

Tara Stereo Vision USB 3.0 Camera

IMU Sample App User Manual



Version 1.2

e-con Systems

5/31/2018



e-con Systems

Your Product Development Partner

Disclaimer

e-con Systems reserves the right to edit/modify this document without any prior intimation of whatsoever.

Contents

INTRODUCTION TO TARA - SEE3CAM STEREO	3
IMU APPLICATION	4
IMU CONFIGURATION	4
APPLICATION ILLUSTRATION	4
GETTING THE IMU VALUES	4
SCREENSHOTS OF SAMPLE APPLICATION	5
WHAT'S NEXT?	7
GLOSSARY	8
SUPPORT	9

Introduction to Tara - See3CAM_Stereo

The Tara - See3CAM_Stereo, hereafter called as Tara, is a UVC compliant USB 3.0 SuperSpeed Stereo vision camera from e-con Systems, a leading embedded Product Design Services company which specializes in the advanced camera solutions. Tara is based on MT9V024 stereo sensor from ON Semiconductor and it supports a maximum resolution of WVGA (2 x 752 x 480) at 60fps over USB 3.0 in uncompressed format. Tara is the latest member of the Stereo Vision family of USB 3.0 SuperSpeed camera products launched by e-con Systems.

Tara is a monochrome camera with the S-mount (also known as M12 board lens) lens holder and pre-calibrated lens pair. The S-mount is one of the most commonly used small form-factor lens mounts for board cameras. Tara has two OnSemi's 1/3-inch MT9V024 image sensors separated by an inter-ocular distance or base line of 60 mm. With USB 3.0 interface to the host PC, Tara can stream WVGA (2 x 752 x 480) resolution at 60 fps, VGA (2 x 640 x 480) resolution at 60 fps and QVGA (2 x 320 x 240) resolution at 60 fps in uncompressed Y16 format. It also has ability to capture still images. Tara is also backward compatible with USB 2.0 host ports and it does not require any special camera drivers to be installed in the host PC. In USB 2.0, the camera is capable of streaming WVGA (2 x 752 x 480) resolution at 30 fps, VGA (2 x 640 x 480) resolution at 30 fps and QVGA (2 x 320 x 240) resolution at 60 fps in uncompressed Y16 format.

Tara camera houses LSM6DS0/LSM6DS33 (IMU unit) chip which is a 6dof (degree of freedom) IMU unit featured with triaxial accelerometer and triaxial gyroscope and supports different modes of configuration.

This document describes the detailed usage of LSM6DS0/LSM6DS33 integrated with Tara and illustrates the sample IMU application provided in the Tara SDK package.

IMU Application

This section describes the IMU Application in detail.

IMU Configuration

The LSM6DS0 is a 6dof IMU unit featured with triaxial accelerometer and triaxial gyroscope and supports different modes of configuration. These configurations are handled using Human Interface Device (HID) commands. To know more about the HID commands, please refer to the *Tara_Linux_Extension_Unit_API* document provided in the release package. To get the IMU values, based on the application requirement, you need to configure the following:

- Configure the IMU modes
- Output data rate
- Sensitivity
- IMU value update mode

Application Illustration

The IMU sample application included in Tara SDK is a basic example demonstrating the rotations of camera around x, y and z axis. The output rotation angles calculated from the IMU values are limited to the range from -90 to +90 degrees for illustration.

Getting the IMU Values

The steps to get the IMU values are as follows:

1. You must configure IMU mode, Axis control, Output data rate and Sensitivity.

For REVISION A(LSM6DS0):

- IMU_MODE = IMU_ACC_GYRO_ENABLE
- ACC_AXIS_CONFIG = IMU_ACC_X_Y_Z_ENABLE
- IMU_ODR_CONFIG = IMU_ODR_119HZ
- ACC_SENSITIVITY_CONFIG = IMU_ACC_SENS_2G
- GYRO_AXIS_CONFIG = IMU_GYRO_X_Y_Z_ENABLE
- GYRO_SENSITIVITY_CONFIG = IMU_GYRO_SENS_245DPS

For REVISION B(LSM6DS33):

- IMU_MODE = IMU_ACC_GYRO_ENABLE
- ACC_AXIS_CONFIG = IMU_ACC_X_Y_Z_ENABLE
- IMU_ODR_CONFIG = IMU_ODR_104HZ
- ACC_SENSITIVITY_CONFIG = IMU_ACC_SENS_2G
- GYRO_AXIS_CONFIG = IMU_GYRO_X_Y_Z_ENABLE

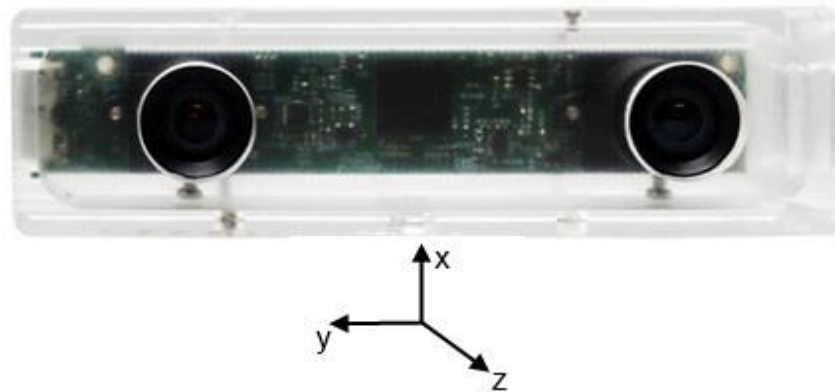
- `GYRO_SENSITIVITY_CONFIG = IMU_GYRO_SENS_250DPS`
2. You must configure IMU value update mode.
 - `IMU_UPDATE_MODE = IMU_CONT_UPDT_EN`
 3. Once these values are configured, you must call the `GetIMUValueBuffer` HID command and you will get the IMU values in a separate thread.

These raw values from accelerometer and gyroscope must be interpreted to use in the application. You can interpret these values, calculate the rotation angles and render an inclination window based on the rotation from the camera. By rotating the camera around a particular axis, the other two planes will be rotating. You can view how these results change based on the inclination of camera, and the application waits for a user interrupt (keyboard event). If you press **Enter** key in the keyboard, the application will exit.

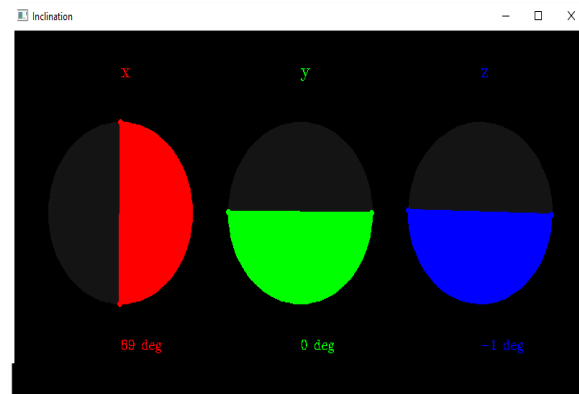
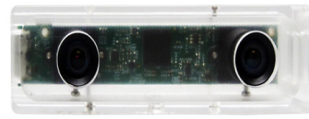
Screenshots of Sample Application

The screenshots of sample application are shown below.

- In the below figure, you can view the stereo camera - Tara depicting the axis.

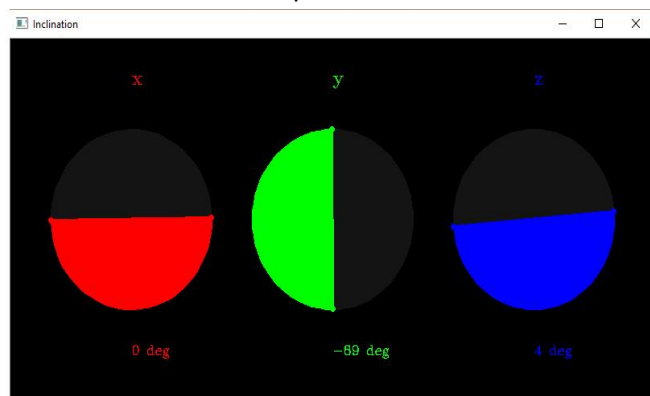


- In the below figure, you can view the application screenshot which is captured when the camera is rotated in the first half of picture.



For this position of camera, the angles are calculated as X rotation = 89 degrees, Y rotation = 0 degrees, and Z rotation = -1 degrees, based on the IMU values.

- In the below figure, you can view the application screenshot which is captured when the camera is rotated in the first half of picture.



For this position of camera, the angles are calculated as X rotation = 0 degrees, Y rotation = -89 degrees, and Z rotation = 4 degrees based on the IMU values.

What's Next?

After understanding the usage of IMU application, you can refer to the *Tara_Linux_Extension_Unit_API* document to understand more about Tara.

Glossary

IMU: Inertial Measurement Unit.

QVGA: Quarter Video Graphics Array (320 x 240 resolution).

USB: Universal Serial Bus.

USB 2.0: Universal Serial Bus High speed.

USB 3.0: Universal Serial Bus Super speed.

UVC Compliant: USB Video Class Compliant.

VGA: Video Graphics Array (Industry name for 640 x 480 resolution).

WVGA: Wide Video Graphics Array (752 x 480 resolution).

Contact Us

If you need any support on Tara 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
1.1	21-May-2016	Initial Draft	Karthikeyan.A
1.2	31-May-18	Added IMU LSM6DS33 sensor	Chandra Sekar V