

Code

Issues 42

Pull requests 13

Discussions

Actions

Security

...

Implementing BEVDet in Autoware #4635

New issue

Open

6 of 7 tasks

cyn-liu opened this issue on Apr 18 · 9 comments · May be fixed by [autowarefoundation/autoware.universe#7956](#)

cyn-liu commented on Apr 18 · edited

Checklist

- I've read the [contribution guidelines](#).
- I've searched other issues and no duplicate issues were found.
- I've agreed with the maintainers that I can plan this task.

Description

BEVDet is a BEV perception algorithm based on panoramic cameras. It unifies multi-view images into the perspective of BEV for 3D object detection task. It is different from the current 3D perception feature of Autoware.

[BEVDet code repos](#)

Purpose

Integrating BEVDet into Autoware for 3D object detection based on multi-view images, this task related to Sensing& Perception task.

Possible approaches

BEVDet is a 3D object detection model trained on NuScenes dataset using 6 surround view camera images. The 6 cameras form a 360 degree field of view with overlapping fields of view. When mapping from 2D to 3D, some parameters are required, including camera intrinsic parameters and extrinsic parameters between each camera and ego.

Integrating BEVDet into Autoware involves the placement of 6 cameras and calibration. Convert BEVDet model into ONNX format for deployment in Autoware.

Definition of done

- The placement of 6 cameras and calibration

Assignees



cyn-liu

Labels

component:calibration

component:perception

component:sensing

Projects

Software Working Group

Status: Todo

+1 more

Milestone

No milestone

Development

Successfully merging a pull request may close this issue.

[feat\(autoware_tensorrt_bevdet\): add ...](#)
cyn-liu/autoware.universe

2 participants



- Convert BEVDet model into ONNX format
- Deploying BEVDet model on device using TensorRT
- BEVDet output result adaptation to Autoware topics

 **cyn-liu** added **component:calibration** **component:perception** **component:sensing** labels on Apr 18

 **cyn-liu** added this to **Autoware Labs** on Apr 18

 **cyn-liu** moved this to **Todo** in **Autoware Labs** on Apr 18



liuXinGangChina commented on Apr 18

Great maybe you can make a todo task list first and see what others can take part in

 **xmfcx** assigned **cyn-liu** on Apr 19

 **liuXinGangChina** moved this from **Todo** to **In Progress** in **Autoware Labs** on May 21



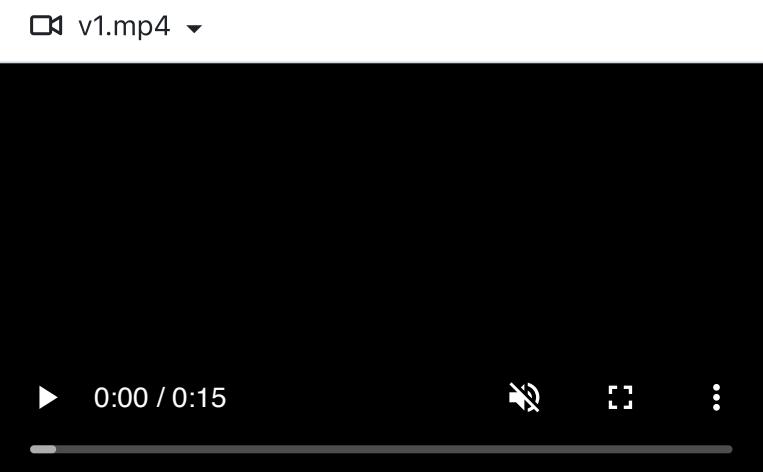
cyn-liu commented on May 21 · edited

[Author](#)

We refer to this [project](#) and successfully ran it on our own machine.

We use RTX3080 GPU and Trt FP16 inference BEVDet-R50-4DLongterm-Depth model. The mAP and inference speed of BEVDet-R50-4DLongterm-Depth TensorRT version can refer this [project link](#).

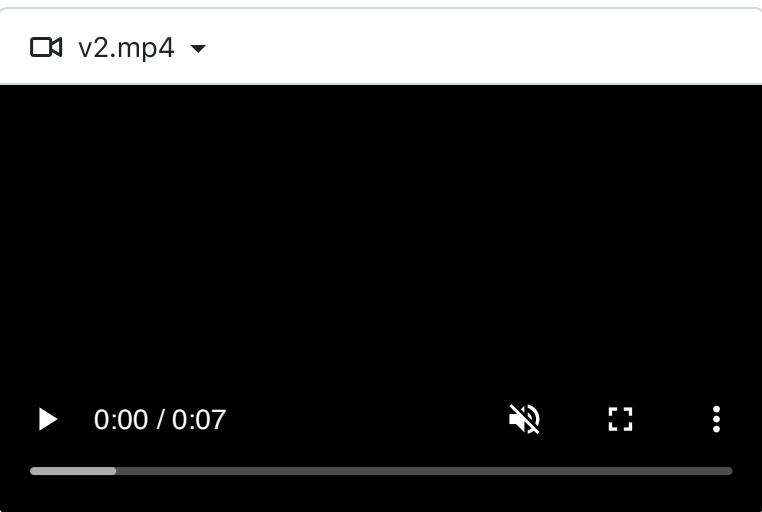
The following is the running results on our machine:

 v1.mp4 ▾

▶ 0:00 / 0:15



The following is the inference speed on our machine:



Next, we will modify ROS1 node to ROS2 node based on this project, then, we will use [TIER IV's dataset](#) for testing, and we hope that this dataset can provide ROS2 bag format.

Our plan of integrate the BEVDet ROS2 node into Autoware:

1. define a `bevdet_node` in Autoware perception module
2. organize the 3D boxes results into
`autoware_perception_msgs::msg::DetectedObjects`
type
3. input the output result of `bevdet_node` into the
`object_merger` node and fuse it with the detection
results of other models

 **cyn-liu** commented on May 29

Author

Environment:

CUDA11.3.1

cudnn- linux-x86_64-8.8.1.3_cuda11

TensorRT-8.5.1.7.Linux.x86_64-gnu

 **liuXinGangChina** commented on Jun 18

Maybe try with AWSIM data

 **liuXinGangChina** commented on Jul 2

list the cuda env here

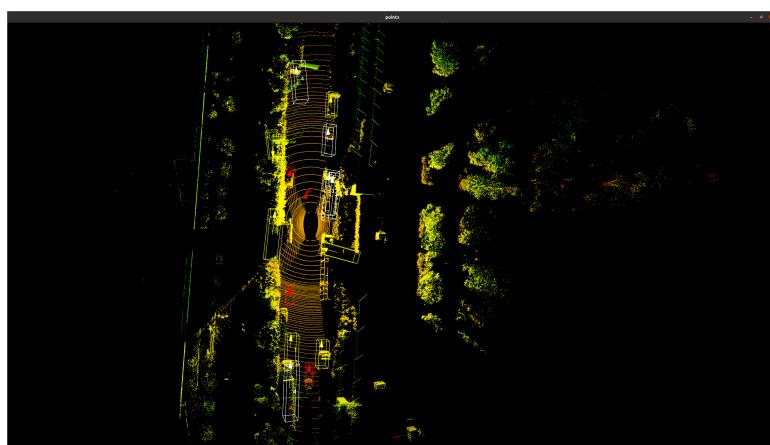
 **cyn-liu** commented on Jul 3 • edited

Author

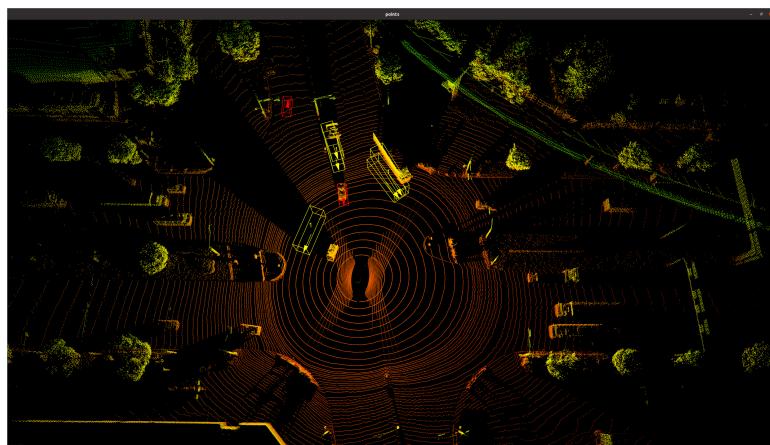
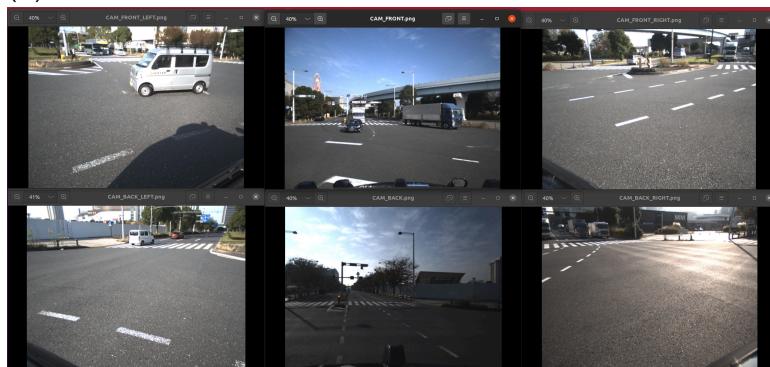
Using the BEVDet model to infer the TIER4 dataset, it was found that the model had poor generalization performance on the TIER4 dataset.

Visualization results on TIER4 data

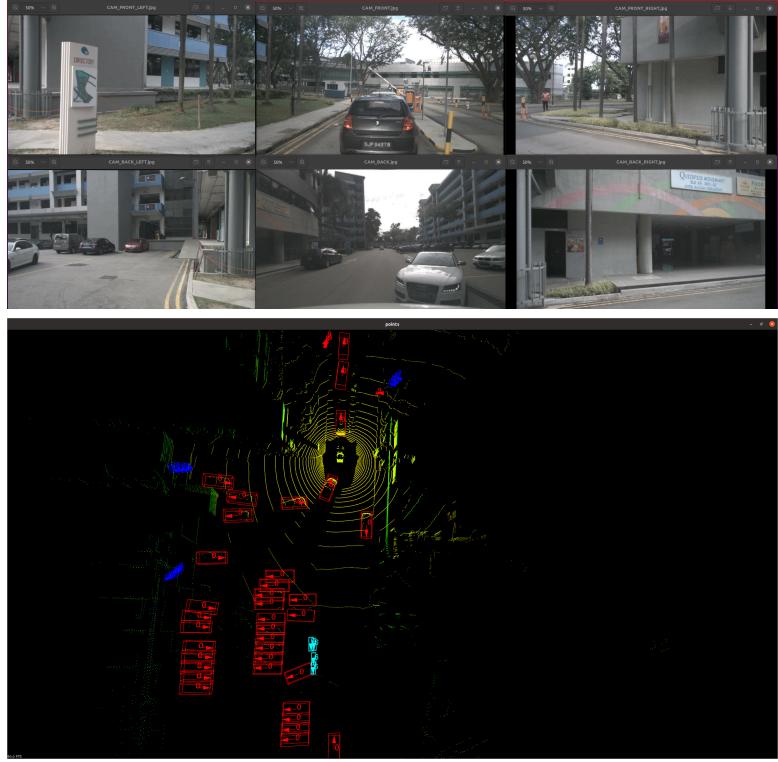
(1)



(2)



Visualization results on NuScenes data



liuXinGangChina commented on Jul 3

Looks like the original pre-train based on nuScenes dataset model's generalization on tire4 dataset is not as well as we expected. Obstacles's direction is almost right but the depth of them ge

we plan to close this task once we have the node tested. And creat a new task of "retrain the model" to see whether the new model's performance on tire4 dataset increase.

cyn-liu commented on Jul 10

Author

Our plan of integrate the BEVDet ROS2 node into Autoware:

1. define a `bevdet_node` in Autoware perception module
2. organize the 3D boxes results into
`autoware_perception_msgs::msg::DetectedObjects`
`ts` type
3. input the output result of `bevdet_node` into the
`object_merger` node and fuse it with the
 detection results of other models

Considering that running the BEV 3D detection algorithm based on multi-cameras and the Lidar based 3D detection algorithm simultaneously is too heavy a load. we have decided not to merge the results of BEVDet with the output results of Lidar, but to create a new `perception_mode`, when `perception_mode = camera`, launch `bevdet_node`.

1

cyn-liu linked a pull request on Jul 11 that will close this issue

feat(autoware_tensorrt_bevdet): add new 3d object detection method [Open](#)
autowarefoundation/autoware.universe#7956

cyn-liu linked a pull request on Jul 16 that will close this issue

feat(autoware_tensorrt_bevdet): add new 3d object detection method [Open](#)
autowarefoundation/autoware.universe#7956



cyn-liu commented on Jul 21

Author

@xmfcx The PR related this issue has been successfully tested in the newer Autoware docker image.
The environment information of this image:

CUDA==12.3
libnvinfer==8.6.1.6

Note: Outside in docker, I must upgrade to my nvidia GPU driver version to ensure that this driver supports a maximum CUDA version >= 12.3.

```
test@Test: ~ $ nvidia-smi
Mon Jul 22 09:48:53 2024
+-----+
| NVIDIA-SMI 550.100       Driver Version: 550.100      CUDA Version: 12.4 |
| GPU Name Persistence-Monitored Bus-Id Disp.A Volatile Uncorr. ECC |
| Fan Temp Perf Pwr:Usage/Cap | Memory-Usage | GPU-Util Compute M. | MIG M. |
|=====================================================================
| 0 NVIDIA RTX A1000 6GB Lap... Off   00000000:01:00.0 Off | N/A | 0% Default | N/A |
| N/A 41C  b P3 312W / 35W | 7MIB / 6144MIB |          0% |           |
+-----+
Processes:
GPU ID CI PID Type Process name GPU Memory Usage
0 N/A N/A 1242 G /usr/lib/xorg/Xorg 4MIB
test@Test: ~
```

xmfcx removed this from **Autoware Labs** on Oct 4

xmfcx added this to **Software Working Group** on Oct 4