Additional constraints for pipe-lining/buffering

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1 Additional constraint idea

To be able to pipeline the stabilization procedure so that the input video is received and its stabilization version displayed with a fixed time lag, we need to buffer incoming video frames while we process a set of frames (let us say 50 frames) that came just before it. Once the stabilization parameters have been computed for the current set of frames, we want to move onto processing the next set of frames in a manner consistent with the previous bunch.
Consistency can be achieved by adding the residuals (effectively derivatives) between the first 2 frames of the new bunch and the last 2 frames of the previous bunch. That is, the usual objective looks like,

Objective

$$\min_{\{B_t\}_1^n} w_1|D(P)|_1 + w_2|D^2(P)|_1 + w_3|D^3(P)|_1. \tag{1}$$

$$|D(P)| = \sum_t |R_t| \tag{2}$$

$$|D^2(P)| = \sum_t |R_{t+1} - R_t| \tag{3}$$

$$|D^3(P)| = \sum_t |R_{t+2} - 2R_{t+1} + R_t|. \tag{4}$$

Where D is the derivative operator and w_1, w_2 and w_3 are scalar weights chosen by the programmer and n, is the number of time steps.
Using the relation **??** and the definition of the first discrete derivative $|D(P)| = \sum_t |P_{t+1} - P_t|$, and assuming that we wish to minimize the sum of the derivatives of every component of P_t, we can derive the following relations -

$$|D(P)| = \sum_t |R_t| \tag{5}$$

$$|D^2(P)| = \sum_t |R_{t+1} - R_t| \tag{6}$$

$$|D^3(P)| = \sum_t |R_{t+2} - 2R_{t+1} + R_t|. \tag{7}$$

Where R_t is the residual defined by

$$R_t = F_{t+1}B_{t+1} - B_t. \tag{8}$$

So for the i^{th} window/bunch/collection of frames, if the size of one window or collection were W the objective would look like

Objective

$$\min_{\{B_t\}_{t=W(i-1)+1}^{W*i}} w_1(|D(P)|_1+r_1)+w_2(|D^2(P)|_1+r_2-r_1)+w_3(|D^3(P)|_1+r_3-2r_2+r_1) \tag{9}$$

Where, d_1, d_2 and d_3 are the 1st, 2nd and 3rd derivative at time step $t = W(i-1)+1$. These are computed from respectively the first, second and third residuals at $t = W(i-1)+1$. The residuals in turn are computed using the pre-computed parameter vectors $b_{W(i-1)}$, $b_{W(i-1)-1}$ and $b_{W(i-1)-2}$ from the previously processed W window of frames. The first second and third residuals can then be used to obtain the derivatives d_1, d_2 and d_3.