



# Extended Vision Algorithms

## Technical note

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***Keysens - Machine Vision***  
**Poligono Ecce Homo nave 4. 12530 Burriana, Spain**  
**info@keysens.com**  
**www.keysens.com**

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## 1 Introduction

*Keysens vAlgorithms* are collections of functions written in C and contained in DLLs. The functions implement machine vision and data processing algorithms. *Keysens* software, like *vDevelop* and the runtimes *vProcess*, *RuntimeGigE*, *RuntimeGigEUser*, etc, load several algorithms DLLs and *algorithms description files* contained in the algorithms directory, alg.

For building machine vision applications one makes a project with *vDevelop*. Projects consist of several parameters for camera settings and communications with installation devices like robots, PLCs and HMIs, and the most important, an algorithms script: a list of algorithms that will be executed sequentially.

One of such algorithms library is the *Extended Algorithms Collection*, whose files are named:

File	Description
extended_algoritms.dll	The algorithms functions.
extended_algoritms.txt	The algorithms description file.

This technical note briefly describes the algorithms contained in this library.

## 2 Extended algorithms categories

The algorithms in the *Extended Algorithms Collection* are distributed in categories:

Category	Description
Calibration with splines	Algorithms to do auto-calibration at every image using bi-cubic splines.
Colour segmentation	Algorithms to segment colour images based on clustering, proximity and/ or similarity.
Pattern detection	Algorithms to find patterns totally visible and partially occluded.

Following, the algorithms in every category are described.

### 3 Category ‘Calibration with splines’

Calibration with splines			
Algorithm	Input	Output	Description
CALIBRATION_SPLINES	DAT	DAT	Calibrate (row,column) with splines interpolation to provide measures in mm in an external coordinate system (x,y).
CALIBRATION_GRID	DAT	DAT	Calibrate (row,column) with a grid (matrix) of points of known coordinates to provide measures in mm in an external coordinate system (x,y).
GRID_POINTS	DAT	DAT	Organize calibration points in a grid or matrix.
GRID_MATRIX	DAT	DAT	Build a matrix for splines interpolation with calibration point coordinates.

### 4 Category ‘Colour segmentation’

Calibration with splines			
Algorithm	Input	Output	Description
CLUSTERING_K_MEANS	DAT	DAT	Colour segmentation using the k-means clustering algorithms.

## 5 Category ‘Pattern detection’

Pattern detection			
Algorithm	Input	Output	Description
CHECK_RECTANGLE	LBL	DAT	Compute rectangularity of a rectangle.
DIFFERENCES_FIT_RECTANGLES	DAT	LBL	Difference image between the image defined by fitted rectangles and a previous image.
PATTERN_ALIGN_COLOR	RAW	LBL	Find alignment to a masked color pattern.
PATTERN_ALIGN_CORRELATION	LBL	LBL	Find alignment to a labeled pattern by correlation.
PATTERN_ALIGN_MATCH	LBL	LBL	Find alignment to a labeled pattern by matching pixels.
PATTERN_CHECK	DAT	DAT	Overlap a pattern on an image at positions defined by input rectangles, compute similar measures.
PATTERN_DELETE	DAT	DAT	Delete input patterns from a label image.
PATTERN_DIFFERENCES	RAW	LBL	Find and mark differences between a masked raw image and a model.
PATTERN_OVERLAP	DAT	DAT	Sort detected occurrences of a pattern by their overlapping area of one over another.
PATTERN_PIXELS_MATCH	LBL	DAT	Find percentages of pixels correspondence to a labeled pattern.
PATTERN_SEARCH	DAT	DAT	Overlap a pattern on an image in an area close to input points, find best match position.
PATTERN_XOR	LBL	LBL	Differences between a labelled image and a model doing an xor.
RECTANGLES_LINES_LBL	DAT	DAT	Find rectangles from perpendicular lines and check if they are filled enough in a previous labelled image.
REGIONS_FIT_RECTANGLES	REG	DAT	Fit best enclosing rectangles to regions with a voting scheme.
REGIONS_ROTATE_FIT_RECT	REG	REG	Rotate regions with the orientation of the best line computed by Hough transform.
REGIONS_SQUARE_MEASURES	REG	REG	Find best width, height and countour lines for almost-square regions using the Hough transform.

## 6 Comments

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