e-con Systems India Pvt Ltd

Rishabh Inforpark, RR Tower – IV, 7th Floor,
Super A-16 & A-17, Thiru-Vi-Ka Industrial Estate
Guindy Chennai - 600032
www.e-consystems.com

Tara-SDK – IMU Sample Application User Manual

Revision 1.1

21-May-2016

Contents

Tara-SDK – IMU Sample Application

1 Revision History

Rev No	Date	Major Changes	Author
1.1	21-May-2016	Initial Draft	Karthikeyan A

2 Introduction

Tara - See3CAM_Stereo 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 OnSemi Imaging and it supports a maximum resolution of WVGA (2x752x480) at 60fps over USB 3.0 in uncompressed format. Tara is the latest member of the Stereo Vision family of USB3.0 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 (2x752x480) resolution at 60 fps, VGA(2x640x480) resolution at 60 fps and QVGA(2x320x240) resolution at 60 fps in uncompressed Y16 format. It also has ability to capture still images. See3CAM_Stereo_TARA is also backward compatible with USB2.0 host ports and 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 (2x752x480) resolution at 30 fps, VGA(2x640x480) resolution at 30 fps and QVGA(2x320x240) resolution at 60 fps in uncompressed Y16 format.

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

3 Scope

This document describes the detailed usage of an IMU unit(LSM6DS0) integrated with econ's stereo camera - Tara. Also illustrates the sample IMU application provided in the Tara SDK package.

4 IMU Application

4.1 IMU Configuration

The LSM6DS0 is a 6dof(degree of freedom) IMU unit featured with triaxial accelerometer and triaxial gyroscope support 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 API documentation. In order to get the IMU values, based on the application requirement we need to do the following things beforehand:

- Configure the IMU modes
- output data rate

- sensitivity
- IMU value update mode

4.2 Application Illustration

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

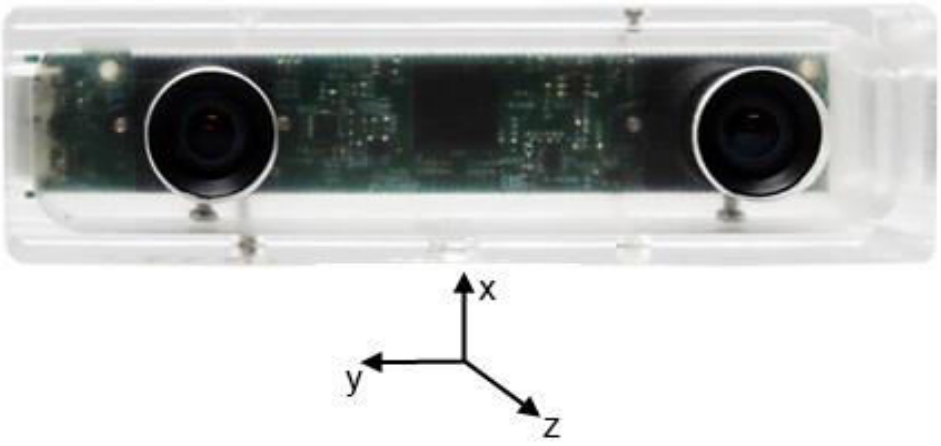
Steps to get the IMU values:

Following are steps to get the IMU values. In our case, we have chosen the following configurations.

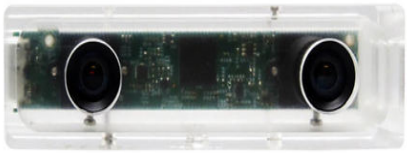
1. Configuring IMU mode, Axis control, output data rate and sensitivity.
   - IMU_MODE = IMU_ACC_GYRO_ENABLE;
   - ACC_AXIS_CONFIG = IMU_ACC_X_Y_Z_ENABLE;
   - IMU_ODR_CONFIG = IMU_ODR_119HZ;
   - ACC_SENSITIVITY_CONFIG = IMU_ACC_SENS_2G;
   - GYRO_AXIS_CONFIG = IMU_GYRO_X_Y_Z_ENABLE;
   - GYRO_SENSITIVITY_CONFIG = IMU_GYRO_SENS_245DPS;
2. Configuring IMU value update mode.
   - IMU_UPDATE_MODE = IMU_CONT_UPDT_EN;
3. Once these values are configured, we should call the GetIMUValueBuffer HID command and we will be getting the IMU values in a separate thread.
4. These raw values from accelerometer and gyroscope should be interpreted in some way to use in the application. We interpreted these values, calculated the rotation angles and rendered an Inclination window based on the rotation from the camera. By rotating the camera around x and y axis, we can see how these results change based on the inclination of camera.
5. The application waits for an user interrupt (keyboard event). If the user presses any key in the keyboard, the application will exit.

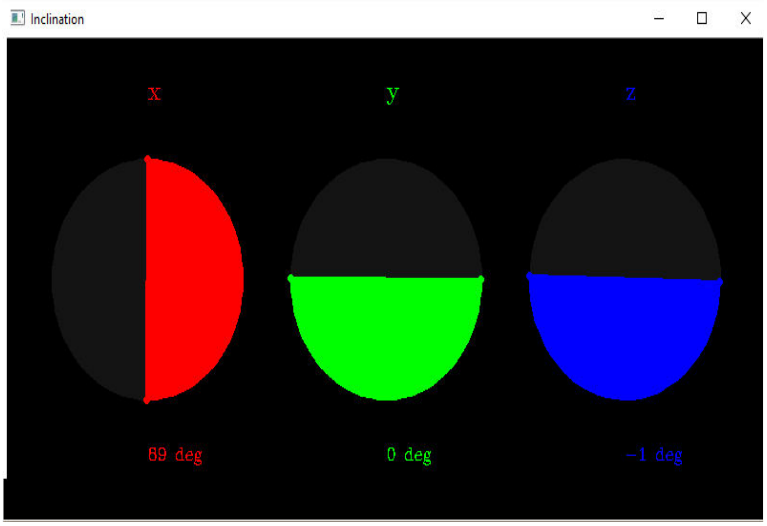
Screen shots of sample application:

a) Here is the stereo camera – TARA depicting the axis.



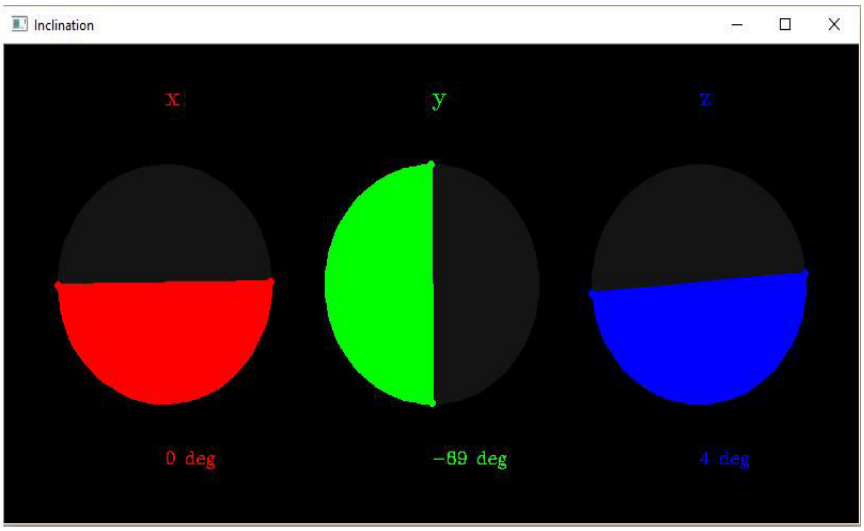
b) Here is an application screen shot taken when the camera is rotated as like in the first half of picture.





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

c) Here is an application screen shot taken when the camera is rotated as like in the first half of picture.



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

5 Conclusion

This document has explained the detailed information about the IMU sample application provided along with Tara SDK.