Basic Operations
Version 1.0

This module corresponds to various 3D processing operations of video streams. In most cases, the functions require an input video stream, selected through the *Video Streams* dialog box, and possibly some related input parameters, given through additional dialog boxes. In case the user selects to use an output file to store the outcome of the video operation,(see Video Stream dialog box in 4.2.1) he/she will be prompted with a typical *Save As…* dialog box to select a file to store the output video stream. Processing is performed only within the volume of interest (VOI) that is uniquely specified for each input video stream either through the DIVA3D Player window or through the Video Stream dialog box. The menu items are described in detail below and a view of the Basic Operations menu can be seen in Figure 1. Unless otherwise stated the operations are applied either in one channel (in case of single channel (grayscale) video streams or on all three channels of a color video stream.

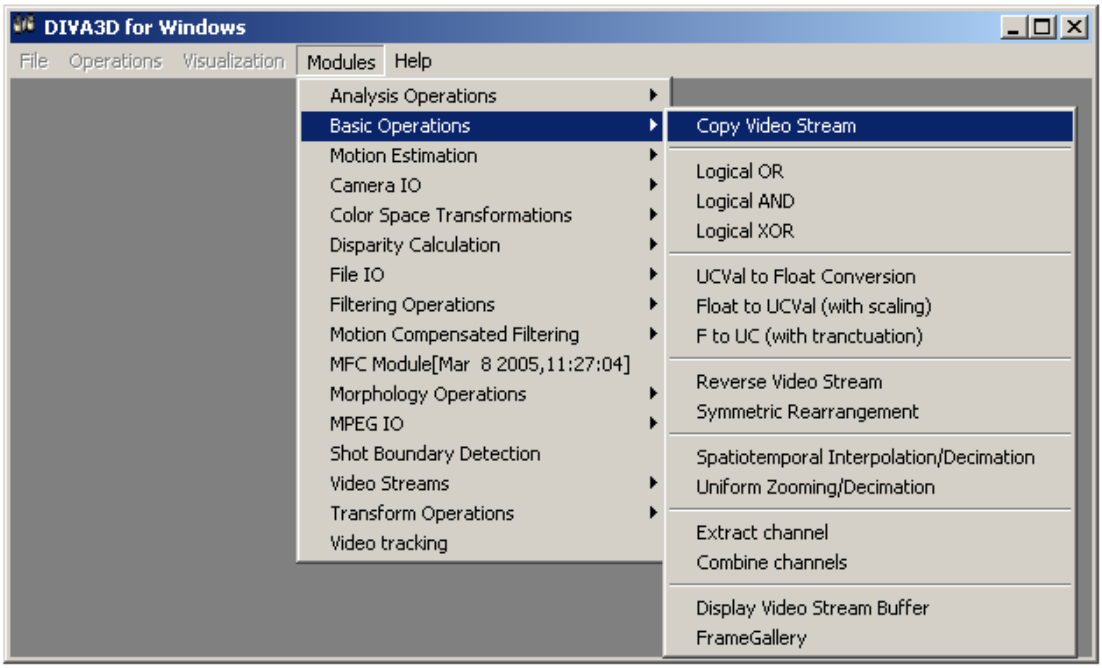

Figure 1: A view of the Basic Operations submenu.

- **Copy Video Stream:** Copies a VOI of a video stream to a newly created video stream. The user first selects the input video stream through the *Video Stream* dialog box and then a file to store the output video stream. VOI of interest has no meaning in this operation once it actually creates a copy of the selected video stream's video file. This operation is not supported by the CameraIO Module.

- **Logical AND:** Performs the bit-wise AND logical operator between two binary video streams. Binary video streams are streams containing only two pixel values: 255 and 0. They can be either 8bit or 24 bit (where each channel has only values 0 and 255) and they are produced by a threshold operation (explained later in the *Analysis Operations* Submenu). The user first selects the two input video streams, through two successive *Video Streams* dialog boxes, and then a file to store the output video stream. This operation is not supported by the CameraIO Module.
- **Logical OR:** Performs the bit-wise OR logical operator between two binary video streams. The same procedure as in Logical AND is followed. This operation is not supported by the CameraIO Module.
- **Logical XOR:** Performs the bit-wise XOR logical operator between two video binary streams. The same procedure as in Logical AND is followed. This operation is not supported by the CameraIO Module.
- **UCVal to Float conversion:** Converts a video stream with unsigned char data type to a video stream with float data type. The user selects the input video stream and an *.fval file to contain the output video stream. This operation is supported by the CameraIO Module.
- **Float to UCVal conversion (with scaling):** Converts a video stream with float data type to a video stream with unsigned char data type using pixel value scaling (the input frame pixel value range is scaled to the range 0…255). The user selects the input video stream, which should be an fval video stream, and a file to contain the output video stream. This operation is not supported by the CameraIO Module.
- **Float to UCVal conversion (with truncation):** Converts a video stream with float data type to a video stream with unsigned char data type using truncation (input values less than 0.0 are set to 0 at output, whereas input values greater than 255.0 are set to 255 at output). The same procedure as in Float to UCVal conversion (with scaling) is followed. This operation is not supported by the CameraIO Module.
- **Reverse video stream:** Creates a time reversed copy of the input video stream. The user first selects the input video stream and a file to store the output video stream. This operation is not supported by the CameraIO Module.
- **Symmetric:** Produces the symmetric of a video stream in respect to its center. Center of a video stream is considered to be the pixel with spatial coordinates $(\frac{frame\_width}{2}, \frac{frame\_height}{2}, \frac{video\_duration}{2})$. The user selects the input video stream and if selected a file to store the output video stream. This operation is not supported by the CameraIO Module.

- **Spatiotemporal Interpolation/Decimation:** Converts the scale of a video stream using any specified interpolation/decimation factor for each dimension x,y,t. The user first selects the input video stream and then sets the interpolation options through the *Interpolation Options* (Figure 2) dialog box. The user can choose to set interpolation factors to the three video dimensions (x,y,t) or to set the output video stream's frame dimensions and specify that the factors will be derived from the output video stream. There are two available methods for interpolation: Nearest Neighbour and Linear interpolation (the first is faster, whereas the second gives better results and is recommended). Finally, if selected, the user selects a file to store the output video stream.

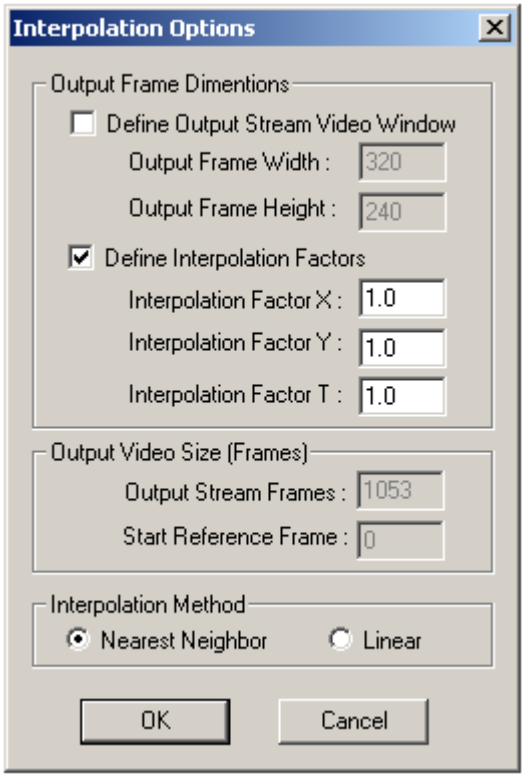

Figure 2: Interpolation Options Dialogue Box.

Note that, because DIVA3D processes the video stream in blocks, the user may be informed that the video stream cannot be interpolated with the chosen factor. In such case the user, should either change the interpolation factor t or change the VOI (Volume Of Interest) of the video stream (e.g. select to process one frame less). This operation is partially supported by the CameraIO module. Interpolation along the x and y axis is supported, but interpolation along the time axis (t) is not supported.

- **Uniform Zooming / Decimation:** Enlarges or decimates a video stream with the same specified zooming factor for all three dimensions. The user selects the input

video stream, gives the factor through the *Zooming/Decimation* factor dialog box and a file to store the output video stream. This operation in not supported by the CameraIO Module.

- **Extract channel:** Performs channel extraction on a selected 3 channel video stream, e.g. if the 3 channel video is an RGB one, the R/G/B channels can be extracted. The user selects an input video stream, is prompted with the *Plane Extraction* dialog box to select which planes will be extracted and finally selects video files to store the output video streams. This operation is applied only to 3channel video streams and is supported by the CameraIO Module ,as long as the camera capturing mode is set to "Convert to RGB" (see Part II of DIVA3D Manual , CameraIO Module).
- **Combine Channels:** Combines three 8bit video streams to produce a 24bit video stream. Thus, he can create an RGB video stream from its R,G,B channels. The user selects three 8bit input video streams and a file to store the output video stream. The three input video streams must have the same dimensions in both three axes (x,y,t). This operation applies only to one channel (8bit) video streams and is not supported by the CameraIO module.
- **Display Video Stream Buffer:** Displays the contents of a video stream buffer. This operation is supported by the CameraIO Module (in that case it will display the latest acquired frames of the camera video stream buffer).
- **Frame Gallery :** This menu option is used for displaying the frames of a video stream buffer as a gallery image, that is one displaying many video frames simultaneously one next to the other (usually in smaller size). The user first selects the input video stream. Then, he specifies the required parameters through the *Frame Gallery Display Options* dialog box, i.e. the number of the displayed video frames per row in the output image and the interpolation method (Nearest Neighbour or linear) that will be used for the adaptation of the frame size. A default width of 100 pixels is used for the input frames in the output image. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. This operation in not supported by the CameraIO Module.

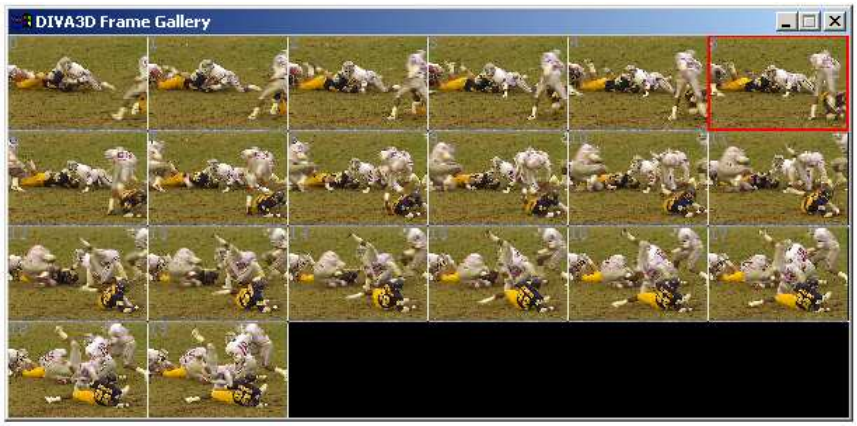

Figure 3: Output of the Frame Gallery Menu.