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## Tools

Image Processing

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Pointlist

String-buffer

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Other

The number of **VIMOS** tools is ever increasing. Since the software is running on different hardware platforms, not all tools are available everywhere. The following table is intended to give a quick overview. Some of the tools have more than one function. If you seek for something, it might not be found in the name of the tool, but in the short description given here.

While you can call your own software modules from **VIMOS**, it would still be good, if you would call when you miss a tool with a given functionality. Probably it is on our list of tools to be added, so maybe we can prepare it for your application.

Most tools are available for **ALL** cameras. Some of the most powerful tools need many resources. So they are available only on the **TI-CAMs**, which are the VC-cameras having VC20xx designators. Then there are tools, that only draw on the screen. Such tools are without use on sensors without a video-output and are therefore labeled as available only on **CAMs** (cameras). Finally there are tools that work with special hardware features of the **Sensors** or even more specific, the **M40**.

For more information please [download](#) the 'Tools description' document.

Image processing	Cameras	Description
Median filter	<b>ALL</b>	good to filter noise out of images
3x3 Convolution filter	<b>ALL</b>	many uses, i.e. sharpening, softening, edge enhancement
Barcode reader	<b>ALL</b>	reads Code 39 and Interleaved 2 of 5, ask for others pls.
Rectangle test	<b>ALL</b>	relation bright / dark within an area (threshold, rotatable)
Circle test	<b>ALL</b>	relation bright / dark within a circular area
Color pixel counter	<b>ALL</b>	multiuse color-segmentation or grayscale texture analysis
Contour	<b>ALL</b>	subpixel-precise contour-following
Correlation init	<b>ALL</b>	store a pattern for later selection by the Correlation exec
Correlation exec	<b>ALL</b>	normalized correlation - searching by matching patterns
Edge detection	<b>ALL</b>	high-quality filtered single-line edge-detector
Fast edge detection	<b>ALL</b>	fast version of the edge-detector, only 0, 45, 90 ... degrees
Edge detection 2	<b>ALL</b>	multi-line, fast, threshold based edge-detector
Find blobs	<b>ALL</b>	image binarization (2 thresholds) and object segmentation
Image area	<b>ALL</b>	Copy,And,Or,Xor,Not,Add,Sub,Min,Max,Pyramid,Subsample
Image projection	<b>ALL</b>	horizontal or vertical projection : average brightness
Light balance	<b>ALL</b>	checks the average brightness - detects illumination failure
Percent threshold	<b>ALL</b>	threshold that follows brightness, also average brightness
OCR tool	<b>ALL</b>	simple OCR, teachable, size independent, rotatable
Object recognition ini	<b>TI-CAMs</b>	teach an object to recognize later
Object recognition exec	<b>TI-CAMs</b>	recognize objects, even zoomed, rotated and occluded
Load image area	<b>ALL</b>	loads part of an image from flash, like patterns or masks
Save image area	<b>ALL</b>	saves part of an image, like error-images or patterns

Graphics & Calculations	Cameras	Description
Marker	<b>ALL</b>	draws a cross of the size you wish at a point you specify
Text box	<b>CAMs</b>	text output
Distance	<b>ALL</b>	distance measurement between points and / or lines
Angle	<b>ALL</b>	angle measurement
Calculator	<b>ALL</b>	calculations with tool-results

 Tolerance	ALL	checks if a value is within a given range
 Midpoint	ALL	creates a point on the line between 2 pts. between or behind
 Make point	ALL	creates a point at a location specified by two values
 Convert point	ALL	creates values out of the X and Y coordinates of a point
 Infinite line	ALL	draws a line given by a point and an angle
 2-point infinite line	ALL	draws a line through two points and returns the angle
 Finite line	CAMs	draws a line between two points
 Best line	ALL	approximates a best-fit line from up to 10 points, <a href="#">see also</a>
 Line-cross	ALL	returns the crossing point of two lines
 Point-projection	ALL	returns the point on a line, that is closest to a given point
 Line across circle	ALL	returns the points where a line crosses a circle
 Tangent	ALL	returns closest, farest and the two tangential points
 2-point circle	ALL	draws a circle from center and point, gives the radius
 3-point circle	ALL	draws a circle from 3 points, gives center, radius and area
 Best circle	ALL	approximates a best-fit circle from up to 10 points, <a href="#">see also</a>
 Circle-cross	ALL	finds the crossing points of two circles
 Rectangle	ALL	draws a rectangle from center, angle and size, gives area
 Coordinate system	CAMs	draws a coordinate system

Pointlist	Cameras	Description
 Load pointlist	ALL	loads a pointlist from flash, good for program-parameters
 Save pointlist	ALL	saves a pointlist to flash-memory
 Set pointlist parameter	ALL	sets one of the 8 parameters of a part of the pointlist
 Set pointlist item	ALL	sets one element of the pointlist (point + 8 parameters)
 Get pointlist parameter	ALL	gets one of the 8 parameters from one element of the list
 Get pointlist item	ALL	gets one element of the pointlist (point + 8 parameters)
 Get blob	ALL	gets the information of one blob object from the pointlist
 Sort pointlist	ALL	rearanges pointlist elements depending on one parameter
 Filter pointlist	ALL	copies part of the pointlist depending on one parameter
 Display pointlist	ALL	more then one way to display points from the pointlist
 Generate line coordinates	ALL	generates coordinates on a line in pointlist elements
 Generate circle coordinat.	ALL	generates coordinates on a circle in pointlist elements

	Move & Rotate pointlist	<b>ALL</b>	displaces and rotates pointlist coordinates vs. point or line
	Get grayvalues from pts.	<b>ALL</b>	reads the grayvalue at point locations into a parameter
	Pointlist median filter	<b>ALL</b>	filters a parameter sequence over a part of the pointlist
	Pointlist edge-detection	<b>ALL</b>	detects edges on a parameter sequence
	Pointlist distance	<b>ALL</b>	fills a parameter sequence with the distance to a point or line
	Pointlist angle	<b>ALL</b>	fills a parameter sequence with the angle to a point
	Pointlist Best-line	<b>ALL</b>	approximates a best-fit line from pointlist points
	Pointlist Best-circle	<b>ALL</b>	approximates a best-fit circle from pointlist points
	Pointlist Hough-line/circle	<b>TI-CAMs</b>	approximates a Hough line or circle from pointlist points
	Contour matching	<b>TI-CAMs</b>	very powerfull multi-contour object comparision, subpix errors
	Matching error filter	<b>ALL</b>	filter for creating two-dimensional error-objects
	Pointlist compare	<b>ALL</b>	finds best matched position between lists, linear and circular
	Fast pointlist compare	<b>ALL</b>	same as above, but integer precision instead of floating pt.

String-buffer	Cameras	Description
	Load string-buffer	<b>ALL</b> loads strings from flash - i.e. for the graphical user-interface
	Save string-buffer	<b>ALL</b> saves strings to flash - i.e. from OCR, barcode, ...
	Put character into buffer	<b>ALL</b> sets an element of the String-buffer
	Get character from buffer	<b>ALL</b> gets an element of the String-buffer
	Number to string	<b>ALL</b> takes a value (result) and writes it as a sequence of numbers
	String to number	<b>ALL</b> takes a sequence of numbers and returns a value (result)
	Show string	<b>CAMs</b> displays a string on the screen
	Compare strings	<b>ALL</b> compares two strings

Graphical user-interface	Cameras	Description
	<b>TI-CAMs</b>	draws a window
	<b>TI-CAMs</b>	draws a button
	<b>TI-CAMs</b>	draws an edit or text field
	<b>TI-CAMs</b>	draws a group of radio-buttons
	<b>TI-CAMs</b>	draws a checkbox
	<b>TI-CAMs</b>	draws a spin-control or toggle-text (instead of combo-box)

 Initialize GUI

**TI-CAMs** initializes various properties of the GUI

Statistic counters	Cameras	Description
 Reset counters to 0	 ALL	resets one or all counters to zero
 Increment counter	 ALL	increments a counter (+1)
 Decrement counter	 ALL	decrements a counter (-1)
 Set counter	 ALL	sets a counter to a given value
 Save counters to flash	 ALL	saves all counters to flash, they are reloaded at power-up

Input / Output	Cameras	Description
 Get I/Os	 ALL	reads the state of the PLC-input-lines
 Set I/Os	 ALL	sets the state of the PLC-output-lines
 Get I/O-box	 ALL	reads the state of the PLC-input-lines from an extension-box
 Set I/O-box	 ALL	sets the state of the PLC-output-lines of an extension-box
 Clean serial input queue	 ALL	deletes the content of the serial input-buffer
 Receive result	 ALL	receives a result value via serial port
 Send result	 ALL	sends a result value via serial port
 Receive string	 ALL	receives part of the string-buffer via serial port
 Send string	 ALL	sends part of the string-buffer via serial port
 Receive pointlist	 ALL	receives part of the pointlist via serial port
 Send pointlist	 ALL	sends part of the pointlist via serial port
 Receive image-area	 ALL	receives a rectangular area of the image via serial port
 Send image-area	 ALL	sends a rectangular area of the image via serial port

Program flow	Cameras	Description
 Cycle counter	 ALL	number of program executions - good for initializations
 IF / ELSE / CASE	 ALL	enables conditional execution
 GOTO	 ALL	jumps to a label
 LABEL	 ALL	labels a place to jump to
 Load user-program	 ALL	loads another user-program

 Exec (external source)	<b>ALL</b>	executes an external exec-module (alien source)
 Exit	<b>ALL</b>	exits the program to Edit-mode or operation system

Other	Cameras	Description
 Take picture	<b>ALL</b>	takes a new picture with given shutter and triggering
 Take CMOS picture	<b>M40</b>	takes a new picture of given size, shutter and triggering
 Copy picture	<b>ALL</b>	copies the entire image between frame & freeze buffers
 Button & LED	<b>Sensors</b>	checks the button and sets the LEDs off the sensors M40,50
 Pause / Wait	<b>ALL</b>	stops the execution for a given time or until a mouse-click
 Timer	<b>ALL</b>	returns elapsed time in hr:min:sec:ms - up to 10 timers
 Delete file / Pack flash	<b>ALL</b>	deletes a file and does fast flash-packing
 Free correlation pattern	<b>ALL</b>	deletes one of the patterns loaded with Correlation init
 Select calibration set	<b>ALL</b>	activates one of the calibration sets

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