

DRP-AI Translator V1.90

Release Note

Introduction

This release note describes the improvements of the DRP-AI Translator.

Key Features and Enhancements

- Update OS version to 22.04
- Update Python version to 3.10
- Update python packages(libraries) version(e.g. : numpy, etc.,)
- Improvement
 - Relaxed constraints on Convolution

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1. Improvements

1.1 Relax Restriction

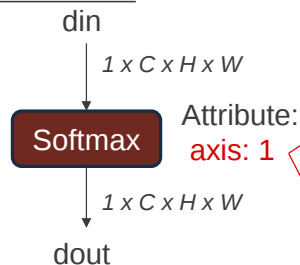
Relaxed constraints on Convolution attribute. Please refer to Section4 of User's Manual for more details.

- Convolution kernel 5x5, stride 1, pad 0000 or 2222 was supported
- Convolution kernel 5x5, stride 2, pad 0000 or 2222 was supported

2. Known Issues

- resize_hwc (PreProcessing by DRP)
 - The channel size must be smaller than 513.
- softmax
 - Due to a change in the interpretation of axis attribute, old opset softmax operation is not supported. There are error in output value.

onnx node



Supported Operation

```
# din shape is 1,c,h,w
tmp_din = din.transpose((0,2,3,1)) # transpose to 1,h,w,c
for _h in range(h):
    for _w in range(w):
        tmp_din[0][_h][_w] = softmax(tmp_din[0][_h][_w])
dout = tmp_din.transpose((0,1,2,3)) # transpose to 1,c,h,w
```

Not Supported Operation

```
# din shape is 1,c,h,w
tmp_din = din.reshape((1,c*h*w)) # reshape to 1,h*w*c
tmp_din[0] = softmax(tmp_din[0])
dout = tmp_din.reshape((1,c,h,w)) # reshape to 1,c,h,w
```

Appendix 1. How to use python sample scripts

From DRP-AI Translator V1.80, python APIs and its sample scripts have been provided to improve development environment. The features are followings:

- Help to make input files for DRP-AI Translator
Pre & Post definition and address map definition file can be generated by python APIs.
- Support to run simulation including Pre & Postprocessing by DRP
It is possible to check the execution result before execution on the device.

The following two types of code are included as sample scripts in the DRP-AI Translator package.

1. Sample script to run DRP-AI Translator
 - Generate pre & post definition file(.yaml) & address map definition file (.yaml) by python script
 - Call DRP-AI Translator on python script
2. Sample script to run simulation including DRP pre & post processing
 - Simulate pre & post processing on python script
 - Simulate AI model inference by onnxruntime

[Note] These functions are beta version. The features and APIs subject to change. Also, the simulation does not guarantee a complete match with the results from the device.

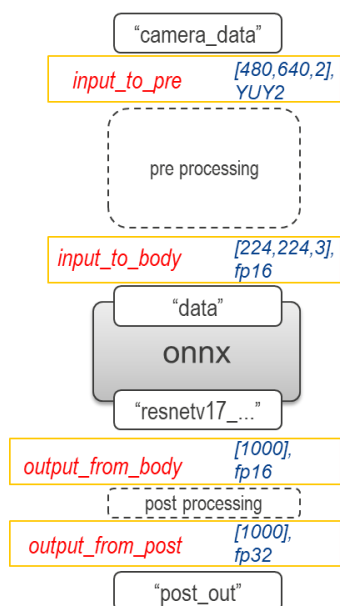
1. How to use running DRP-AI Translator script

- This section will explain the included sample code. The file name is below:
<install dir>/UserConfig/sample_scripts/run_translator_sample_resnet50.py
- The steps to run the DRP-AI_Translator are as follows.
 - A) Define and set pre & post nodes information to drp_prepost class
 - B) Define and set pre & post processing classes to drp_prepost class
 - C) Save pre & post definition file
 - D) Initialize DRP-AI Translator class
 - E) Make address map definition file & save
 - F) Run DRP-AI Translator
- Before running sample script, please set environment variable(TRANSLATOR) to the directory where you installed DRP-AI Translator.
e.g. \$export TRANSLATOR=/home/user/drp-ai_translator_release/

A) Define and set pre & post nodes information to drp_prepost class

At first, define input & output node information about onnx model and pre & post processing

```
pp = drp_prepost()
pp.set_input_to_body("data", shape=[224,224,3],
                        order="HWC",type="fp16",format="RGB")
pp.set_input_to_pre("camera_data", shape=[480,640,2],
                    order="HWC",type="uint8",format="YUY2")
pp.set_output_from_body("resnetv17_dense0_fwd",
                        shape=[1000],order="C",type="fp16")
pp.set_output_from_post("post_out",
                        shape=[1000],order="C",type="fp32")
```



B) Define and set pre & post processing classes to drp_prepost class

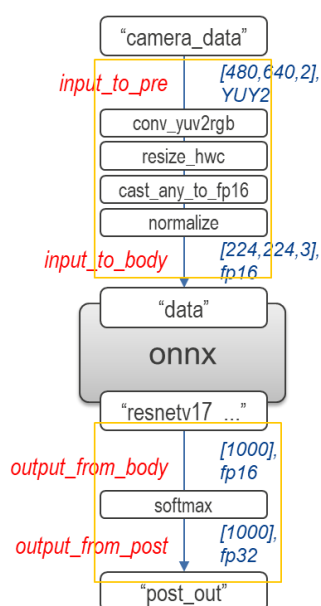
Next, initialize pre & post processing class, and get its instance object. Please refer section 4-2 in User's Manual about parameters of each process. To define sequence order of pre & post processing, make list data which stored instances. Then set pre & post processing sequence to drp_prepost class instance.

```
pre1_conv_yuv2rgb = conv_yuv2rgb(DOUT_RGB_FORMAT=0)
pre2_resize_hwc   = resize_hwc(shape_out=[224,224],RESIZE_ALG=1)
pre3_cast         = cast_any_to_fp16()
pre4_normalize    = normalize(cof_add=[-123.675, -116.28, -103.53],\
                             cof_mul=[0.01712475, 0.017507, 0.01742919])

post1_softmax     = softmax(DOUT_FORMAT=1)

pre_sequence      = [pre1_conv_yuv2rgb,pre2_resize_hwc,pre3_cast,pre4_normalize]
post_sequence     = [post1_softmax]

pp.set_preprocess_sequence(src=["camera_data"],dest=["data"],pp_seq=pre_sequence)
pp.set_postprocess_sequence(src=["resnetv17_dense0_fwd"],dest=["post_out"],pp_seq=post_sequence)
```



C) Save pre & post definition file

To check setting of pre & post processing definition, show_param() function can be used. The result will show on the console. And by using save() function, pre & post processing definition file is saved.

```
# show setting info
pp.show_params()

# Save data as yaml file
pp.save("output.yaml")
```

```
# Initialize DRP-AI Translator class
drp_tran = drp_ai_translator()

# Choose device of run script
drp_tran.set_translator("V2M")

# Make address map file
drp_tran.make_addrfile("0x5F000000",addr_file="./addr_map.yaml")
```

D) Initialize DRP-AI Translator class

To run DRP-AI Translator, drp_ai_translator class instance object is required. Please initialize and set the target device.

```
# Initialize DRP-AI Translator class
drp_tran = drp_ai_translator()

# Choose device of run script
drp_tran.set_translator("V2M")
```

E) Make address map definition file & save

To make address map definition file, use make_addrfile() function. Please set the start address of the physical memory to map the DRP-AI Object files.

```
# Make address map file
drp_tran.make_addrfile("0x5F000000",addr_file="./addr_map.yaml")
# Check onnx model file
ONNX_MODEL="../../onnx/resnet50v1.onnx"
```

F) Run DRP-AI Translator

By call run_translate() function, DRP-AI Translator will execute. The execution result is the same as using "./run_DRP-AI_translator_V2M/L.sh".

```
# Check onnx model file
ONNX_MODEL="../../onnx/resnet50v1.onnx"
drp_tran.run_translate("resnet_test",\
                      onnx=cur_path + "/" + ONNX_MODEL,\
                      prepost=cur_path+"/output.yaml",\
                      addr=cur_path+"/addr_map.yaml"
                      )
```

2. How to run simulation including DRP pre-post processing

- This section will explain the included sample code. The file name is below:
<install dir>/UserConfig/sample_scripts/prepost_sim_sample_resnet50.py
- The steps for running a simulation including pre & post processing are as follows.
 - Define pre & post processing classes
 - Load input yuy2 file
 - Run pre processing simulation

- D) Run onnx simulation by onnxruntime
- E) Run post processing simulation
- F) Check the inference result

A) Define pre & post processing classes

Generate instance objects of pre processing which is used for its simulation. Please refer section 4-2 in User's Manual about parameters of each process.

```
pre1_conv_yuv2rgb = conv_yuv2rgb(DOUT_RGB_FORMAT=0)
pre2_resize_hwc   = resize_hwc(shape_out=[224,224],RESIZE_ALG=1)
pre3_cast         = cast_any_to_fp16()
pre4_normalize    = normalize(cof_add=[-123.675, -116.28, -103.53],\
                             cof_mul= [0.01712475, 0.017507, 0.01742919])
post1_softmax     = softmax(DOUT_FORMAT=1)
```

B) Load input yuy2 file

Read input data file for simulation.

```
yuy2_file = "./sample_input.bin"
yuy2_bin = np.fromfile(yuy2_file,dtype=np.uint8).reshape((480,640,2))
```

C) Run pre processing simulation

Set the input data with numpy format for the pre processing instance object. The instance will return the simulation result with numpy format.

```
val1 = pre1_conv_yuv2rgb(yuy2_bin) # Pre1 : Conv_yuy2rgb
val2 = pre2_resize_hwc(val1)       # Pre2 : resize
pilImg = Image.fromarray(val2)     # <for debug> check resized data
pilImg.save('val2.png')
val3 = pre3_cast(val2)             # Pre3 : Cast
val4 = pre4_normalize(val3)        # Pre4 : Normalize
```

D) Run onnx simulation by onnxruntime

Onnxruntime is used for simulation of onnx part. Since the data format of onnxruntime is CHW, it is necessary to run "transpose" processing.

```
_val4 = val4.transpose(2,0,1)
_val4 = _val4.reshape((1,_val4.shape[0],_val4.shape[1],_val4.shape[2]))
_val4 = _val4.astype(np.float32)
ONNX_MODEL="./../onnx/resnet50v1.onnx"
sess = rt.InferenceSession(ONNX_MODEL)
pred_onnx = sess.run(None, {"data": _val4}) # Run onnx runtime
output = pred_onnx[0] # get onnxruntime output
```

E) Run post processing simulation

Set the input data with numpy format for the instance object of post processing. The instance will return the simulation result with numpy format.

```
output = output.reshape(1,1,1000)
val5 = post1_softmax(output) # Post1 : Softmax
```

F) Check the inference result

Finally, check the inference result. This process varies by application. The sample code is for a classification task.

```
print(">> Inference result : ")
get_label(val5[0][0])
```

3. API reference

- Details of each API are described below. These APIs are beta versions and subject to change in the future.

CLASS : python_api.drp_prepost

drp_prepost.set_input_to_pre(node_name, shape=None, order=None, type=None, format=None)

Set information about input to preprocessing to drp_prepost class instance object.

Parameters :

node_name : str, input node name. e.g. "camera_in"

shape : list, data shape. e.g. [480,640,2]

order : str, data order. e.g. "HWC" / "CHW"

type : str, data type. e.g. "fp16" / "uint8"

format : str, data format. e.g. "RGB" / "YUY2"

Return :

None

drp_prepost.set_input_to_body(node_name, shape=None, order=None, type=None, format=None)

Set information about input to body to drp_prepost class instance object. "input to body" means input node name of onnx model.

Parameters :

node_name : str, input node name. e.g. "input"

shape : list, data shape. e.g. [224,224,3]

order : str, data order. e.g. "HWC"

type : str, data type. e.g. "fp16"

format : str, data format. e.g. "RGB"

Return :

None

drp_prepost.set_output_from_body(node_name, shape=None, order=None, type=None)

Set information about output from body to drp_prepost class instance object.

"output from body" means output node name of onnx model.

Parameters :

node_name : str, input node name. e.g. "output"

shape : list, data shape. e.g. [1000]

order : str, data order. e.g. "HWC" / "C"

type : str, data type. e.g. "fp16"

Return :

None

drp_prepost. set_output_from_post(node_name, shape=None, order=None, type=None, format=None)

Set information about output from post drp_prepost class instance object. "output from post" means output node of Postprocessing.

Parameters :

node_name : str, input node name. e.g. "post_out"
shape : list, data shape. e.g. [1000]
order : str, data order. e.g. "C"
type : str, data type. e.g. "fp32" / "fp16"

Return :

None

drp_prepost. set_preprocess_sequence(src=[], dest=[], pp_seq=[])

Set preprocess sequence to drp_prepost class instance object.

Parameters :

src : list, source node name of preprocess sequence. e.g. ["camera_in"]
dest : list, destination node name of preprocess sequence. shape. e.g. ["input"]
pp_seq : list, preprocess instance list. e.g. [conv_yuv2rgb, resize_hwc, cast, normalize]

Return :

None

drp_prepost. set_postprocess_sequence(src=[], dest=[], pp_seq=[])

Set postprocess sequence to drp_prepost class instance object.

Parameters :

src : list, source node name of postprocess sequence. e.g. ["output"]
dest : list, destination node name of postprocess sequence. shape. e.g. ["post_out"]
pp_seq : list, preprocess instance list. e.g. [softmax]

Return :

None

drp_prepost. show_param()

Show prepost processing definition status to console.

Parameters :

None

Return :

None

drp_prepost. save(file_name)

Save prepost processing definition information as yaml file .

Parameters :

file_name : str, output file name. e.g. "output.yaml"

Return :

None

CLASS : python api.drp ai translator**drp_ai_translator.set_translator(device)**

Select target device.

Parameters :

device : str, target device. e.g. "V2M" / "V2L"

Return :

None

drp_ai_translator.make_addrfile(start_addr, addr_file=None)

Save address map definition file

Parameters :

start_addr: str, start address of the physical memory to map the DRP-AI Object files. e.g. "0x5F00000"

addr_file : str, output yaml file name. e.g. "./addr_map.yaml"

Return :

None

drp_ai_translator.run_translate(prefix, onnx=None, prepost=None, addr=None)

Run DRP-AI Translator

Parameters :

prefix : str, prefix is output folder name. e.g. "Resnet50_test"

onnx : str, input onnx file path. e.g. "../onnx/resnet50.onnx"

prepost : str, prepost processing definition file path. e.g. "./prepost.yaml"

addr : str, address map definition file path. e.g. "./addrmap.yaml"

Return :

None

CLASS : python api. <Pre and Postprocessing>**drp_ai_translator.<Pre and Postprocessing>(**Parameters)**

Each Pre & Postprocessing has python class which is used as input data for drp_prepost class.

And those class have a function to run simulation.

Parameters :

Please refer section 5-3 in User's Manual.

Return :

Pre/Postprocessing instance object or simulated output

After initialization, the instance object can be obtained as a return value.

When input data is set to the instance, it runs the simulation, and returns the execution results.

Supported Pre/Postprocessing :

transpose, conv_yuv2rgb, conv_x2gray, resize_hwc, cast_any_to_fp16, normalize, memcpy, crop, softmax, cast_fp16_fp32, argminmax

Examples :

```
>> # Generate preprocessing instance objects
>> pre1_cast      = cast_any_to_fp16()
>> pre2_normalize = normalize(cof_add=[-123.675, -116.28, -103.53], cof_mul= [0.01712475,
0.017507, 0.01742919])
>> # Run simulation. The input data must be numpy array.
>> pre1_out       = pre1_cast(input)
>> pre2_out       = pre2_normalize(pre1_out)
```

