

ORB Demo Algorithm



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1. ORB Demo algorithm

ORB stands for ORB (Oriented FAST and Rotated BRIEF). ORB is an algorithm to get feature descriptor (using rotated BRIEF descriptor) to the corner points detected by FAST9 corner detect algorithm. This particular demo algorithm shows creating an ORB algorithm with using below 5 applets in following order.

- Image Pyramid Creation
- Fast 9 corner Detection
- Best Feature to front using Fast9 Score and applying NMS (within each Pyramid Level)
- Best Feature to front using Harris Score (across all Pyramid levels)
- Computing RBRIEF descriptor on the key points detected across multiple image pyramid levels

The interface details of each of these applets can be find as part of EVE_Applets_UserGuide located in apps/docs drecotory.

The algorithm accepts one 8-bit gray scale image with some control parameters as detailed out in later section of the document and provides key points, level and 256 bit descriptor. The number of maximum pyramid levels supported by this demo algorithm is 3.

The algorithm is supplied with a test bench to demonstrate the usage and nterface.

2. Data Structures

2.1.1.1 ORB_TI_CreateParams

|| Description

This structure defines the creation parameters for ORB algorithm

|| Fields

Field	Data Type	Input/ Output	Description
visionParams	IVISION_Pa rams	Input	Commom structure for vision modules
imgFrameWidth	uint8_t	Input	Width in bytes for the input image of highest level
imgFramePitch	uint16_t	Input	Pitch in bytes for the input image of highest level
imgFrameHeight	uint16_t	Input	Height in bytes for the input image of highest level
numLevels	uint16_t	input	Total number of pyramid levels including base level (1 means only base resolution)
fast9Threshold	uint16_t	Input	Threshold on difference between intensity of the central pixel and pixels of a circle around this pixel for FAST9 corner detect applet.
startX	uint16_t	Input	X co-ordinate of the first (top-left) pixel in the image. Useful for a ROI processing in a bigger image. Though the information about ROI is supplied via iVISION buf desc but create time also this information is required as this algorithm use the XY value as some create time initialization. It is for base level only.
startY	uint16_t	Input	Y co-ordinate of the first (top-left) pixel in the image. Useful for a ROI processing in a bigger image. Though the information about ROI is supplied via iVISION buf desc but create time also this information is required as this algorithm use the XY value as some create time initialization. It is for base level only
harrisSensitivityParam	uint16_t	Input	Value of sensitivity parameter (known as kappa in literature) for Harris score. The format of this is Q1.15. Which means for a value of 0.04 you should set $0.04 * \text{pow}(2, 15) \approx 1310$

Field	Data Type	Input/ Output	Description
bestNFeaturesOut	uint16_t	Input	Total number of features to be generated across all levels
scoreMethod	uint8_t	Input	Method for FAST9 Score – this score is used for best feature to front. ORB_TI_THRESH_METHOD and ORB_TI_SAD_METHOD are supported values
orbPattern	int8_t	Input	This pattern defines the position of 256 pairs of src and dst to create 256 bit rBRIEF descriptor. Total size of this memory are has to be 256*4. For Exact format of this pattern - 256 bytes - X offset from center in src 256 bytes - X offset from center in dst 256 bytes - Y offset from center in src 256 bytes - Y offset from center in dst

2.1.1.2 ORB_TI_InArgs

|| Description

This structure contains all the parameters which are given as an output by ORB algorithm

|| Fields

Field	Data Type	Input/ Output	Description
iVisionInArgs	IVISION_InArgs	Input	Common inArgs for all ivision based modules
fast9CornerSelectMethod	uint8_t	Input	Method of selecting fast9 corners if there are more corners produced refer eORB_FAST9CornersSelectMethod in interface header file.

2.1.1.3 ORB_TI_OutArgs

|| Description

This structure contains all the parameters which are given as an output by ORB algorithm.

|| Fields

Field	Data Type	Input/ Output	Description
iVisionOutArgs	IVISION_Pa rams	Output	Commom structure for outArgs ivision modules
numCorners	uint16_t	Output	Total number of Key points (corners) detected. It can be little different than configured value (totalFeatures) to take care of alignments
activeImgWidth[]	uint16_t	Output	activeImgWidth is primarily <= imgFrameWidth and decided by applet to satisfy the internal DMA and kernel requirements. This is the actual number of horizontal pixels being processed. It is exported for user as informative. This information is returned for each input level.
activeImgHeight[]	uint16_t	Output	activeImgHeight is primarily <= imgFrameHeight and decided by applet to satisfy the internal DMA and kernel requirements. This is the actual number of vertical lines being processed. It is exported for user as informative. This information is returned for each input level.

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