

Filtering Operations

Version 1.0

This module (Figure 1) includes several spatiotemporal video filtering operations. All the operations are supported by the CameraIO Module and applied either in one channel (in case of single channel (grayscale) video streams or on all three channels of a color video stream.

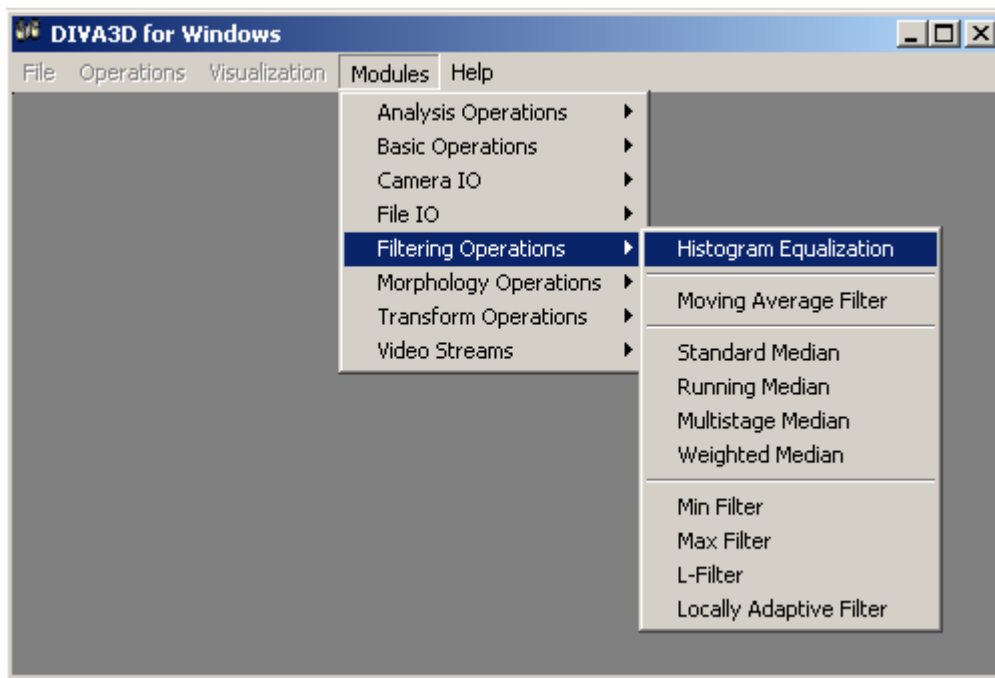


Figure 1: A view of the Filtering Operations module.

- **Histogram Equalization:** Performs histogram equalization of a video stream. The histogram used for the equalization is not the histogram of the entire video stream but the histogram of the current block in the video buffer. (The histogram used is calculated for each block of frames). The user selects the input video stream through the *Video Streams* dialog box and a file to store the output video stream. This operation is supported by the CameraIO Module.
- **Moving Average Filter:** Performs filtering of a video stream using the moving average filter. The user first selects the input video stream and then a dialog box appears for setting the dimensions of the 3D window mask through the *Filter Window Dimensions* dialog box. Finally, the user selects a file to store the output video stream.

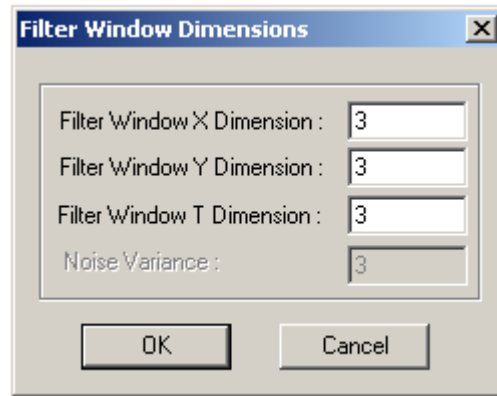


Figure 2: Filter Window Dimensions Dialog Box.

- **Standard Median:** It implements the standard spatiotemporal (3D) median filter. The same procedure as in Moving Average Filter is followed.
- **Running Median:** Performs filtering of a video stream using a faster implementation (running) of the spatiotemporal (3D) median filter. The same procedure as in Moving Average Filter is followed. .
- **Multistage Median:** Performs filtering of a video stream using the multistage implementation of the spatiotemporal (3D) median filter. The same procedure as in Moving Average Filter is followed, with the difference that only one parameter is given for the 3D window size, as it can only be cubic.
- **Weighted Median:** Performs filtering of a video stream using the weighted median implementation of the spatiotemporal median filter. The user first selects the input video stream. The user is prompted to select a *.par file containing the weights. If this *.par file follows a set of rules, DIVA3D will automatically create a binary video stream buffer containing the structuring element data from the file. These rules are : The overall number of the weights inside the file should be a cubic power of an integer (e.g. $3 \times 3 \times 3 = 27$, $5 \times 5 \times 5 = 125$) depending on the filter's window dimension ($3 \times 3 \times 3$, $5 \times 5 \times 5$ and so on) and each weight should be followed by a coma (,) operator, as shown in Figure 15. The structuring element coefficients $h(i,j,k)$, $i = 1, \dots, N$, $j = \dots, N$ and $k = 1, \dots, N$ are written in a row-wise manner. The coordinates i, j, k correspond to video coordinates x, y, t . Each line contains one row of N coefficients $h(i,j,k)$, $i = 1, \dots, N$ for fixed j, k . Therefore the coefficients are written in a row-wise and then frame-wise manner.

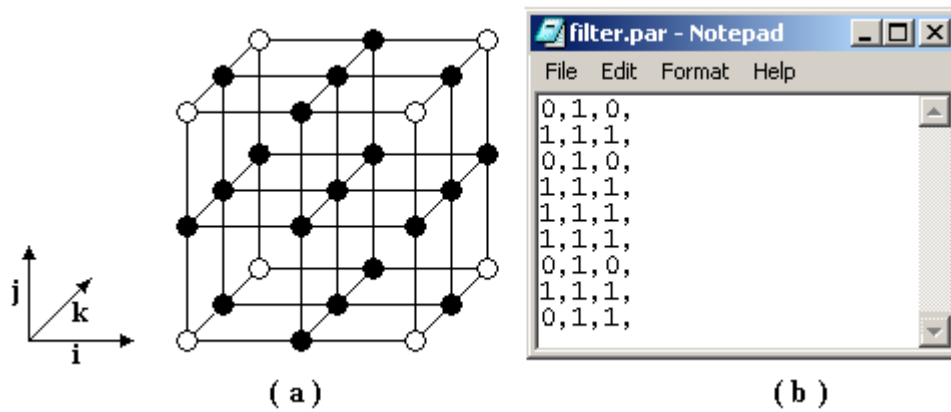


Figure 15: Filter window (a) and its implementation on a *.par file (b)

- **Min Filter:** Performs filtering of a video stream using the spatiotemporal (3D) minimum filter. The same procedure as in Moving Average Filter is followed.
- **Max Filter:** Performs filtering of a video stream using the spatiotemporal maximum filter. The same procedure as in Moving Average Filter is followed.
- **Locally Adaptive Filter:** Performs locally adaptive filtering of a video stream, i.e. the filtering depends on the local video content. The user selects the input video stream and a file to store the output video stream.