="list-style-type: none"> <li>• Double framerate</li> <li>• Slightly blurred because of scaling in vertical direction.</li> </ul>
Smart Deinterlace filter	Virtualdub and Smart Deinterlace filter	<ul style="list-style-type: none"> <li>• Not losing any motion information</li> <li>• The resolution and framerate remain unchanged.</li> </ul>	<ul style="list-style-type: none"> <li>• Not fully interlaced, some interlaced lines will be left.</li> </ul>

## References

- [1] A. Lee, “<http://www.virtualdub.org>.”
- [2] AVISYNTH, “<http://www.avisynth.org>.”
- [3] D. Graft, “<http://neuron2.net>.”
- [4] 100fps website, “<http://www.100fps.com>.”