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Q1: How to display digital video designed for TV industry on a computer screen with best quality? (Hint: computer display is 4:3, 1280x1024, 72 Hz, progressive.)

Ans:

Supposing the digital TV display is 4:3 640x480, 60Hz, we can use **temporal interpolation** to up-sample the video become 4:3 640x480, 72Hz (If the original frequency is less than 36 we can try using interlance first), then using **spatial interpolation** to up-sample the video become 4:3 1280x1024, 72 Hz.

As for **temporal** and **spatial interpolation** we can use the following method.

Temporal Interpolation:

We can use the original n frames to generate n-1 frames by interpolate every continuous frames the formula can be like $F_{k+1} = \frac{1}{2}F_k + \frac{1}{2}F_{k+2}$, F_{k+1} is the result from the two continuous frams. Than use uniform sampling from the total frams to fit 72Hz. Go one step further, we can consider motion effect to make the interpolation more robust for high motivation parts.

Spatial Interpolation

After the procedure temporal interpolation, the other thing left is spatial interpolation which up-samples all 640x480 frames by a factor of 2 to 1024x768. But in this way might loss some details, so we can up-sampled to a higher factor then down-sample to 1024x768. For example, first up-sample to a factor to 6400x4800 then down-sample to 1024x768. In this way might keep some details (rely on a good up-sampling algorithm).