Vision SDK TDA2xx

Surround View Calibration

User Guide

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1 Introduction

Vision Software Development Kit (Vision SDK) is a multi-processor software development package for TI's family of ADAS SoCs. The software framework allows users to create different ADAS application data flows involving video capture, video pre-processing, video analytics algorithms, and video display. The framework has sample ADAS data flows which exercises different CPUs and HW accelerators in the ADAS SoC and demonstrates how to effectively use different sub-systems within the SoC. Frame work is generic enough to plug in application specific algorithms in the system.

Vision SDK is currently targeted for the TDA2xx family of SoCs

This document explains the Calibration Use case required for the 3D Surround View (SRV) use case to work perfectly.

Without running the Calibration use case, the 3D SRV use case doesn't run.

There is no change in the procedure to build and run the 3D SRV use case, the Calibration use case is additional use case in the Vision SDK Linux part.

This document is applicable for Vision SDK versioned 2.10 and greater.

1.1 References

Refer the below additional documents for more information about Vision SDK

Document	Description
Vision_sdk/docs/linux/ VisionSDK_Linux_DataSheet.pdf	Data Sheet document.
Vision_sdk/docs/linux/ VisionSDK_Linux_UserGuide.pdf	This document. Contains install, build, execution information
Vision_sdk/docs/UserGuides/VisionSDK_UserGuide_TDA2xx.pdf	Not relevant **unless explicitly mentioned in this document**
Vision_sdk/docs/VisionSDK_ReleaseNotes.pdf	Not relevant to this code drop
Vision_sdk/docs/VisionSDK_DataSheet.pdf	Not relevant to this code drop
Vision_sdk/docs/VisionSDK_ApiGuide.CHM	User API interface details
Vision_sdk/docs/Arhitecture/VisionSDK_SW_Architecture_Overview.pdf	Overview of software architecture
Vision_sdk/docs/VisionSDK_DevelopmentGuide.pdf	Developer Guide on bios side only, partly relevant for this code

	drop
Vision_sdk/docs/SurroundView/VisionSDK_Overview_SurroundView_Demo.pdf	Refer for all surround view use-cases

2 Setup and Run the Calibration Use cases

VisionSDK_UserGuide_TDA2xx.pdf documents detailed pre-requisites to use Vision SDK, the following sections lists SRV Calibration use case specific requirements.

It is assumed that the user is familiar with the setup required to run the 3D SRV use case.

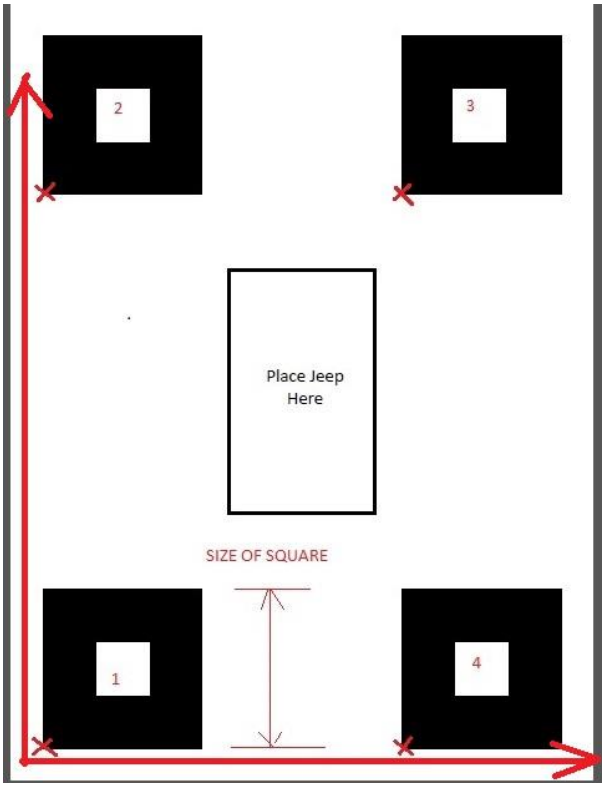
The following 3d SRV Calibration Use case options are available:

2.1 Auto Calibration:

For auto calibration the jeep/car with the four cameras mounted on it is required to be placed at the center of the life size print of the calibration chart. The sample chart 'poster_calib_chart.pdf' is present in '`\vision_sdk\apps\tools\surround_vision_tools\docs\`' directory.

A directory by name 'TDA2X' should be created on the MMC/SD card containing the **CHARTPOS.BIN, LENS.BIN and LENS_2D.BIN** files. This file should have the following format with the **actual dimensions** of the chart used for calibration:

- 4 bytes :Number of cameras
- 124 bytes :Header
- 4 bytes :Size of the square in mm
- 8 bytes :Co-ordinates of the bottom left corner of Chart 1 in mm
- 8 bytes :Co-ordinates of the bottom left corner of Chart 2 in mm
- 8 bytes :Co-ordinates of the bottom left corner of Chart 3 in mm
- 8 bytes :Co-ordinates of the bottom left corner of Chart 4 in mm



The '\vision_sdk\apps\tools\Lens_params' directory contains the lens parameters for the following lens modules:

1. Equisolid : LENS_equisolid_455focallength.BIN
2. Imi : LENS_imi.BIN
3. Sunex : LENS_sunex_dsl218.BIN
4. 2D : LENS_2D.BIN
5. DSL219 with IMX290 sensor: LENS_SunexDSL219_imx290.BIN
6. DSL267 with OV10640 sensor (Newer TDA3X RVP boards): LENS_SunexDSL267_ov10640.BIN

'LENS_2D.BIN' should be copied to TDA3X folder on MMC/SD card.

Based on the lens module used in the system the corresponding LENS_xxx.BIN should be renamed to 'LENS.BIN' and copied to TDA3X folder on MMC/SD card.

A sample CHARTPOS_RUBICON.BIN used for Rubicon jeep is provided at '\vision_sdk\apps\tools\surround_vision_tools\Srv_LUTs\TDA2X'

Assuming that the steps to run the Vision SDK on Linux for TDA2X EVM are followed,

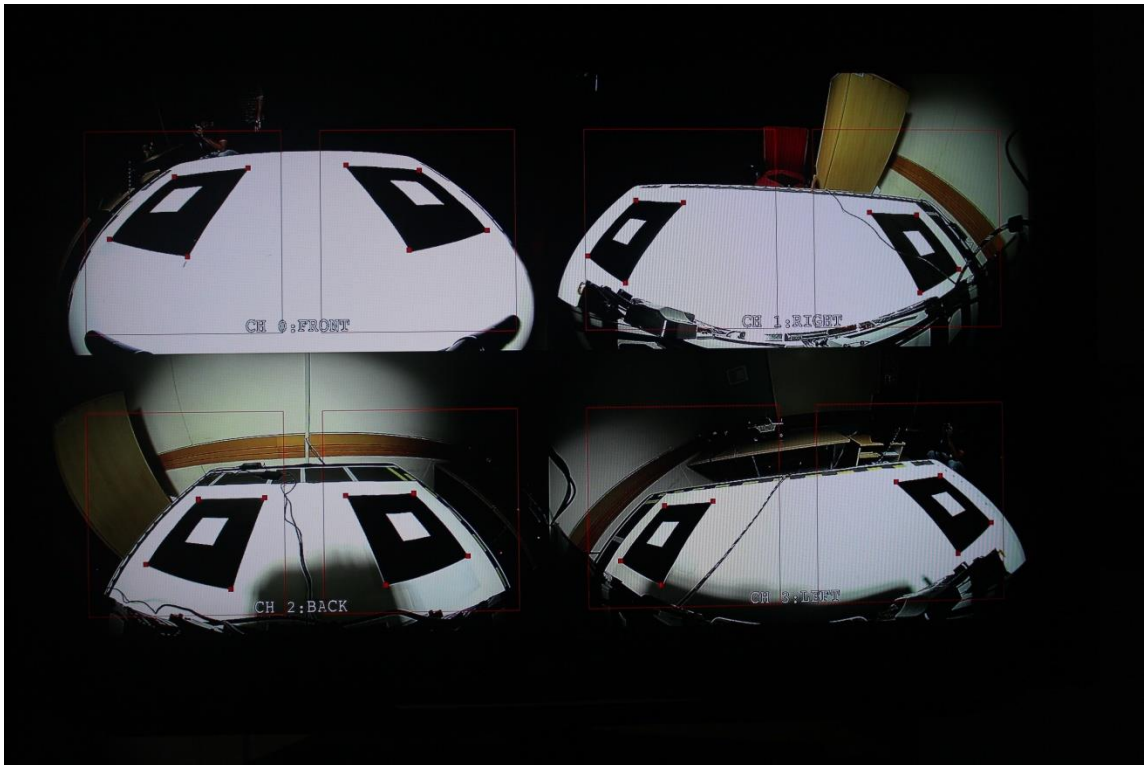
Run the Calibration use case (Option 'e' from Main menu).

The tiled display of the four cameras is displayed on the display device.

Make the following adjustments before starting Auto Calibration (as shown in the below figure):

- The 2 squares of each camera are confined to the 2 ROIs drawn on each tile.
- There is no reflection from the 2 black squares of each tile, otherwise the chart corner detection may fail.

Now select option 'a' to start the Auto Calibration. Once the calibration is completed properly then the corners of the squares detected are shown (as shown in below figure) and visually the correctness of the calibration can be verified. If required rerun the Auto Calibration after making the above said adjustments.



At the end of the Auto Calibration use case, the generated Calibration Matrix is stored in CALMAT.BIN file on MMC/SD card.

Now Calibration use case can be exited by pressing 'x'.

Now 3D SRV use case can be run which utilizes the CALMAT.BIN generated by the Calibration use case and the LENS.BIN file copied to MMC/SD card.

2.2 Maual Calibration:

First of all take the dump of the YUV images from the four cameras using the option 'd' of Calibration use case.

Use the offline PC 3D calibration tool to generate the CALMAT.BIN file. Pl. refer to the VisionSDK_3D_SurroundVision_manual_CalibTool.pdf present in the '`\vision_sdk\apps\tools\surround_vision_tools\3d_calibration_tool`' directory for using the tool.

Copy the generated CALMAT.BIN file to the TDA2X directory on the MMC/SD card.

Run the Calibration use case and select option 'b'.

This calibration option will create the SGX Geometric Alignment LUT using the user provided CALMAT.BIN file and the SGX Geometric Alignment LUT is saved to the '/home/root/.calibtable' file present in the Linux target file system.

Now exit the calibration use.

Now 3D SRV use case can be run which utilizes the CALMAT.BIN generated by the Calibration use case and the LENS.BIN file copied to MMC/SD card.

2.3 Default Calibration:

Start the calibration use case and select the option 'c', this will create the SGX Geometric Alignment LUT using the default cal mat present in the use calibration use case code. Note that this option may not generate the properly calibrated SRV output and should be used only for testing purposes when setting up the Calibration set up is not possible.

Once the default calibration is completed the SGX Geometric Alignment LUT is created and saved to the '/home/root/.calibtable' file present in the Linux target file system.

Now exit the calibration use.

Now 3D SRV use case can be run which utilizes the CALMAT.BIN generated by the Calibration use case and the LENS.BIN file copied to MMC/SD card.

3 Revision History

Version	Date	Revision History
0.1	5th July 2016	Draft
0.2	29th October 2016	Updated for Vision SDK ver 2.11
0.3	29th June 2017	Updated for Vision SDK ver 3.0

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