See3CAM_24CUG

Application Note: Face and Smile Detection

e-con Systems

Your Product Development Partner

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Introduction to See3CAM_24CUG

See3CAM_24CUG is a 2.3 MP, color, UVC compliant, USB 3.1 Gen1 SuperSpeed camera from e-con Systems, a leading embedded Product Design Services Company which specializes in the advanced camera solutions. It is the latest member of the See3CAM family of USB 3.1 Gen1 SuperSpeed camera products launched by e-con Systems.

See3CAM_24CUG is a 2.3 MP color camera with the S-mount (also known as M12 board lens) lens holder. The S-mount is one of the most commonly used small form-factor lens mounts for board cameras. See3CAM_24CUG is a single-board solution containing the camera sensor module board with 1/2.6" AR0234 CMOS image sensor from Aptina™ and the USB 3.1 Gen1 interface board. It is also backward compatible with the USB 2.0 high speed interface, albeit at lower frame rates.

See3CAM_24CUG is a UVC compliant camera and it does not require any drivers to be installed on the PC. The native UVC drivers of Windows and Linux Operating Systems (OS) will be compatible with this camera. e-con Systems also provides the sample application that demonstrates some of the features of this camera. However, this camera can utilize any DirectShow application such as Skype and so on.

This document describes Face and Smile detection of See3CAM_24CUG.

Description

The application note concentrates on the working of face and smile detection in See3CAM_24CUG.

See3CAM_24CUG offers the ability to embed the face and smile data at the end of the frame which can be used for further image processing.

Face Detection

The face detection can be enabled or disabled through e-CAMView Extension Unit. For more details, refer to *e-CAMView_Streaming_Application_User_Manual_See3CAM_24CUG.pdf* of See3CAM_24CUG.

When face detection is enabled, the overlay rectangles will be displayed around the faces. If smile detection is enabled, the progressor will show smile level for each face.

Along with the image data, the status structure containing the face details can be appended at the end of the frame. The status structure starts with a Start of Status Structure (SOSS) marker 0xFFBC and ends with an End of Status Structure (EOSS) marker 0xFFBD.

On enabling the embed data, the last 164 (Status structure-160 bytes, SOSS-2 bytes, EOSS-2 bytes) bytes of the frame image data will be replaced by the status structure.

The status structure will be in the below format.

Face_ID_1	Face_X0_1	Face_Y0_1	Face_X1_1	Face_Y1_1
Face_ID_2	Face_X0_2	Face_Y0_2	Face_X1_2	Face_Y1_2
Face_ID_3	Face_X0_3	Face_Y0_3	Face_X1_3	Face_Y1_3
		- - - -		
Face_ID_15	Face_X0_15	Face_Y0_15	Face_X1_15	Face_Y1_15
Face_ID_16	Face_X0_16	Face_Y0_16	Face_X1_16	Face_Y1_16

Smile Detection

The smile detection can be enabled or disabled through e-CAMView Extension Unit. For more details, refer to *e-CAMView_Streaming_Application_User_Manual_See3CAM_24CUG.pdf* of See3CAM_24CUG.

Along with the image data, the status structure containing the smile details can be appended at the end of the frame. The status structure starts with a SOSS marker 0xFFBC and ends with an EOSS marker 0xFFBD.

On enabling the embed data, the last 68 (Status structure-64 bytes, SOSS-2 bytes, EOSS-2 bytes) bytes of the frame image data will be replaced by the status structure.

The status structure will be in the below format.

Face_ID_1	Smile_Rate_1
Face_ID_2	Smile_Rate_2
Face_ID_3	Smile_Rate_3
-	
-	
-	
-	
Face_ID_15	Smile_Rate_15
Face_ID_16	Smile_Rate_16

When both the Face and Smile detection is enabled, the last 196 (Status structure-192 bytes, SOSS-2 bytes, EOSS-2 bytes) bytes of the frame image data will be replaced by the status structure.

The status structure will be in the below format.

Face_ID_1	Face_X0_1	Face_Y0_1	Face_X1_1	Face_Y1_1	Smile_Rate_1
Face_ID_2	Face_X0_2	Face_Y0_2	Face_X1_2	Face_Y1_2	Smile_Rate_2
Face_ID_3	Face_X0_3	Face_Y0_3	Face_X1_3	Face_Y1_3	Smile_Rate_3
-					
-					
-					
-					
Face_ID_15	Face_X0_15	Face_Y0_15	Face_X1_15	Face_Y1_15	Smile_Rate_15
Face_ID_16	Face_X0_16	Face_Y0_16	Face_X1_16	Face_Y1_16	Smile_Rate_16

The Face ID holds the unique face identifier which are described as follows:

- Face_ID [15: 8] - Age - Number of frames since this frame was detected. If set to 0xff, the face slot is invalid.
- Face_ID [7: 0] - ID - Unique face identifier to track the face.
- Face_X0_1 - In top-left corner of face region, the X coordinates of faces are recognized in the image.
- Face_Y0_1 - In top-left corner of face region, the Y coordinates of faces are recognized in the image.
- Face_X1_1 - In bottom-right corner of face region, the X coordinates of faces are recognized in the image.
- Face_Y1_1 - In bottom-right corner of face region, the Y coordinates of faces are recognized in the image.

Note: These X and Y coordinates represents the pixel value of the image.

The example of status structure for Smile detection are as follows.

0xff, 0xbc (SOSS)	0xff, 0x6e (Face_ID_1)	0x05, 0x6a (Face_X0_1)	0x00, 0x8a (Face_Y0_1)	0x06, 0x60 (Face_X1_1)	0x01, 0x80 (Face_Y1_1)	0x00, 0x0b (Smile_Rate_1)
0x00, 0x01 (Face_ID_2)	0x04, 0x68 (Face_X0_2)	0x00, 0x84 (Face_Y0_2)	0x05, 0x4c (Face_X1_2)	0x01, 0x68 (Face_Y1_2)	0x00, 0x64 (Smile_Rate_2)	
			- - - -			
	0x03, 0x70 (Face_ID_15)	0x03, 0x28 (Face_X0_15)	0x01, 0x8e (Face_Y0_15)	0x04, 0x52 (Face_X1_15)	0x02, 0x9b (Face_Y1_15)	0x00, 0x1d (Smile_Rate_15)
0xff, 0x6f (Face_ID_16)	0x05, 0x75 (Face_X0_16)	0x00, 0x89 (Face_Y0_16)	0x06, 0x5b (Face_X1_16)	0x01, 0x6f (Face_Y1_16)	0x00, 0x04 (Smile_Rate_16)	0xff, 0xbd (EOSS)

From the above example, Face_ID_1 [15: 8] = 0xff indicates that it is an invalid face and the face coordinates associated to this face are invalid.

Both Face_ID_2 and Face_ID_15 are valid faces.

Face_ID_15 [15: 8] = 0x03 indicates the age of face (number of frames since the face was detected).

What's Next?

After understanding the usage of Face and Smile detection of See3CAM_24CUG, you can refer to *e-CAMView Streaming Application User Manual* to understand more about See3CAM_24CUG.

Glossary

CMOS: Complementary Metal Oxide Semiconductor.

EOSS: End of Status Structure.

OS: Operating System.

SOSS: Start of Status Structure.

USB: Universal Serial Bus.

USB 2.0: Universal Serial Bus High Speed.

USB 3.1 Gen1: Universal Serial Bus Super Speed.

UVC: USB Video Class.

Support

Contact Us

If you need any support on See3CAM_24CUG product, please contact us using the Live Chat option available on our website - https://www.e-consystems.com/

Creating a Ticket

If you need to create a ticket for any type of issue, please visit the ticketing page on our website - https://www.e-consystems.com/create-ticket.asp

RMA

To know about our Return Material Authorization (RMA) policy, please visit the RMA Policy page on our website - https://www.e-consystems.com/RMA-Policy.asp

General Product Warranty Terms

To know about our General Product Warranty Terms, please visit the General Warranty Terms page on our website - https://www.e-consystems.com/warranty.asp

Revision History

Rev	Date	Description	Author
1.0	24-Jan-2021	Initial Draft	Camera Team