Exotic Interlacing

by scharfis_brain

Contents

This text dedicates itself to the Interlacing (and its treatment/removal), which might not arise actually, if films were mastered properly on the PAL format. Fundamental handling AVISynth and basic knowledge is presupposed concerning Interlacing, I on it and/or will not be received only briefly.

Everyone, which worked already times with video on the PC, will have surely noticed that it comes with some video sequences to horizontal strips with moved contents in the video. This is the infamous interlacing effect. I will call these horizontal stripes in the text only combs or referred to as interlacing.

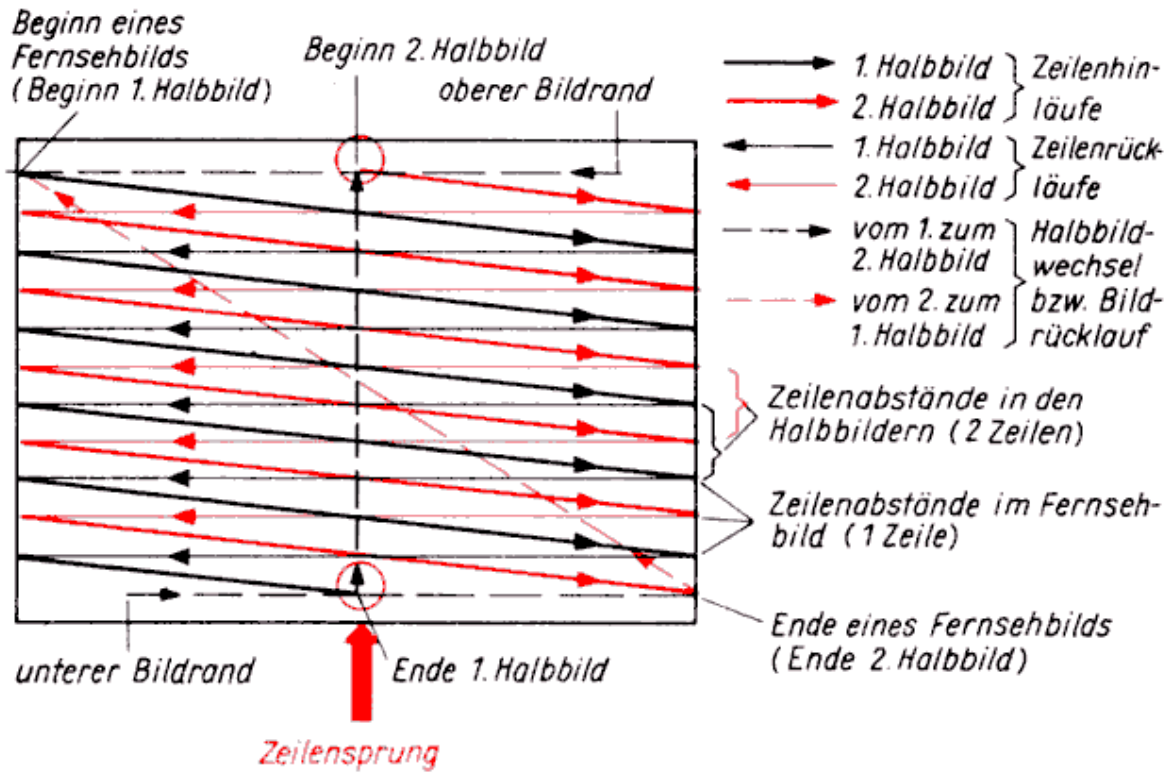
Now, how do these combs develop?

1. Introduction to the structure of video

1.1 Explanation of the field-wise transmission of PAL video

For this we need to know how an analog video is transferred. With the television standard PAL usual in our area, we have a vertical resolution of 576 picture relevant lines. Frame pictures are sent, 25 times per second. Since it would flicker however intolerablly on a television, if one would again-draw the picture only 25 times in the second on the screen completely, to have itself intelligent people in the twenties invented interlaced scanning (Interlacing). With this procedure first the **even-numbered lines** will over-meet picture (thus the **lines 2,4,… 572,576, first/lower field** and/or **Even/Bottom Field**) and only after it the **odd-number lines (1,3,5,…, 573,575, second/upper field** and/or **Odd/Bottom Field**).[1.] Thereby reducing the flicker, as it now has a refresh rate of 50Hz. This one acquires however a resolution reduction in moving areas of the video. For television, this is moving diagonal edges in, they always exhibit a stepping effect. Static image elements, however, have full detail resolution. The interlaced scanning is thus a kind compression.

[1)] As an analog field exactly proves only 575 (instead of the digitized 576) character rows has, contains each field also only 287 and a **half** line. The complete PAL picture has therefore 574 complete lines and per a half line **above (line 1)** and **down (line 576)**. See this picture:



1.2 Explanation of field-wise video recording in a camera (normal Interlacing)

In a video camera not 25 frames per second are taken up, but 50 fields per second, i.e. each field contains another movement condition than the preceding one. Therefore two successive fields are also no longer congruent. If we work on now such a video at the PC, this will at the same time indicate us always two fields, is not congruent there however both fields, due to the different time indices, gives it the well-known combs. In addition a field pattern:

```
Videofield1   0  2  4  6  8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
Mating        ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´, ´,
Videofield2    1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
Time          ----------------------------interlaced------------------------------------>
```

This would be the normal Interlacing, which can be eliminated either through deinterlacing, or better still without deinterlacing then interlaced MPEG is stored, since it comes at no quality loss.

1.3 Explanation of the notations used in this document

This is a typical field representation, as I will quite often use it:

```
Filmframe     A  B  C  D  E            A  B  C  D  E  F  G  H
Videofield1   A  B  B  D  E            A  B BC  D DE F FG GH
Mating        |  |/ ,  ´ /     or       `  |  ,  |  ,  |  ,  ,
Videofield2   A  B  C  E  F            AB B  C  D  E  F  G  H
Time        --p--p--i--i--i-->         -i--p--i--p--i--p--i--i-->
```

Filmframe	marks the individual frames of the original film, BEFORE all conversion.
Videofield1&2	describes the fields of the available video stream. Either • in sequential numbering 0,2,…, 2n for field1 and 1,3,…, 2n+1 for field2 or • with Filmframe notation: Individual letters mark that the field carries only contents of the Film frames. While two consecutive letters a blend, that is a mixture of two Film frames.
Mating	describing the equality of each individual field: | or / refers to 2 fields per frame (typical) |/or |\ points on three fields per Filmframe (happens with NTSC Telecine). , or ´ refers to an abandoned field per Filmframe, is however normal with "genuine" Interlacing, since there are here 50 hfps.
Time	describes the time course. **p** marks a progressive Frame (possible only if equal to two fields one above the other) **i** marks a Interlaced Frame

2. Exotic Interlacing

The exotic Interlacing arises now, if someone wants to convert a film to the PAL format. This procedure is called Telecine. A film has always an image repetition frequency of 24 fps. PAL however has 50 hfps (half frames per second). Now we have several possibilities of converting the film to the PAL format.

2.1 Telecine with PAL Speedup

2.1.1 No Interlacing

The most used and best method is the so-called PAL Speedup. Here the film is accelerated from 24fps to 25fps. Then it is converted to PAL, as always two fields contain the same Film frame. This acceleration has however a small side effect: The pitch changes around almost a half-tone upward. For more complex transformations, this is avoided by a complex procedure. AVISynth has a function TimeStretch, which can make the Speedup/Slowdown

without changing pitch starting from the version 2.5.5.

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
-------------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Mating        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
Videofield2    A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Time          ---------------------------progressive-------------------------------------->
```

This sequence would make the fields 0&1, 2&3, 4&5 be seen on the PC without Interlacing, and thus also only individual Film frames A, B and C.
This video can be treated as problem free progressive.

Imitation in AviSynth:

```
AVISource("24fpsFilm.avi")
AssumeFPS(25, true)
```

Recovery in AVISynth:
- not necessarily!

2.1.2 Telecine with PAL Speedup - Phase shifted

Sometimes however it happens that this field sequence shifts by 1/50 second. The accompanying diagram would look like this:

```
Filmframe       A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
-------------------------------------------------------------------------------------------
Videofield1   *  A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Mating          /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /  /
Videofield2    A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Time          ---------------------------interlaced-------------------------------------->
```

Now we can see, paired fields 0&1, 2&3, 4&5 now split over two different Film frames (A&B, B&C, C&D), since the PC, as descriptive above, which represents fields in each case in this steps, each picture of the film is combed, without the film actually being interlaced, because always two film frames are represented simultaneously. On the TV however, it is in no way noticable.

Imitation in AviSynth:

```
AVISource("24fpsFilm.avi")
AssumeFPS(25, true).DoubleWeave().SelectOdd()
```

This kind of the Telecine is called phase shifted or sometimes also as Perverse Telecine and can be repaired by AVISynth quite simply, by sorting the fields again:

Recovery in AviSynth:

```
DoubleWeave().SelectOdd()
```

2.1.3 Telecine with PAL Speedup - dynamic phase SHIFT

It also sometimes happens that normal Telecine, and perverse Telecine, alternate (like e.g. the Independence Day - DVD). This could no longer be repaired by the DoubleWeave().SelectOdd(), fix (since the normal Telecine sections will become perverse Telecine). Here only an automatic solution can help, in the form of Telecide from Donald Grafts Decomb package:

```
Telecide(order=1, guide=2, post=0)
```

Telecide() scans the video for similar fields and adds these together (provides correct collating of the fields), so that the video becomes progressive again.

2.2 Telecine without PAL Speedup

2.2.1 Without Blending

2.2.1a Progressive

Here the film is not accelerated to 25fps, but each second a single film picture is shown twice (or two fields twice):

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y
-------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  X  Y
Mating        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
Videofield2    A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  X  Y
Time          ---------------------------progressive---------------------------------------->
```

red = dupes

The 24th Film picture is shown again and 4x, in the fields 46 to 49, however, this process leads to stuttering second by second.

Imitation in AVISynth:

```
AVISource("24fpsFilm.avi")
ChangeFPS(25)
```

or

```
AVISource("24fpsFilm.avi")
SelectEvery(24,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,23)
```

Recovery in AviSynth:

```
Decimate(25)
```

The double pictures can be removed with Decimate (x) from the Decomb package. Decimate looks for the doubled picture for double frames in the video and removes duplicate X pictures. The resulting video has then a Framerate of 24fps, exactly that of film.

2.2.1b Interlaced

In order to reduce the 'stutter' which develops with 2.2.1a, one inserts not a frame every second, but twice per second a field. That leads however to the fact that one gets every 12 Filmframes, a phase shift (and a little stutter):

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y
-------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  F  G  H  I  J  K  L  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y
Mating         |  |  |  |  |  |  |  |  |  |  |  |/  /  /  /  /  /  /  /  /  /  /  /  /|  |
Videofield2    A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  X  Y
Time          ----------progressive-------------|----------------interlaced-- ------|--p--->
```

red = dupes

The video is thus alternating, 13 Frames long progressive and then 12 Frames interlaced.

Imitation in AVISynth:

```
AVISource("24fpsFilm.avi")
ChangeFPS(50).SeparateFields().SelectEvery(4,0,3).Weave()
```

Recovery in AVISynth:
First the phase SHIFT must be eliminated. We again use:-

```
Telecide(order=1, guide=2, post=0)
```

By Telecide() one receives a video, like in 2.2.1a., which then by means of

```
Decimate(25)
```

is brought back to 24fps.

2.2.2 Telecine without PAL Speedup - with blending - interlaced

This is one of the cruel methods to transfer film to PAL. Here fields, which are not exactly temporally under a Filmframe, from the temporally neighbouring film pictures are mixed (blending). The sequence could look in such a way (depending upon converter somewhat differently):

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
-------------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  F  G  H  I  J  K  L LM MN NO OI PQ QR RS ST TU UV VW WX XY Y  Z
Mating        ´  ´  ´  ´  ´  ´  ´  ´  ´  ´  ´  ´  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ´  ´
Videofield2    AB BC CD DE EF FG GH HI IJ JK KL LM M  N  O  P  Q  R  S  T  U  V  W  X XY YZ
Time          ----------------------------interlaced---------------------------------------->
```

The bold marked fields are intact fields, whose contents correspond to that of individual FilmFrames. The other fields are blends, i.e. their contents consist of the mixture of two neighbouring Filmframes.

Imitation in AviSynth:

```
AVISource("24fpsFilm.avi")
ConvertFPS(50).SeparateFields().SelectEvery(4,0,3).Weave()
```

Recovery in AVISynth:
On a TV, such Telecine is hardly noticeable. On a PC however one has in nearly every Frame interlacing. Also, there is no standard method such as Telecide to eliminate the interlacing, as the adjacent fields are not similar. You could deinterlace the video to tackle the interlacing, but that would make more than half of the frames blends too, as in:

```
FieldDeinterlace(order=1, blend=false)
```

I found a solution that can possibly be helpful:
First one must deinterlace the video with a Fullframerate Deinterlacer, such as e.g. DGBob, Kernelbob or TMCkernelBob to 50 fps. Afterwards you must select the intact fields using Unblendpattern. This presupposes however that the sequence exhibits a constant pattern. Also no Framedrops may be in the video, this would also shift the blend pattern.

```
KernelBob(4)
UnblendPattern(offset, 24, false, false)
```

2.3 Standards Converted Film Material

2.3.1 Explanation of the NTSC Telecine by 3:2 Pulldown

In order to bring a film to NTSC (60 hfps), one cannot submit it to speedup of 24 to 30 fps, which would be very noticeable. Instead, we show the film frames in alternating 2x and 3x, as the sequence shows:

```
Filmframe     A   B   C  D   E   F   G  H   I   J  K
Videofield1   A  B  B  C  D  E  F  F  G  H  I  J  J  K
Mating         |  |/  /  /|   |  |/  /  /|   |  |/  /
Videofield2    A  B  C  D  D  E  F  G  H  H  I  J  K  L
Time        --p--p--i--i--p--p--p--i--i--p--p--p--i--i->
```

Or a slightly different presentation style:

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Videofields   0  2  5  7 10 12 15 17 20 22 25 27 30 32 35 37 40 42 45 47 50 52 55 57 60 62
              1  3  6  8 11 13 16 18 21 23 26 28 31 33 36 38 41 43 46 48 51 53 56 58 61 63
                 4     9    14    19    24    29    34    39    44    49    54    59    64
Time         ------------------------------------------------------------------------------>
```

This results in persistent 'bucking', which is noticable but not too annoying.

Imitation in AviSynth:

```
AVISource("24fpsFilm.avi")
SelectEvery(2,0,0,0,1,1).SeparateFields().SelectEvery(4,1,2).Weave()
```

One can undo the 3:2 Pulldown as follows by AVISynth and the Decomb package:

```
Telecide(order=1, post=0)
Decimate(5)
```

This procedure is called *inverse Telecine* (IVTC)

2.3.2 Standards Converted Film Material - without Blending

This is the simplest, cheapest and worst method to accomplish a norm conversion. Here the video is brought first with a Fullframerate Deinterlacer to 60 fps and then each 6th picture is removed. That leads to completely intolerable 10 cycles per second jerk and with Filmmaterial to the following sequence:

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Videoframes   0  2  x  7 10 12 15  x 20 22 25 27 30 32  x 37 40 42 45  x 50 52 55 57 60 62
              1  3  6  8  x 13 16 18 21  x 26 28 31 33 36 38  x 43 46 48 51  x 56 58 61 63
                 4     9    14    19    24     x    34    39    44    49    54     x    64
Time         ------------------------------------------------------------------------------>
```

x - deleted pictures

Afterwards the frames are reduced again to field size.

The resulting PAL - sequence:

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Videofields   0  2  5  6  9 10 13 15 17 19 21 23 25 27 30 31 34 35 38 40 42 44 46 48 50 52
              1  3     7    11 14 16 18 20 22 24 26 28    32    36 39 41 43 45 47 49 51 53
                 4     8    12                      29    33    37                      54
Time         ------------------------------------------------------------------------------>
```

or in field sequence:

```
Filmframe     A  B  C  D  E   F  G  H  I  J  K  L  M  N  O  P  Q  R   S  T  U  V  W  X  Y  Z
Videofield1   0  2  4  6  8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 49 51 53
Mating        |  |/ ,  |/ ,  |/  /  /  /  /  /  /  /  /|  ` /|  ` /|  |  |  |  |  |  |  |  |
Videofield2   1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 48 50 52 54
Time         --p--p--i--p--i--p--i--i--i--i--i--i--i--i--p--i--p--i--p--p--p--p--p--p--p--p>
(` and , identify orphaned, but image-related fields)
```

As you can see, you have a nice mess in the image sequence. Seven (G-M) and six (S-Y) frames are complete with two fields isolated forever. But then a consequence comes of five Frames, from which three (BDF) Frames of three fields each and two (CE) Frames consist of only one field.

Imitation in AviSynth:

```
AVISource("30fpsTelecinedFilm.avi")
DGBob(order=1).Changefps(50).Separatefields().Selectevery(4,0,3).Weave()
# Or
DGBob(order=1).Selectevery(6,0,1,2,3,4)
Separatefields().Selectevery(4,0,3).Weave()
```

Recovery in AviSynth:
With Telecide one cannot unfortunately begin with such Stream nothing at all, there Telecide the abandoned fields simply “swallows”, i.e. from the preceding three-fold field 2 frames (4 fields) become.

At present however one can do quite well with

```
SmartDecimate(24,50, tel=0.9)
```

Gentleman become…
However there are and again at times jerks, if SmartDecimate() does not correctly recognize the abandoned fields (B, C, O, Q) **[Should this not read (C,E,O,Q)]**.

2.3.3 Standards Converted Film Material - with Blending

Here from that, on Fullframrate deinterlaced, video is not simply deleted each 6th picture, but the pictures are reduced over a weighted Blending (to mix) of 60fps to 50fps:

Blending in general:

```
NTSC Field       1     2     3     4     5     6     7     8     9    10    11    12    13
                 |     |    / \   / \   / \    |     |     |    / \   / \   / \    |     |
Weighting in %  100   75  25  60 40 40 60  25  75   100   75  25  60 40 40 60  25  75    100
                 |      \/     |/     \|     \ /     |      \/     |/     \|     \ /      |
PAL - Field      1      2      3       4      5      6      7      8       9     10      11
Time             ------------------------------------------------------------------------>
```

Blending with Telecined film:

```
NTSC Field       A     A     B     B     B     C     C     D     D     D     E     E     F
                 |     |    / \   / \   / \    |     |     |    / \   / \   / \    |     |
Priority in %   100   75  25  60 40 40 60  25  75   100   75  25  60 40 40 60  25  75    100
                 |      \/     |/     \|     \ /     |      \/     |/     \|     \ /      |
PAL - Field      A      AB     B       B     CB     C      D      D      DE     E       F
Time             ------------------------------------------------------------------------>
```

For a full second:

(One above the other letters feature a blend)

```
NTSC : AABBBCCDDDEEFFFGGHHHIIJJJKKLLLMMNNNOOPPPQQRRRSSTTTUUVVVWWXXXYYZZZ
PAL  : A ABBBC DDDEF FFGGH HIIJJ KKLLM MNNNO PPPQR RRSST TUUVV WWXXY YZZ
         B  C    E    G H  I J    L    N  O    Q    S T  U V    X    Z
```

In field notation:

```
Filmframe   A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Videofield1 A  B  BC D  DE F  FG GH HI IJ J  KL L  MN N  O  P  Q  R  S  T  U  V  W  X  Y  Z
Mating      `  |  ,  |  ,  |  ,  ,  ,    /,    /,    /  `  /  `  /  `  `  `  |  `  |  `  |
Videofield2 AB B  C  D  E  F  G  H  I  J  K  L  M  N  NO P  PQ R  RS ST DO UV V  WX X  YZ Z
```

This is only a theoretical Pattern, since during a genuine conversion between 59.94fps and 50fps must be changed. Thus the Pattern all 1000 NTSC Frames and it shifts gives more blended fields than this example shows. Nevertheless, this example should show how bad such a standard conversion effect on film!

Imitation in AviSynth:

```
AVISource("24fpsFilm.avi")
SelectEvery(2,0,0,0,1,1).SeparateFields().SelectEvery(4,1,2).Weave()
DGBob(order=1).ConvertFPS(50).SeparateFields.SelectEvery(4,0,3).Weave()
```

Recovery in AviSynth:
If one tries to deinterlace such a video , one has 2 problems, depending upon Deinterlacer:

1. It shakes 1x unbearably per second. This happens when a deinterlacer in, interpolate' deinterlaced mode. FieldDeinterlace(blend=false)
2. No shakes, but almost all frames are blends. This occurs when the deinterlacer field blends: FieldDeinterlace(blend = true)

There are no real solution, but several solutions:

1. Restore24 von Dideé use:

```
AVISource("normwandel.avi")
restore24()
```

2. Kernelbob, Unblend and Smartdecimate, the most basic version of restore24:

```
AVISource("normwandel.avi")
KernelBob(4)
Unblend()
SmartDecimate(24,100)
```

3. Unblendpattern use. But makes sense only if the video does not have too many offset leaps. StarTrek or the like would be hard to restore, the effort would simply be too large:

```
AVISource("normwandel.avi")
KernelBob(4)
UnblendPattern(offset, 24, false, false)
```

2.3.4 How a correct NTSC-->PAL - Conversion should look

A "good" standards conversion should submit the film parts of a video inverse Telecine (IVTC, chapter 2.3.1.). The IVTC re-establishes the original 24fps files. Then the entire video will become on 62.5 fps accelerated and then the IVTC'ed part WITHOUT Blending to 25 fps accelerated and only the video parts by Blending to 50hfps converted. This avoids in the previous section treated problems.

The AVISynth function converter.avs controls this kind of the norm conversion. Alternatively with or without Speedup. Film parts however are converted in each case without Blending .

2.4 What the TV-Stations Still have in Store

Here land all other abuses, to which film Streams can fall victim.

2.4.1 Speedup of 25fps on 26fps, in order to be able to show more advertisement

Some time ago BaronVlad had a interlacing problem with a film, which ran on Sat.1. After some (remote) analyses, which degenerated into confusion, I received a sample from him. After detailed analysis I was shocked. I found 26, in words: twenty-six, film pictures per second in 50 fields per second, the remaining 24 fields were blended:

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L M  N  O  P  Q  R  S  T  U  V  W  X Y  Z
-------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  F  G  H  I  J  K  L  MN NO OP PQ QR RS ST TU UV VW WX  Y  Z
Mating n.mö.  ´  ´  ´  ´  ´  ´  ´  ´  ´  ´  ´  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ´  ´
Videofield2    AB BC CD DE EF FG GH HI IJ JK KL  M  N  O  P  Q  R  S  T  U  V  W  X  YZ  ZA
Time          ----------------------------interlaced---------------------------------------->
```

This Stream caused me to write Unblendpattern() with which the baron got this clip successfully progressive again. Sat.1 accelerated this (over 2 hour long) film from already 25fps (PAL Speedup) to 26fps, which permitted probably still another further advertising block all in all of some minutes of duration.

2.4.2 Slow-down of 25fps to 22.5 fps Cuts moderate amounts of time to hide censorship

This I have seen with one sample of the channel Pro7 Ashyak. Slow Down Here, fortunately, was carried out without blending, so that a duplicate has all 10 images. This pattern is similar to 2.2.1b , except that the triples more often occur during this process:

```
Filmframe     A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X
-------------------------------------------------------------------------------------
Videofield1   A  B  C  D  E  E  F  G  H  I  J  K  L  M  N  O  O  P  Q  R  S  T  U  V  W  X
Mating        |  |  |  |  | /  /  /  /  /  /|  |  |  |  |  | /  /  /  /|  |  |  |  |  |
Videofield2    A  B  C  D  E  F  G  H  I  J  J  K  L  M  N  O  P  Q  R  S  T  T  U  V  W  X
Time          -p--p--p--p--p--i--i--i--i--p--p--p--p--p--p--i--i--i--i--p--p--p--p--p--p-->
```

red = Tripel

In principle Telecide(post=0).Decimate(10) would have helped. Since the film does not supposed-prove however durchgänging with 22.5 fps ran, one would have had to analyze it scene by scene.

3. Concluding remarks, Acknowledgements

Well, got a Headache? Aspirin helps!
I should hereby actually have discussed nearly all film abuses. Should find you nevertheless something, that is not covered by my explanations, post your problem to http://forum.gleitz.info!

More on my functions here:

kernelbob & unblendpattern	http://forum.doom9.org/showthread.php?s=&threadid=66093&
converter.avs	http://forum.doom9.org/showthread.php?s=&threadid=67161&

Thankyou to all, who sent sample clips to me:

BaronVlad	26fps Speedup
Ashyak	22.5fps Slowdown and standards conversion without blending
i4004/ivo	telecine with no PAL Speedup blending
Manono	NTSC-blended various clips
The Karl	star trek **is** a standard conversion! and woe to you, if you argue with me again! ;-)
Dogleg	
Encod3r	
kortduorsch	Anime standards conversion
narler	dynamic phase SHIFT
wim	
zeronegative	
zisoft	for the HTML conversion

and many more that dont come to mind.

4. Appendix

4.1 AviSynth Script to simulation the effects

The following AviSynth Script produces a video sequence, with which the discussed effects can be simulated:

```
src=BlankClip(1,256,384,"RGB24",24)
```

```
rot=$FF0000
gruen=$00FF00
blau=$0000FF
gelb=$FFFF00
lila=$FF00FF
tuerkis=$00FFFF
gr=320
off=48
A=src.SubTitle("A",size=gr,text_color=rot)
B=src.SubTitle("B",x=off,size=gr,text_color=gruen)
C=src.SubTitle("C",size=gr,text_color=blau)
D=src.SubTitle("D",x=off,size=gr,text_color=gelb)
E=src.SubTitle("E",size=gr,text_color=lila)
F=src.SubTitle("F",x=off,size=gr,text_color=tuerkis)
G=src.SubTitle("G",size=gr,text_color=rot)
H=src.SubTitle("H",x=off,size=gr,text_color=gruen)
I=src.SubTitle("I",size=gr,text_color=blau)
J=src.SubTitle("J",x=off,size=gr,text_color=gelb)
K=src.SubTitle("K",size=gr,text_color=lila)
L=src.SubTitle("L",x=off,size=gr,text_color=tuerkis)
M=src.SubTitle("M",size=gr,text_color=rot)
N=src.SubTitle("N",x=off,size=gr,text_color=gruen)
O=src.SubTitle("O",size=gr,text_color=blau)
P=src.SubTitle("P",x=off,size=gr,text_color=gelb)
Q=src.SubTitle("Q",size=gr,text_color=lila)
R=src.SubTitle("R",x=off,size=gr,text_color=tuerkis)
S=src.SubTitle("S",size=gr,text_color=rot)
T=src.SubTitle("T",x=off,size=gr,text_color=gruen)
U=src.SubTitle("U",size=gr,text_color=blau)
V=src.SubTitle("V",x=off,size=gr,text_color=gelb)
W=src.SubTitle("W",size=gr,text_color=lila)
X=src.SubTitle("X",x=off,size=gr,text_color=tuerkis)
Y=src.SubTitle("Y",size=gr,text_color=rot)
Z=src.SubTitle("Z",x=off,size=gr,text_color=gruen)

res=a+b+c+d+e+f+g+h+i+j+k+l+m+n+o+p+q+r+s+t+u+v+w+x+y+z

res=res.crop(0,88,0,-40)

res+res+res+res+res
```