AI Navigator V1.1.0

Release Note

Introduction

This document describes the contents of AI Navigator V1.1.0, such as changes from the previous version (V1.0.0), restrictions and so on. Please read this document before using.

Please also read the AI Navigator Quick Start Guide too for the installation and usage.

Contents

1. About AI Navigator

1.1 Summary

AI Navigator is one of several plugins which operate under the e^2 studio integrated development environment.

When using AI (Artificial Intelligence) embedded system development, this product allows to integrate and operate the various functions needed to develop AI. This shortens the development period.
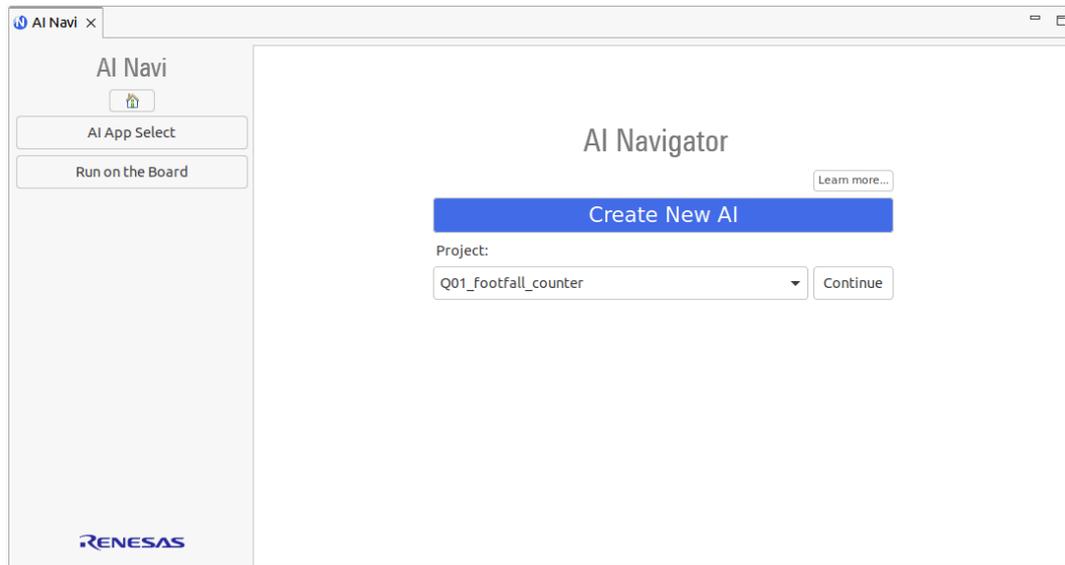
Figure 1-1   AI Navigator Home

- Supports selecting the AI application from AI Application Zoo and downloading the corresponding e^2 studio projects. It makes AI development starting easy.
- Supports the transfer learning feature. Allows customization of AI models for supported AI applications with their own datasets.
- Supports for conversion of AI models to executable files. The tool for RZ/V allows conversion to DRP-AI executable code using TVM.

1.2 Target Plugin

- Renesas AI Navigator (Renesas AI Framework) V1.1.0
- AI Transfer Learning Tool Plugin (RZ/V AI TLT) V1.1.0 *Plugin for Transfer Learning Tool
- AI Model Conversion Tool Plugin (DRP-AI TVM Tool) V1.1.0 *Plugin for TVM Tool

Note: From here on, each of the above plugin names is described as follows.
  ⎯ AI Navigator Plugin
  ⎯ AI TLT Plugin
  ⎯ TVM Plugin

1.3 Supported Environment

- Ubuntu 20.04 LTS
- e² studio 2024-04 (or later) Linux Host

1.4 Supported MCU, MPU

RZ family

- RZ/V Series RZ/V2L, RZ/V2H group

1.5 AI Navigator Quick Start Guide

Please read the AI Navigator Quick Start Guide to learn how to install and use AI Navigator.

(URL) https://renesas-rz.github.io/rzv_ai_sdk/latest/ainavi_quick_start_guide

2. Changes

This chapter explains the changes of each plugin from the previous version.

2.1 AI Navigator Plugin

Table 2-1 Changes (AI Navigator Plugin)

Items	Change details	
	Previous version (V1.0.0)	**This version (V1.1.0)**
Plugin version	AI Navigator Plugin v1.0.0	AI Navigator Plugin v1.1.0
Supported devices	RZ/V2L	RZ/V2L, RZ/V2H
Toolchain registration	Required to register the appropriate toolchain manually after completing the [Start Settings…] process in Application Edit.	The appropriate toolchain is registered automatically after completing the [Start Settings…] process in Application Edit.
Button name	(AI Navigator menu) • AI Application/Model Select	(AI Navigator menu) • AI App Select
	(Project information) • Set the downloaded folder	(Project information) • Set the folder
	(AI information) • Edit Application and Build • Edit Model, Transfer Learning	(AI information) • Edit and Build • Transfer Learning
	(AI Application) • Edit Source Code	(AI information) • Edit
	(Debug Settings) • Copy App (Run config)	(Debug Settings) • Copy App
Error message	When you select an AI application that does not support RZ/V AI TLT and click each button on Train AI view, the following error message appears: "No executable transfer learning plug-ins were found."	For the case described in the left cell, the following messages will appear. • When clicking [Start Settings…] on Train AI view: "Failed to start setting of transfer learning. This project is unsupported." • When clicking [Transfer Learning…] on Train AI view: "Failed to start transfer learning. This project is unsupported."
AI Navigator Help page	-	• Incorporated the contents of v1.1.0. • Added the link for AI Model Conversion Tool Help page.
Perspective	-	Supported Renesas AI perspective.
Process dialog	-	Show the details on the process dialogs for build settings, AI/App copy, and so on.
Tool design	-	• Added icons for each button. • Changed the design of the home page. • Fixed the combo box. • Fixed the scroll bar.

2.2 AI TLT Plugin

Table 2-2 Changes (AI TLT Plugin)

Items	Change details	
	Previous version (V1.0.0)	**This version (V1.1.0)**
Plugin name & version	RZ/V AI TLT Plugin v1.0.0	AI Transfer Learning Tool Plugin v1.1.0
Installation of the RZ/V AI Transfer Learning Tool for a PC with GPU	When installing the RZ/V AI Transfer Learning Tool on a PC with GPUs, the GPU may not be detected correctly, and the installation may be configured to use only the CPU.	You can install RZ/V AI TLT with proper configuration even when using a PC with GPU.

2.3 TVM Plugin

Table 2-3 Changes (TVM Plugin)

Items	Change details	
	Previous version (V1.0.0)	**This version (V1.1.0)**
Plugin name & version	RZ/V AI TLT Plugin v1.0.0	AI Transfer Learning Tool Plugin v1.1.0
Supported devices	RZ/V2L	RZ/V2L, RZ/V2H
Environment settings	Restrictions on environment settings. * The following numbers indicate the chapter number in the V1.0.0 release note. • 3.2.2 Cancelling during the Setup environment function • 3.2.3 Docker image name created in the setup environment function	Fixed items described in the left cell content. • You can cancel during the setup environment. • You can change the name of the Docker image used in the setup environment.
Input models other than image format	Restrictions on input model files for conversion. * The following numbers indicate the chapter number in the V1.0.0 release note. • 3.2.4 Input way models other than in image format	You can convert input models other than image format.
Preprocess settings	Restrictions on preprocess settings. * The following numbers indicate the chapter number in the V1.0.0 release note. • 3.2.6 Saving pre-treatment settings • 3.2.7 Output file directory for pre-processing settings	Removed these restrictions described in the left cell.
Feature of sample code generation	Restrictions on the feature of sample code generation. * The following numbers indicate the chapter number in the V1.0.0 release note. • 3.2.5 Cases where the sample code generation function cannot be used	You can generate a sample code even if you skip preprocessing. *Please refer to 3.1.10 too for the feature of sample code generation.
View name	Project setting	Input file setting
Button name	(On Conversion view) • Check translation script • Start DRP-AI translation	(On Conversion view) • Check conversion script • Start conversion

Quantization Setting *RZ/V2H only	-	You can configure the following setting regarding quantization. • Calibration data for quantization • Parameters (mean and standard deviation) for quantization *Refer to the AI Model Conversion Tool help page to learn how to quantize with this tool.
AI Model Conversion Tool Help page	-	Incorporated the contents of v1.1.0.

3. Notes / Restrictions

This section describes the usage considerations and restrictions for each plugin in this release.

3.1 Usage Considerations

The following items are new usage considerations in this release.

- 3.1.1 [AI TLT Plugin] Installation time
- 3.1.6 [AI TLT Plugin] Supported AI applications
- 3.1.7 [AI TLT Plugin] Changing the name of e^2 studio project
- 3.1.8 [TVM Plugin] Setup the environment
- 3.1.10 [TVM Plugin] Sample code generation

3.1.1 [AI TLT Plugin] Installation time

Installation of the RZ/V AI Transfer Learning Tool (hereafter referred to as RZ/V AI TLT) may take some time depending on network conditions.

3.1.2 [AI TLT Plugin] Interruption during installation

If you cancel the RZ/V AI TLT installation by clicking "Cancel" during the RZ/V AI TLT installation by clicking [Start Settings...] in the AI Navigator. The installation result up to the point of interruption remains as it is. To complete the installation, click [Start Settings...] again and continue the installation to the end.

3.1.3 [AI TLT Plugin] Operation when reinstalling

After installing the RZ/V AI TLT from the AI Navigator, clicking [Start Settings...] will start the reinstallation process, but an error will occur due to the installation of the Docker container. If the reinstallation is interrupted, the operation of the RZ/V AI TLT is not affected.

3.1.4 [AI TLT Plugin] Individual installation

When installing RZ/V AI TLT by clicking [Start Settings...] or launching RZ/V AI TLT using te [Transfer Learning...] on AI Navigator, installation and starting may not be successful if RZ/V AI TLT itself has already been installed separately. If you have already installed RZ/V AI TLT individually, please remove the existing Docker container.

3.1.5 [AI TLT Plugin] End of transition learning tools through dialogue

If you click the cancel button in the modal dialog while the RZ/V AI TLT is being started by clicking [Cancel], the RZ/V AI TLT will also be terminated. In addition, the function for automatically inputting the ONNX model obtained as a result of transition learning by the RZ/V AI TLT into the DRP-AI TVM Plugin may not work.

3.1.6 [AI TLT Plugin] Supported AI applications

The following AI applications do not support transfer learning by RZ/V AI TLT. The e^2 studio project for these AI applications cannot launch RZ/V AI TLT by clicking [Transfer Learning...].

- RZ/V2L AI Applications: Q02, Q05, Q10, Q11
- RZ/V2H AI Applications: All (Q01, Q08, 01, 02, 07, 11)

When you click [Transfer Learning...] in these application projects, the error message "No executable transfer learning plug-ins were found" is displayed. RZ/V AI TLT may support these applications in the future.

3.1.7 [AI TLT Plugin] Changing the name of e^2 studio project

Do not change the e^2 studio project name from the default. If you change the e^2 studio project name, RZ/V AI TLT cannot be started with the error "Failed to check the RZ/V AI TLT service. Please setup the RZ/V AI TLT properly".

3.1.8   [TVM Plugin] Setup the environment

If you click [Start Settings...] without specifying the directory path of the downloaded RZ/V AI SDK zip file, the warning window indicating that the directory path has not been specified appears. Click [Start Settings...] again after specifying the directory path.

Also, setting up the environment for TVM Plugin may take some time depending on network conditions.

3.1.9   [TVM Plugin] Open and Close the TVM GUI tool

Open TVM plugin GUI only when converting models.

If you keep opening TVM plugin GUI during another process, the correct directory/file path would not be set. (For example, RZ/V AI SDK directly downloaded path and the trained AI model file path from RZ/V AI TLT.)

3.1.10 [TVM Plugin] Sample code generation

The sample code generation function in TVM Plugin supports only RZ/V2L, and the input model must be image format. Other format input model such as Multi-layer perceptron (1D and other model) is not supported.

3.1.11 [AI Navigator Plugin] Notes on the Run on the Board

If you click the [Create a bootable disk] on the Run on the Board screen without specifying the directory path where the RZ/V AI SDK zip is downloaded in the AI App view, you will be prompted to specify the download destination directory path.
After specifying the directory path, click the [Create a bootable disk...] button again. After specifying the directory path, click the [Create a bootable disk...] button again.

3.2   Functional Restrictions

The following items are new usage considerations in this release.

- 3.2.2 [TVM Plugin] The default preprocessing setting is cleared with the trained AI model file
- 3.2.3 [TVM Plugin] Percentile value in the advanced quantization setting
- 3.2.4 [TVM Plugin] Multiple input AI model conversion

3.2.1   [AI TLT Plugin] Transfer learning in AI applications including multiple AI models

The following RZ/V AI applications cannot start the transition learning tool (RZ/V AI TLT) because the downloaded e^2 studio project and the directory name expected by the transition learning tool do not match.

— Q08_object_counter (Animal Counting)
— Q08_object_counter (Vehicle Counting)

When clicking [Transfer Learning...] in this application project, the error message "Failed to check the RZ/V AI TLT service. Please setup the RZ/V AI TLT properly.

Workaround:
After importing the above application on AI Navigator, perform the following operations.

> 1. In RZ/V AI TLT project folder (<Path to e^2 studio installation directory>/../rzv_ai_tlt/v2.10/tlt_backend/assets/), create "Q08_object_counter_animal" or "Q08_object_counter_vehicle" folder.

> 2. Copy the following files from Q08_object_counter folder in RZ/V AI TLT project folder.

> ・Q08_object_counter_animal

> > - config.yaml

> ・Q08_object_counter_vehicle

> > - config1.yaml (* Rename the file to config.yaml)

3.2.2   [TVM Plugin] The default preprocessing setting is cleared with the trained AI model file

The default preprocessing setting cannot be read when the following situation.

— Go to preprocessing setting with the trained AI model file that is set to input model file automatically by AI TLT plugin.

Workaround:
Copy the target AI model file to the top of the e^2 studio project and rename the file name to the name specified in input model file.

(e.g.) Convert the AI model trained by RZ/V AI TLT. The target application is RZ/V2L Q01_footfall_counter:

> 1. Copy the AI model file from RZ/V AI TLT project folder (<Path to e^2 studio installation directory>/../rzv_ai_tlt/v2.10/tlt_backend/assets/Q01_footfall_counter_version_XXXX) to the top of e^2 studio project.

> 2. Rename the copied file to the name specified in TVM Plugin Input file setting.

3.2.3   [TVM Plugin] Percentile value in the advanced quantization setting

The percentile value in the advanced quantization setting has no effect on the conversion result.
Quantization is performed with a percentile value of 99.999.
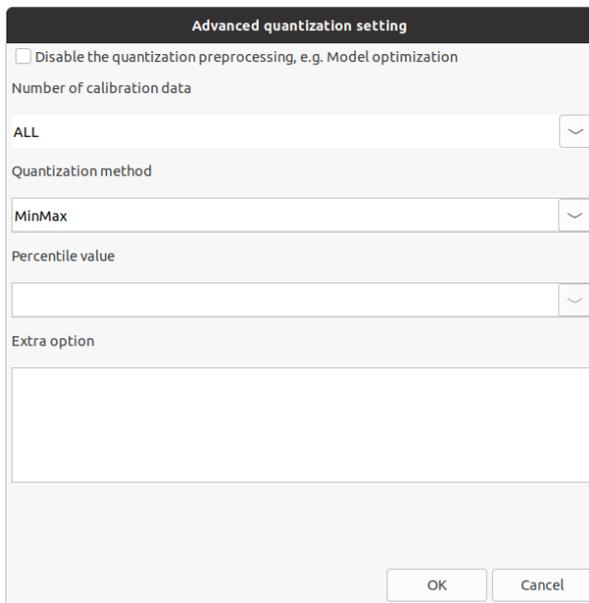
Figure 3-1   Advanced quantization setting

Workaround: None

3.2.4   [TVM Plugin] Multiple input AI model conversion

The TVM plugin supports single input AI models only. If you want to convert multiple input AI models, please refer to DRP-AI TVM GitHub page (https://github.com/renesas-rz/rzv_drp-ai_tvm).

* There is no AI application in RZ/V AI SDK that applies to this restriction.

Revision History

| Rev. | Date | Description | |
		Page	Summary
1.00	Apr 25, 2024	–	First version issued.

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

    A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

    The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

    Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

    Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

    After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

    Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

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(Rev.5.0-1 October 2020)

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