Object Classification: Video Stream Analysis Demonstration

User Guide

FPGA-UG-02180-1.2

November 2024

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
FPS	Frames Per Second
NNC	Neural Network Compiler
SPI	Serial Peripheral Interface
USB	Universal Serial Bus

1. Introduction

This document describes how to set up and run the Object Classification: Video Stream Analysis Demonstration, which uses the Lattice Avant™-E Evaluation Board Rev. D.

2. Functional Description

Figure 2.1 shows the Lattice Avant-AT-E Evaluation Board, which is used in this demo.

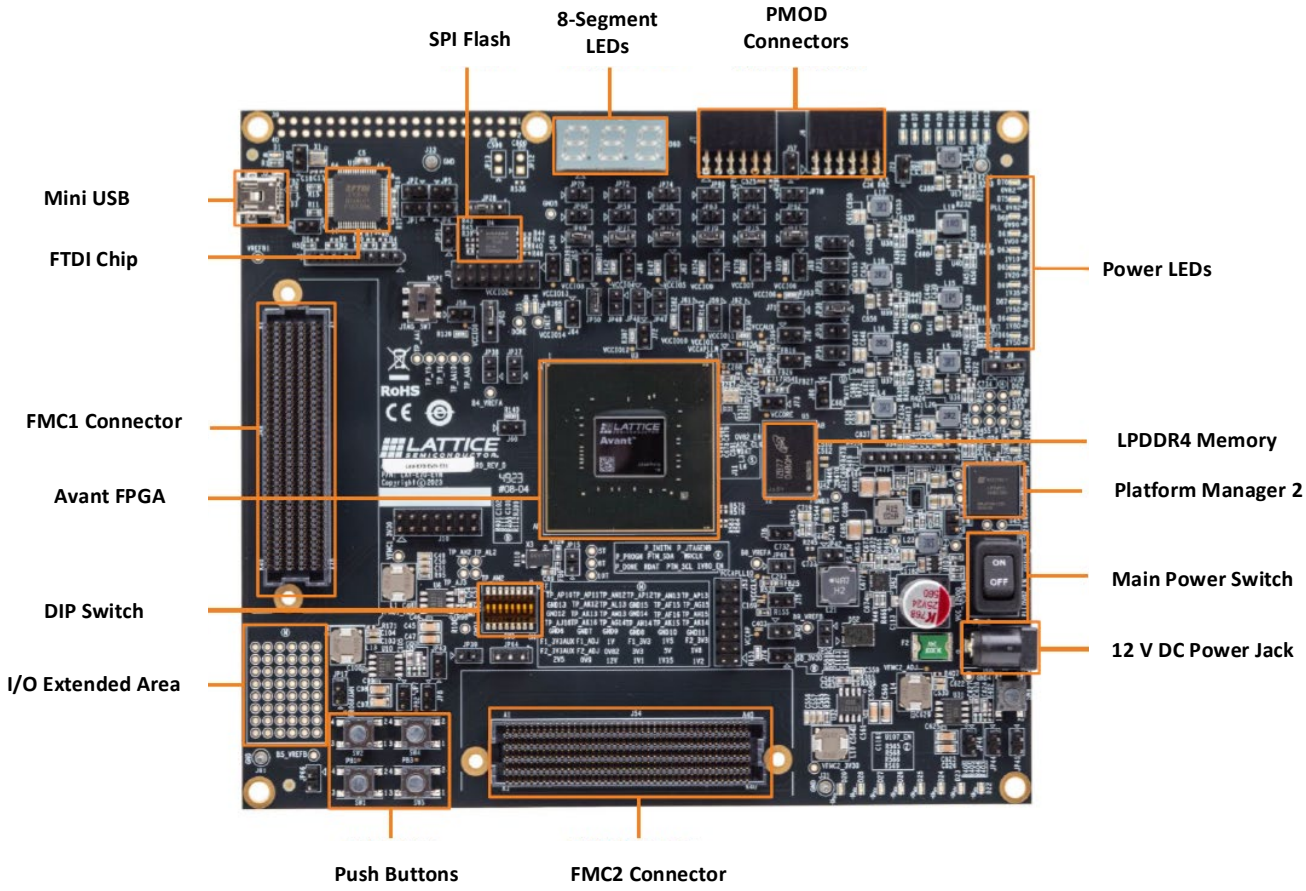

Figure 2.1. Lattice Avant-AT-E Evaluation Board

2.1. Hardware Requirements

This section shows the hardware required for this design and how they are connected.

- Lattice Avant-AT-E Evaluation Board Rev. D, as shown in Figure 2.1.
- USB type A programming cable , as shown in Figure 2.2.

Figure 2.2. Lattice USB programming cable – HW-USBN-2B

- ALINX FL9134: HDMI Input/Output FMC Daughter Board, as shown in Figure 2.3.

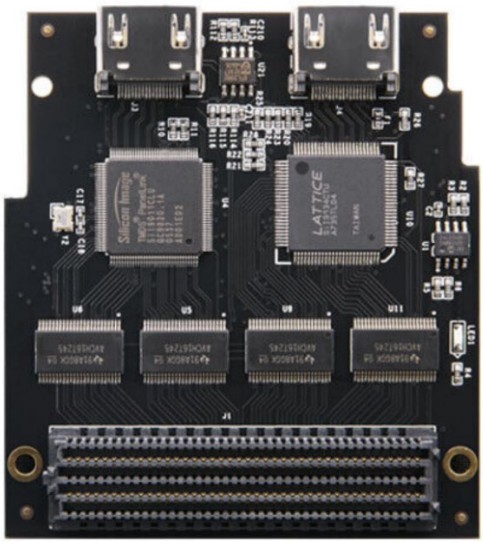

Figure 2.3. Top View of ALINX FL9134: HDMI Input/Output FMC Daughter Board

- AGPTEK live streaming media player, as shown in Figure 2.4.

Figure 2.4. WD TV Live Streaming Media Player

- USB flash drive to store demo video for detection
- Display device (monitor) with HDMI support and 1080p support
- Two HDMI cables

2.2. Software Requirements

- Lattice Radiant™ Programmer version 2024.1. Refer to http://www.latticesemi.com/latticeradiant.

3. Setting up the Demo

Figure 3.1 shows the overall demo setup.

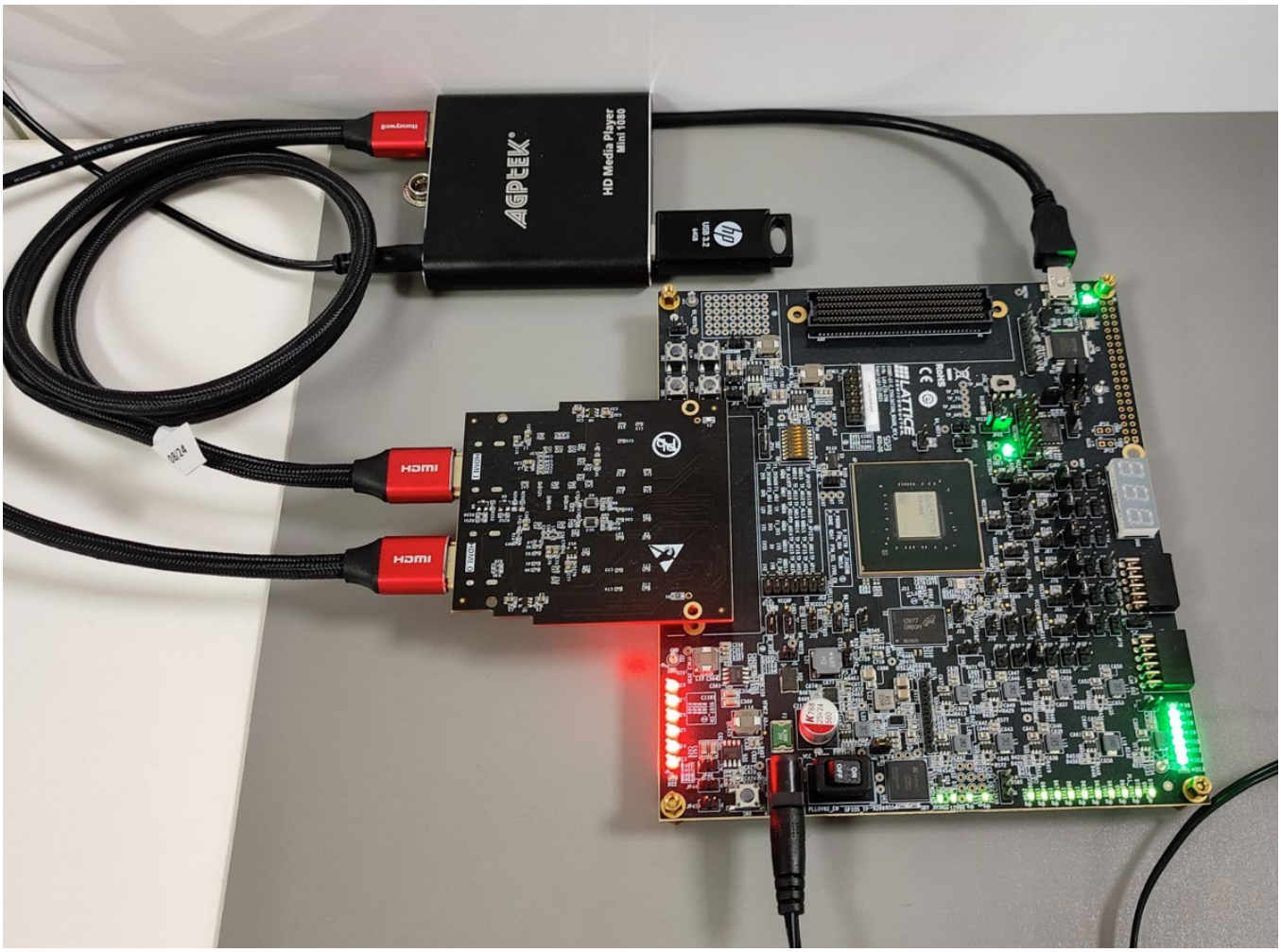

Figure 3.1. Overall Demo Setup

To set up the demo:

1. Connect the 12V power adapter to J50.
2. Connect the Mini-USB Type-A cable from PC to J2.
3. Set jumpers on JP1 and JP2 switches to pins 1 and 2 to enable UART.
4. Leave the JP3 jumper open.
5. Connect the Alinx FL9134 board to the J54 FMC connector of the Avant-AT-E Evaluation Board by connecting the jumper on JP28 to pins 2 and 3.
6. Connect the input HDMI port of the Alinx FL9134 board to the HDMI port of the AGPTEK media streaming player using a HDMI cable.
7. Copy the demo video from demo package folder to USB flash drive and insert it into the USB port of the media streaming player.
8. Connect the output HDMI port of the Alinx FL9134 board to your display device using an HDMI cable.
9. We will use a USB Type-A cable to program the bit file and bin files onto the Avant board's SPI flash.

4. Demo Package Folder Structure

As shown in Figure 4.1, the demo folder contains one binary file and a one-bit file.

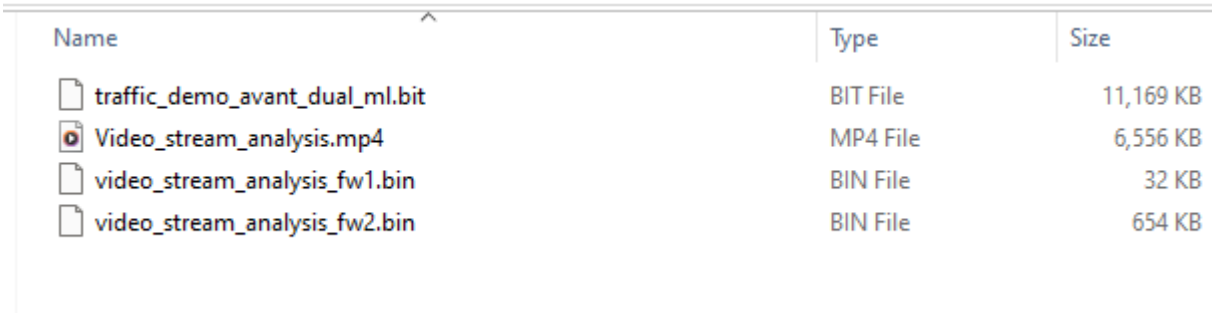

Figure 4.1. Demo Package Folder Structure

5. Programming the Demo

5.1. To program the SPI flash of the Avant-AT-E Evaluation Board:

1. Keep the SW7 switch to JTAG position
2. Power up the Avant-AT-E Evaluation Board.
3. Launch Lattice Radiant Programmer.
4. In the **Getting Started** dialog box, select **Create a new blank project**, as shown in Figure 5.1.
5. Click **OK**.

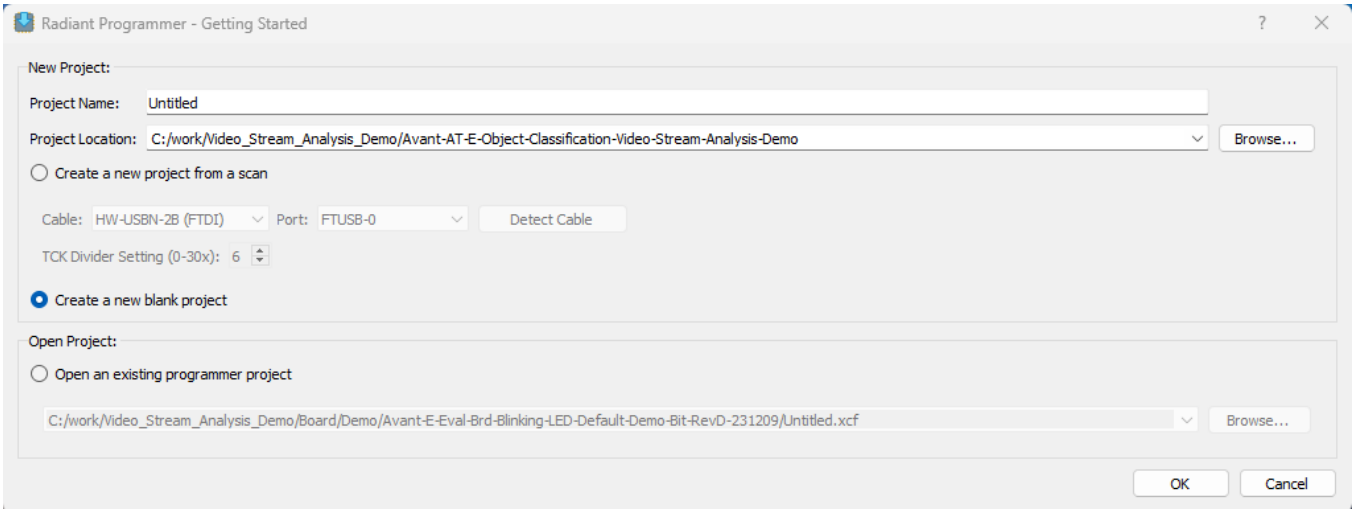

Figure 5.1. Lattice Radiant Programmer – New Project

6. In the main interface, select **Device Family** as **LAV-AT_ENG,** also select the **Device** as **LAV-AT-E70ES1** then double click on **Fast Configuration** in **Operation** tab.

7. In the next pop-up window select the settings as shown in Figure 5.2.

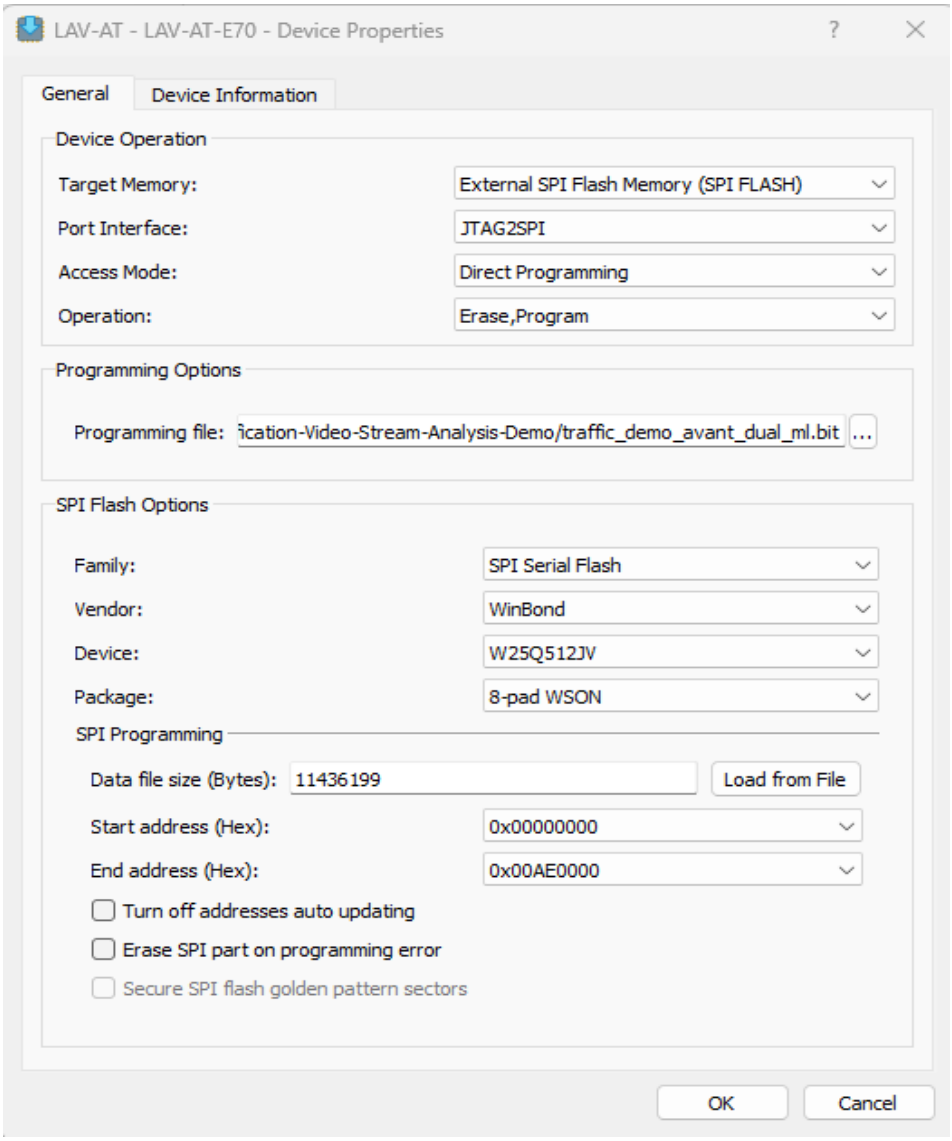

Figure 5.2. Lattice Radiant Programmer –Programming bit file

a. **Target Memory** – External **SPI Flash Memory (SPI FLASH)**
b. **Port Interface** – **JTAG2SPI**
c. **Access Mode** – **Direct Programming**
d. **Operation** – **Erase, Program**
e. **Programming file -** locate and select the *.bit* file provided in the demo package folder
f. **Family – SPI Serial Flash**
g. **Vendor – WinBond**
h. **Device – W25Q512JV**
i. **Package – 8-pad WSON**
j. **Start address – 0x00000000**
k. **End Address – 0x00AE0000**

8. Click **OK**.
9. In the Lattice Radiant Programmer main interface, click the **Program** button to start the programming operation.
10. After the operation is completed, an **Operation: successful** message is displayed in the **Output** console, as shown in Figure 5.3.

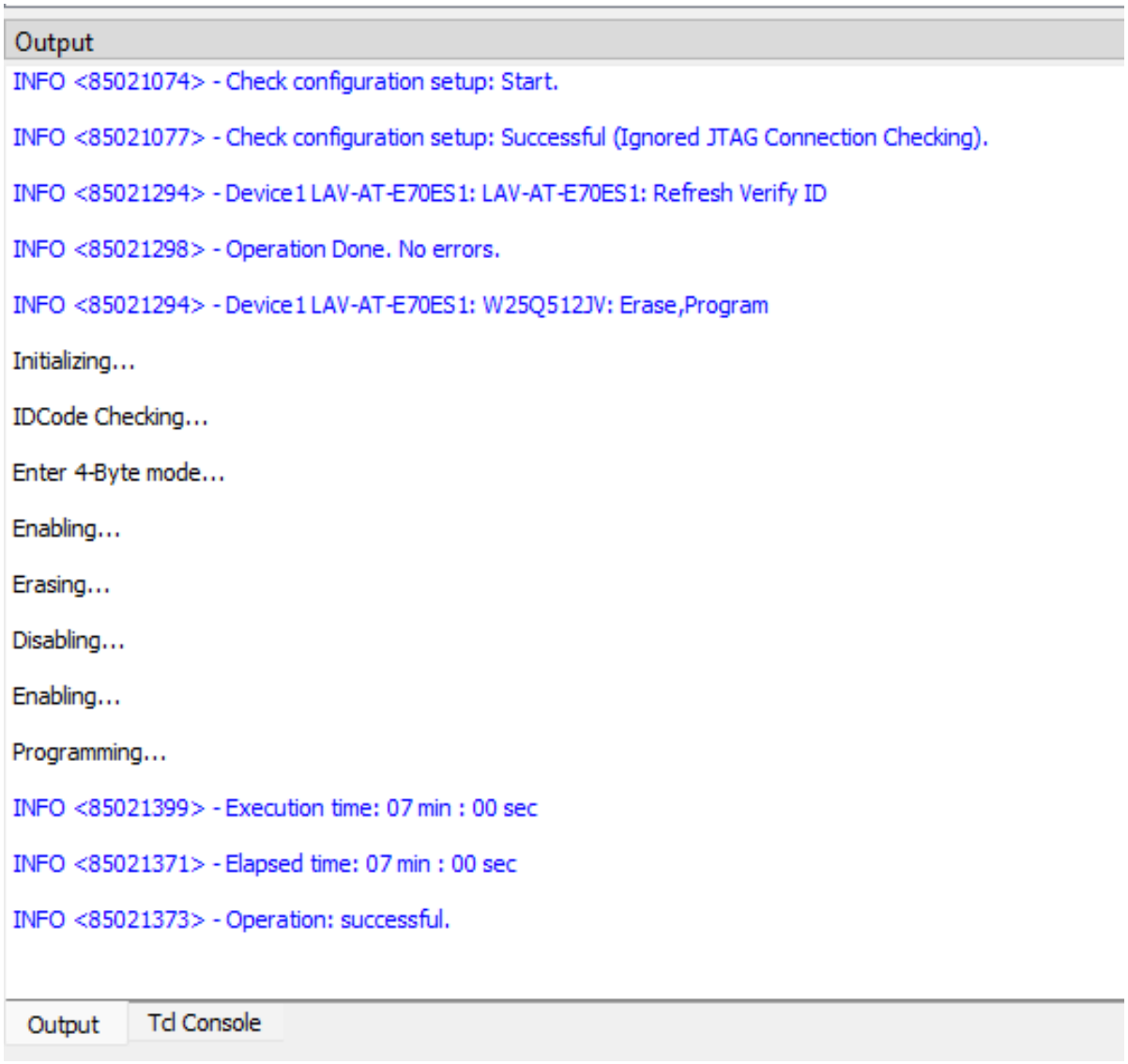

Figure 5.3. Lattice Radiant Programmer – Output Console

11. Now again, double click on **Fast Configuration** in **Operation** tab, configure the options as shown in Figure 5.4.

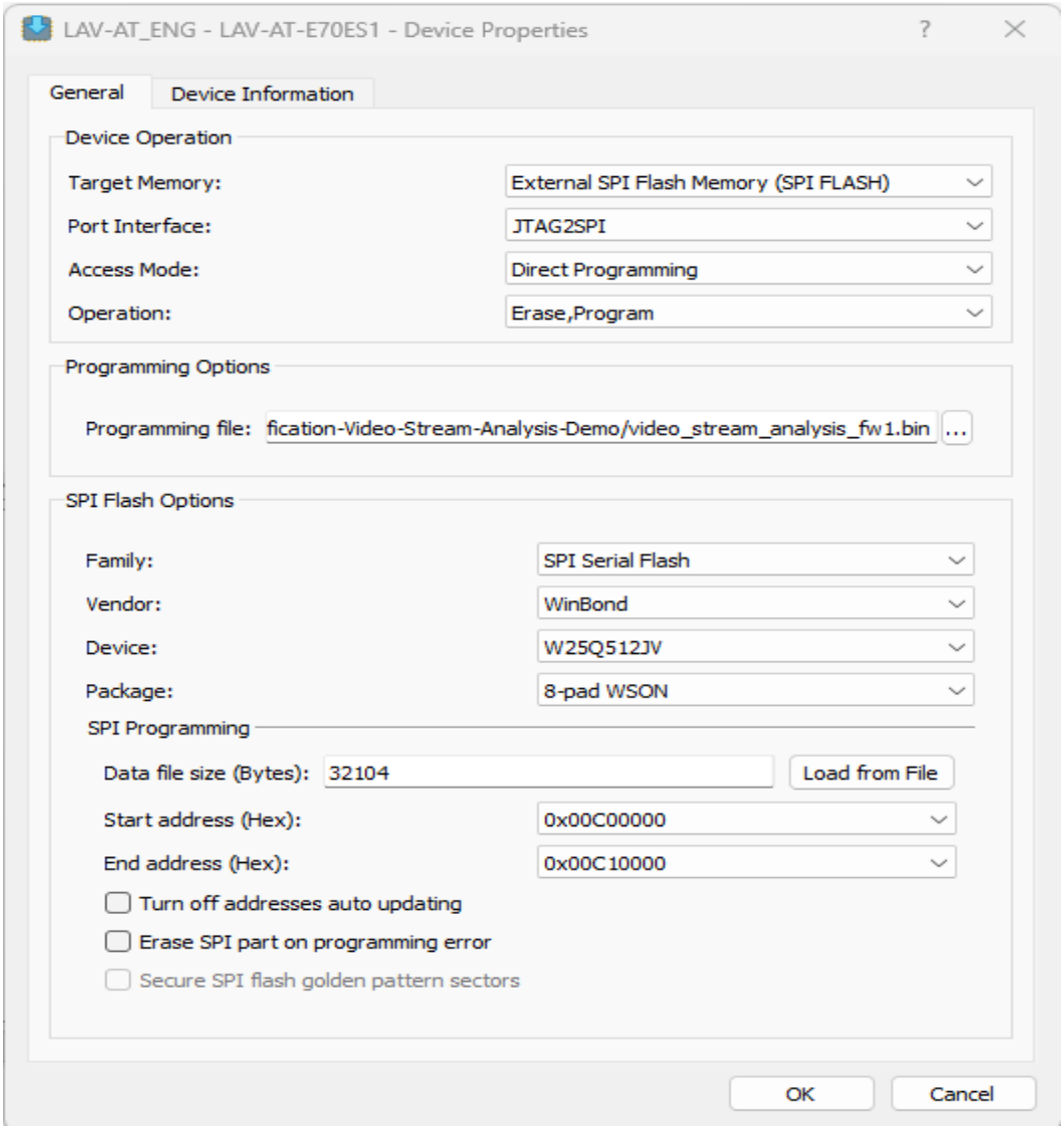

Figure 5.4. Lattice Radiant Programmer –Programming fw1.bin file

a. **Target Memory –** External SPI Flash Memory (SPI FLASH)
b. **Port Interface** – JTAG2SPI
c. **Access Mode** – Direct Programming
d. **Operation** – Erase, Program
e. **Programming file –** Locate and select the **video_stream_analysis_fw1.bin** from the demo package folder
f. **Family –** SPI Serial Flash
g. **Vendor –** WinBond
h. **Device –** W25Q512JV
i. **Package –** 8-pad WSON
j. **Start address –** 0x00C00000
k. **End Address –** 0x00C10000

12. Click **OK**.
13. In the Lattice Radiant Programmer main interface, click the **Program** button to start the programming operation.
14. After the operation is completed, an **Operation: successful** message is displayed in the **Output** console, as shown in Figure 5.3.
15. Now again, double click on **Fast Configuration** in **Operation** tab, configure the options as shown in Figure 5.5

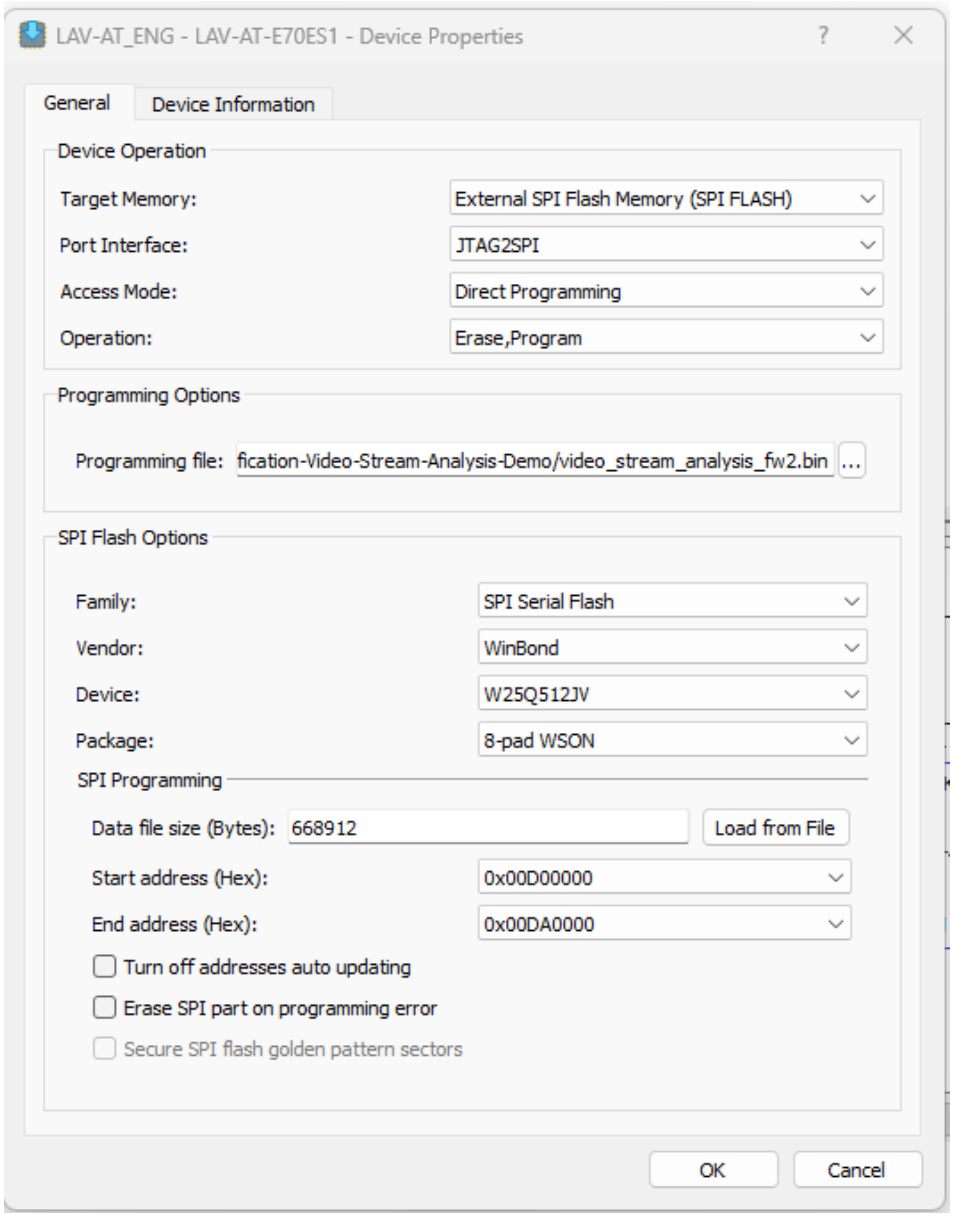

Figure 5.5. Lattice Radiant Programmer –Programming fw2.bin file

a. **Target Memory** – External SPI Flash Memory (SPI FLASH)
b. **Port Interface** – JTAG2SPI
c. **Access Mode** – Direct Programming
d. **Operation** – Erase, Program
e. **Programming file** – Locate and select the **video_stream_analysis_fw2.bin** from the demo package folder

f. **Family** – SPI Serial Flash
g. **Vendor** – WinBond
h. **Device** – W25Q512JV
i. **Package** – 8-pad WSON
j. **Start address** – 0x00D00000
k. **End Address** – 0x00DA0000

16. Click **OK**.
17. In the Lattice Radiant Programmer main interface, click the **Program** button to start the programming operation.
18. After the operation is completed, an **Operation: successful** message is displayed in the **Output** console, as shown in Figure 5.3.
19. Power off the Avant-AT-E Evaluation board.

5.2. To boot FPGA off SPI Flash:

1. Move Switch SW7 to MSPI setting.
2. Power on the board. (It can take ~1min for the device to load off the flash)

6. Running the Demo

The demo may be run after completing the procedures in the Setting up the Demo and Programming the Demo sections.

To run the demo:

1. Power up the display device and media streaming device player and start streaming the sample video.

Note: Make sure to stream the video in 1080p resolution and at 60 FPS.

2. While the video is streaming on the display device, detection boxes appear, as shown in Figure 6.1.

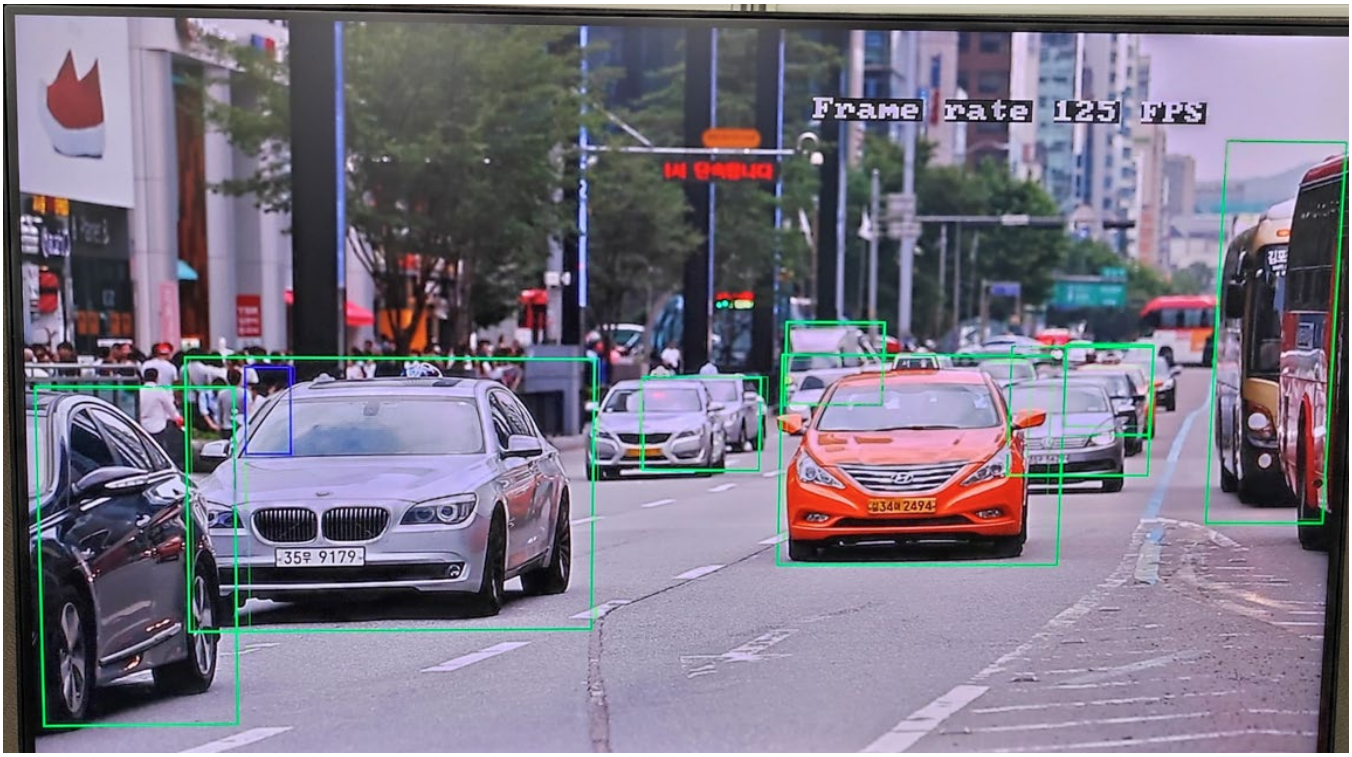

Figure 6.1. Detection of Cars in Sample Video

The green boxes detect the cars, and blue boxes detect the humans in the sample video.

References

For complete information on the Lattice Radiant Project-Based Environment, Design Flow, Implementation Flow and Tasks, as well as on the Simulation Flow, refer to the Lattice Radiant software user guide.

- Avant-E web page
- Lattice sensAI Stack web page
- Lattice Radiant Software web page
- Lattice Insights for Lattice Semiconductor training courses and learning plan.

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

For frequently asked questions, refer to the Lattice Answer Database at https://www.latticesemi.com/Support/AnswerDatabase.

Revision History

Revision 1.2, November 2024

Section	Change Summary
All	Made editorial fixes.
Disclaimers	Updated the boilerplate.
Functional Description	• Updated the Figure 2.1. Lattice Avant-AT-E Evaluation Board, Figure 2.2. Lattice USB programming cable – HW-USBN-2B and Figure 2.4. WD TV Live Streaming Media Player.
Setting up the Demo	• Updated Figure 3.1. Overall Demo Setup • Updated the procedure to setup the demo
Demo Package Folder Structure	Updated the Figure 4.1. Demo Package Folder Structure.
Programming the Demo	• Updated the Figure 5.1. Lattice Radiant Programmer – New Project, Figure 5.2. Lattice Radiant Programmer –Programming bit file, Figure 5.3. Lattice Radiant Programmer – Output Console, Figure 5.4. Lattice Radiant Programmer –Programming fw1.bin file and Figure 5.5. Lattice Radiant Programmer –Programming fw2.bin file. • Updated the procedure for programming the SPI flash of the Avant-AT-E Evaluation Board.
Running the Demo	Updated the Figure 6.1. Detection of Cars in Sample Video.

Revision 1.1, December 2023

Section	Change Summary
Disclaimers	Updated with the latest disclaimers.
Acronyms in This Document	• Added SPI. • Removed CRAM and SD.
Functional Description	• Added 'USB programming cable – HW-USBN-2B' and 'ALINX FL9134: HDMI Input/Output FMC Daughter Board' to the Hardware Requirements section. • Removed Lattice Avant evaluation FMC HyperRAM card, Alinx 1080P HDMI I/O module, microSD card, AiTrip MicroSD card module, and miniUSB cable from the Hardware Requirements section. • Removed Win32 Disk Imager tool from the Software Requirements section. • Updated the Lattice Radiant Programmer version from 2022.1 to 2023.1 in the Software Requirements section.
Setting up the Demo	Updated this section
Demo Package Folder Structure	Updated the Figure 4.1. Demo Package Folder Structure.
Programming the Demo	Updated the procedure for programming the SPI flash of the Avant-AT-E Evaluation Board.
Running the Demo	Updated the Figure 6.1. Detection of Cars in Sample Video.
References	Newly added section.

Revision 1.0, March 2023

Section	Change Summary
All	Initial release.

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