Analysis Operations
Version 1.0

The operations in this module, unless otherwise stated, are applied either in one channel (in case of single channel (grayscale) video streams) or on all three channels of a color video stream.

The Analysis Operations module sub-menu includes the following submenus:

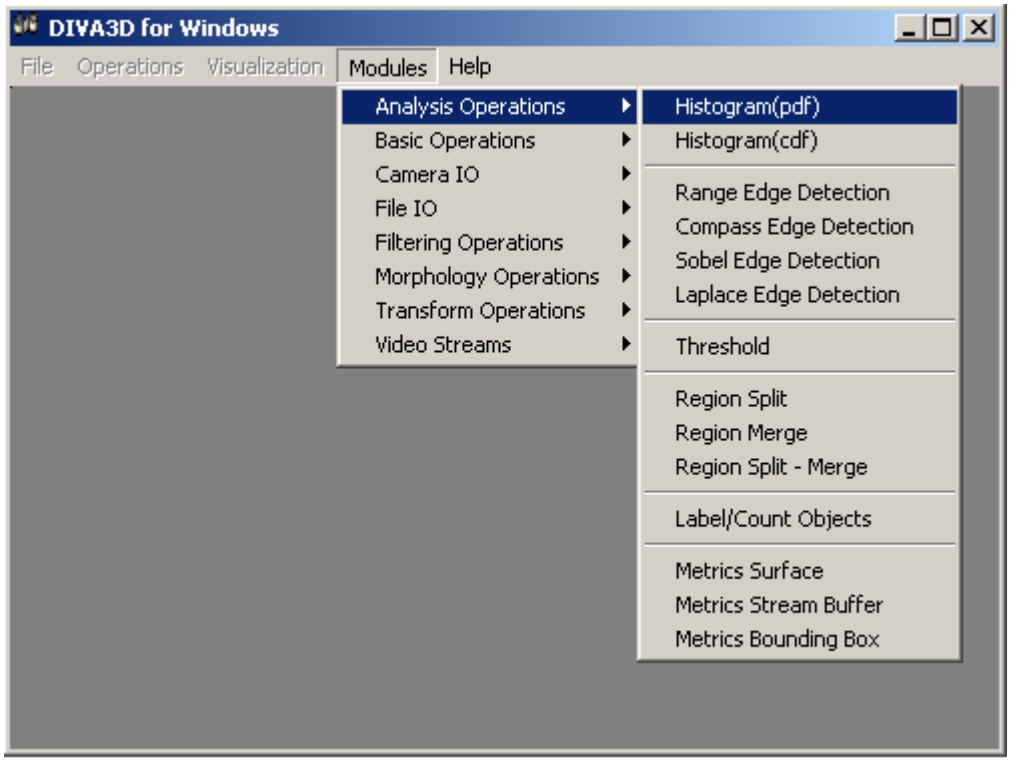

Figure 1: A view of the Analysis Operations Submenu.

- **Histogram (pdf):** Calculates and displays the pdf video stream histogram. First the user selects the input video stream through the *Video Streams* dialog box. After the histogram operation, the user is asked if he/she wishes to store the histogram to text files, one file for each plane. This operation is not supported by the CameraIO module
- **Histogram (cdf):** Calculates and displays the cdf histogram of the video stream. The same procedure is followed as for the pdf histogram calculation. This operation is not supported by the CameraIO module.
- **Range Edge Detection:** Performs edge detection using the spatiotemporal (3D) range operator. The user first selects the input video stream and then defines the dimensions of the 3D window mask through the *Range 3D Window* dialog box. Finally the user

selects a file to store the output stream. This operation is supported by the CameraIO Module.

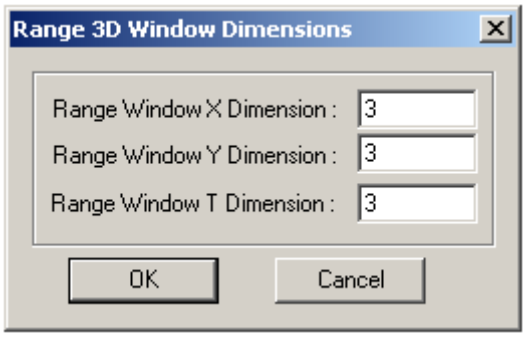

Figure 2: Range Window Dimensions Dialog Box.

- **Compass Edge Detection:** Performs edge detection using the 3D Kirsh masks. The user selects the input video stream and specifies the direction of the detected edge planes through the *Plane Direction (0,45,90,135 degrees)* dialog box. This operation in supported by the CameraIO Module.
- **Sobel:** Performs edge detection using the 3D Sobel masks. The user selects only input and output video streams. This operation is supported by the CameraIO Module.
- **Laplace:** Performs edge detection using the Laplace operator. The user selects only input and output video streams. This operation is supported by the CameraIO Module.
- **Threshold:** Performs region segmentation using simple thresholding. The user selects the input video stream, uses the *Threshold Parameters* dialog box (Figure 3) to define thresholding parameters and, if selected, selects a file to contain the output video stream.

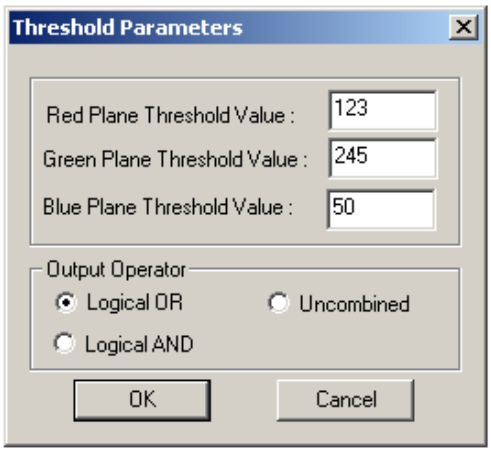

Figure 3: Threshold Parameters Dialog Box

If the input video stream is 24 bit the user must select three different threshold levels, one for each channel and the way the output stream is going to be composed: Either the three planes will be uncombined, producing a binary 3 channel video stream, or the may be combined using the logical OR and AND operators to produce a binary 8 bit video stream. If the input has 1 channel (grayscale video stream) then the user must define only one threshold level. This operation is supported by the CameraIO Module.

- **Region Merge:** Performs region segmentation using the spatiotemporal (3D) region merging technique. The user selects the input video stream, defines the threshold value for region specification and the maximum desirable number of regions through the *Region Segmentation* dialog box. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. Also this operation applies only to 1 channel (grayscale) video streams (3 channel (color) video streams will be automatically converted to grayscale before Region Merge is applied). This operation is not supported by the CameraIO Module.
- **Region Split:** Performs region segmentation using the region split technique. The user selects the input video stream, defines a threshold value for region segmentation and selects a file to contain the output video stream. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. Also this operation applies only to 1 channel (grayscale) video streams (3 channel (color) video streams will be automatically converted to grayscale before Region Split is applied). This operation is not supported by the CameraIO Module.
- **Region Split-Merge:** Performs region segmentation using the region split-merge technique. The same procedure as in the Region Split operation is followed. This operation is applied only to 1 channel (grayscale) video streams (3 channel (color) video streams will be automatically converted to grayscale before Region Split-Merge is applied). This operation is not supported by the CameraIO Module.
- **Label/Count objects:** Performs region (a region is considered as an object) counting and labelling. The user selects the input video stream and is notified for the number of video objects found inside that video stream. It must be noted that video objects are spatiotemporal in nature, i.e. are connected in the (x,y,t) domain. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. Also this operation applies only to 1 channel (grayscale) video streams (3 channel (color) video streams will be automatically converted to grayscale before Label/Count is applied). This operation is not supported by the CameraIO Module.
- **Surface:** Calculates the surface of the video objects in a binary video stream (number of surface voxels). The user selects the input video stream and is notified for the

measurement result. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. Also this operation is applied only to 1 channel (grayscale) video streams (3 channel (color) video streams will be automatically converted to grayscale before Surface operation is applied). This operation is not supported by the CameraIO Module.

- **Video Stream Pixel Count:** Counts the number of pixels of a video object in a binary video stream, i.e. the ‘volume’ of the video object. The user selects the input video stream and is notified the pixel count. This operation is applied only to the contents of the video stream buffer and not to the entire video stream. This operation is not supported by the CameraIO module.
- **Bounding Box:** Finds the bounding box of a video object (the smallest VOI containing non-zero pixels). The user selects the input video stream and is notified for the bounding box coordinates. This operation is applied only to the contents of the video stream buffer and not to the entire video stream.