Vision SDK
Camera Radar Combo Use Cases

User Guide

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1 Introduction

This user guide provides details on how to build and run Camera Radar combo use cases. 2 use cases are provided in the Vision SDK as the followings.

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[IPU1-0]  -------------------------------
[IPU1-0]  1: Camera and Radar Capture +  Radar Processing (DSP1) + Display (HDMI)
[IPU1-0]  2: TIDL OD + Radar Processing + Display (HDMI)
```

The purpose of the first combo use case is to demonstrate how to enable raw data capture from single Camera sensor and single Radar sensor from CSI2 with both sensors connected to single Deserializer (UB960) on 2 separate ports. Camera image and Radar point cloud output are displayed side-by-side.

The purpose of the second use case is to demonstrate how to set up data flow and partition TDA2Px SoC to run Deep Learning algorithm and Radar processing algorithm in parallel. The outputs of both algorithms are displayed on the same screen.

Combining the 2 combo use cases, it illustrates how to utilize the foundation pieces, i.e. drivers and framework, available in Vision SDK to develop Camera Radar Fusion applications and algorithms on TDA2Px Fusion EVM kit.

2 Requirements for Running Camera Radar Combo Use Cases

It is important to make sure the required components are available before trying to run the use cases.

- Hardware Requirements:
    - TDA2Px Fusion EVM Kit from Spectrum Digital. (Link)
    - Sony IMX 390 Camera from D3 Engineering. (Link)
    - TI AWR1243 Satellite Radar Module from D3 Engineering. (Link)
- Input Files for TIDL OD Algorithm

    Refer to the CDDS link (Link) for the videos on TIDL algorithm and Vision SDK TIDL use case.

3 Build and Run Combo use cases

The combo use cases are enabled and run on TDA2Px SoC only.

Build the Vision SDK for TDA2Px BIOS configuration choosing the '*MAKECONFIG?=tda2px_evm_bios_all*' in the Rules.make.

Refer to the '*VisionSDK_UserGuide_TDA2Px.pdf*' for steps on building and running the Vision SDK.

Before running the Vision SDK binary,

- Make sure the following files are present in the MMC/SD card:
    - TIDL OD Network file (NET_OD.bin)
    - TIDL OD Parameter file (PRM_OD.bin)
    - TIDL OD Usecase input data file (inData_OD)
    - TIDL OD Usecase input header file (inHeader_OD)

Refer VisionSDK_UserGuide_TI_DeepLearning.pdf for setting the TIDL demo under same folder

4 Camera and Radar Capture Display Use Case

The Camera and Radar Capture Display use case configures Deserializer UB960 to receive data from D3 IMX390 Camera module with Serializer UB953 at Port0 and D3 Satellite Radar module with Serializer UB953 at Port1. Port0 will be mapped to Virtual Channel0 and Port1 to Virtual Channel1 of the CSI2. Once sensor raw data is captured by IssCapture_Link, CSI2 VC0 data will be assigned to Ch0 and VC1 to Ch1 in Link Framework. Ch0 with image data will then be processed by ISP and Ch1 with radar data will be processed by Radar Process algorithms on DSP1/EVE1. Both camera and radar output will be sent to separate video pipelines and displayed on the monitor via HDMI output.

The system block diagram of the use case is shown as the followings.
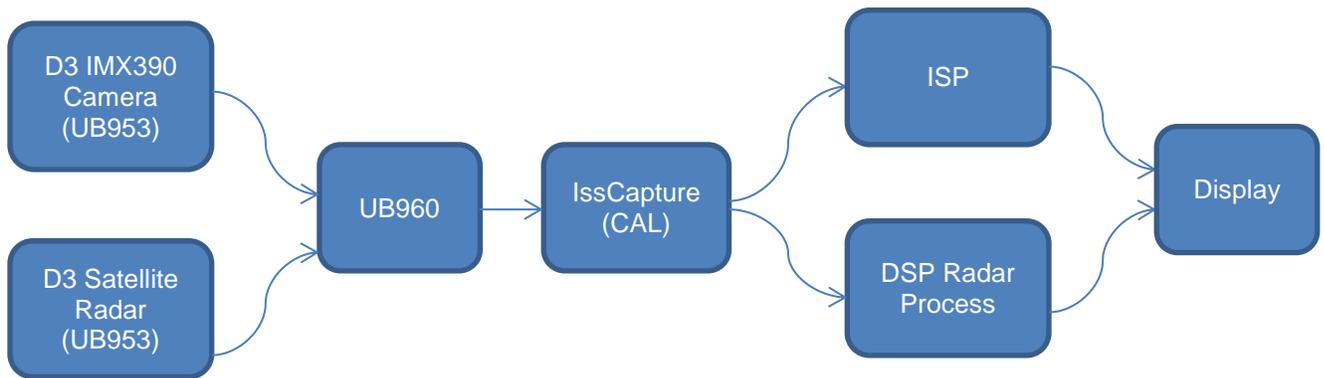
Refer to the below figure for the connection of the sensor modules. Camera module should be connected to Cam0 connector and Radar module to Cam1.
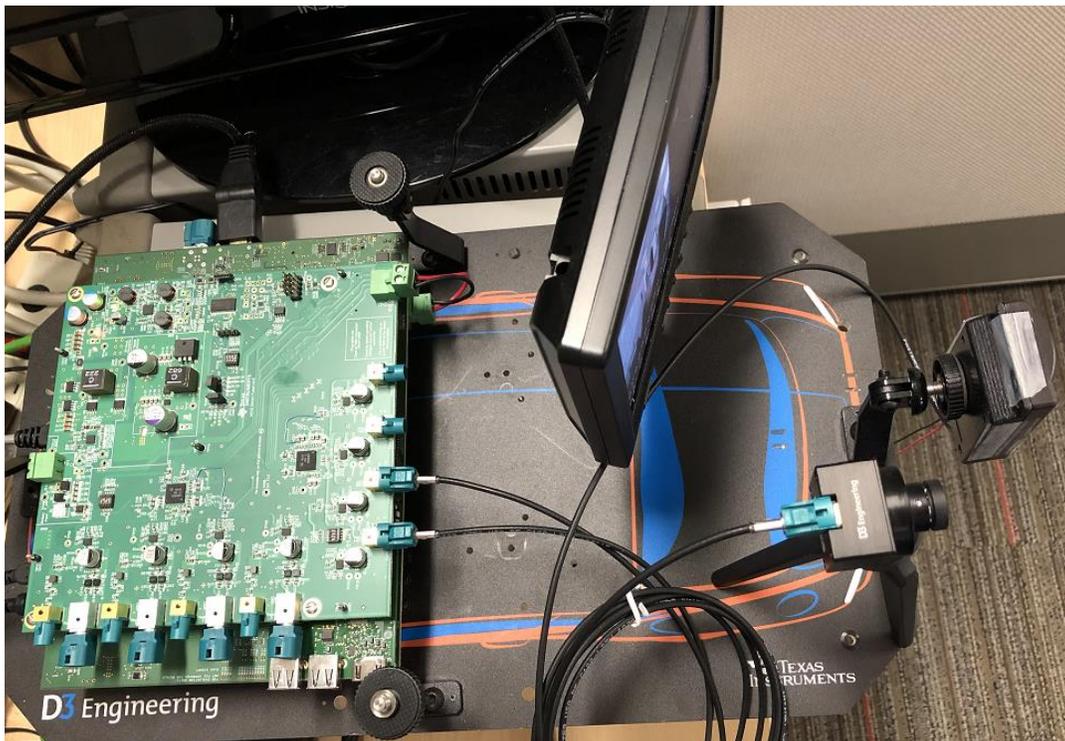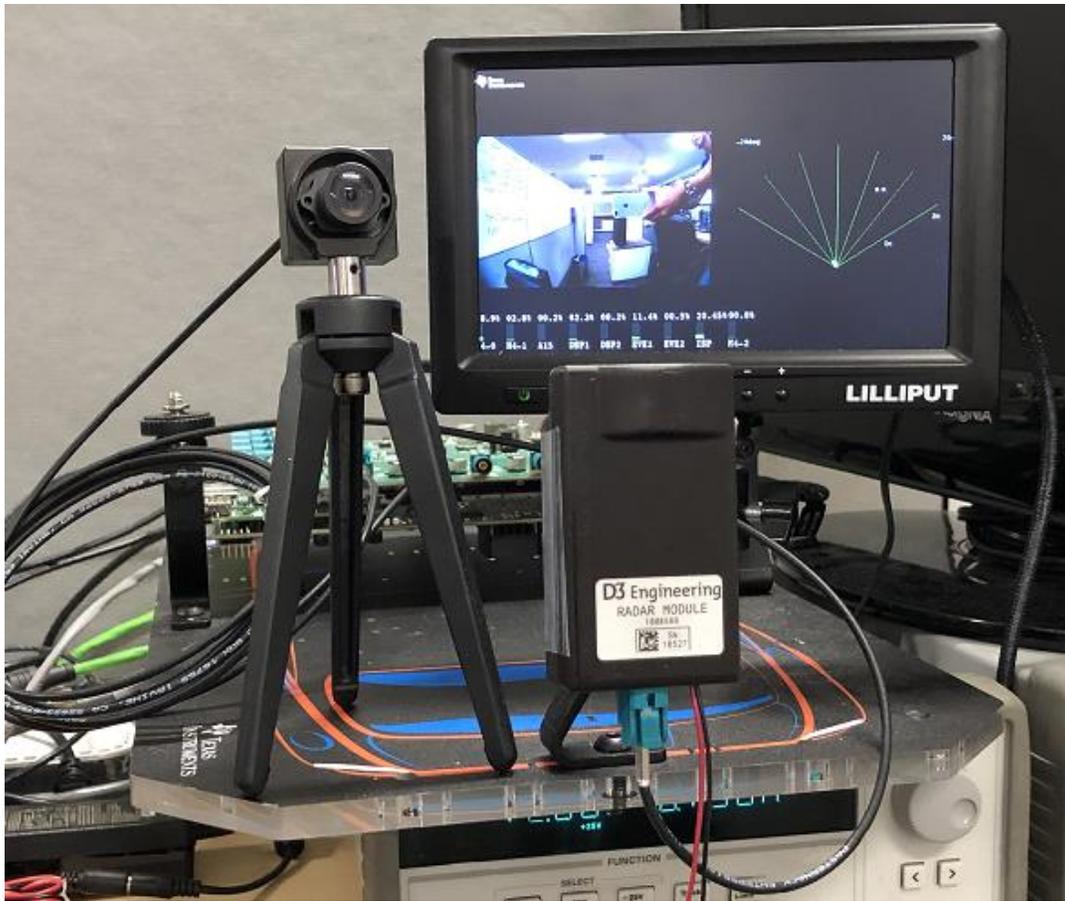
To run the use case, select option 'g' from Main Menu and then '1' in Use Case Menu.

```
[IPU1-0]  Vision SDK Usecases,
[IPU1-0]  -------------------
[IPU1-0]  1: Single Camera Usecases
[IPU1-0]  2: Multi-Camera LVDS Usecases
[IPU1-0]  3: AVB RX Usecases, (TDA2x & TDA2Ex ONLY)
[IPU1-0]  4: Dual Display Usecases, (TDA2x EVM ONLY)
[IPU1-0]  5: ISS Usecases, (TDA3x ONLY)
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[IPU1-0]  s: System Settings
[IPU1-0]
[IPU1-0]  x: Exit
[IPU1-0]
[IPU1-0]  Enter Choice:
[IPU1-0]
[IPU1-0]     14.357744 s:
[IPU1-0]     14.357896 s:
[IPU1-0]
[IPU1-0]  Camera and Radar Combo Use Cases
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[IPU1-0]  1: Camera and Radar Capture +  Radar Processing (DSP1) + Display (HDMI)
[IPU1-0]  2: TIDL OD + Radar Processing + Display (HDMI)
[IPU1-0]
[IPU1-0]  x: Exit
[IPU1-0]
[IPU1-0]  Enter Choice:
```

5   TIDL OD and Radar Processing Use Case

The TIDL OD runs on EVE and DSP cores. Refer to *'VisionSDK_UserGuide_TI_DeepLearning.pdf'* for detail.

To run the use case, select 'g' -> '2'.

File Read → TIDL Pre Process → TIDL OD on EVE2/DSP2 → Display

D3 Satellite Radar (UB953) → UB960 → IssCapture (CAL) → DSP Radar Process on DSP1/EVE1 → Display
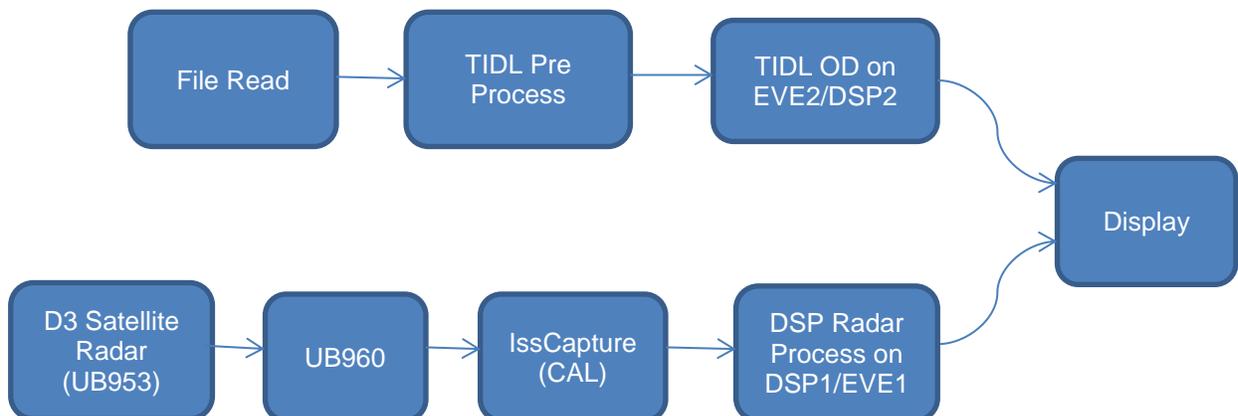
6   Revision History

Version	Date	Revision History
0.1	Jun 25, 2018	Draft
0.2	Jun 27 2018	Reviewed and added reference to TIDL demo UG for setting-up Deep learning demos

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