Enhancing the Distortion Corrector Module #4163

Unanswered **batuhanbeytekin** asked this question in **Ideas**

batuhanbeytekin on Feb 8 Collaborator

Hello Autoware Community,

I've been working with the point cloud preprocessing tools in Autoware and have proposed an enhancement to the distortion correction process, specifically aimed at improving the handling of Z-axis distortions. This enhancement focuses on incorporating vehicle's linear Z velocity to correct for vertical displacements in the point cloud data, which can be particularly useful in varied terrain or when encountering obstacles like speed bumps.

Current Implementation:
The current distortion corrector module effectively compensates for distortions in the X and Y axes, leveraging vehicle twist data. However, corrections in the Z-axis are not explicitly addressed, potentially affecting the accuracy of vertical measurements in the processed point cloud.

Proposed Enhancement:
To address this, I propose an update to include Z-axis distortion correction by utilizing the linear Z velocity (`twist.linear.z`) from vehicle odometry data. The key idea is to adjust point cloud Z positions based on the time offset and the vehicle's vertical movement, providing a more accurate representation of the environment.

Technical Details:

- The enhancement involves modifying the `undistortPointCloud` function to calculate Z displacement using the formula `z += time_offset * u`, where `u` represents the linear Z velocity.
- Each point's Z value is then adjusted accordingly (`*it_z += z`), ensuring that vertical displacements due to vehicle motion are accurately reflected in the point cloud.

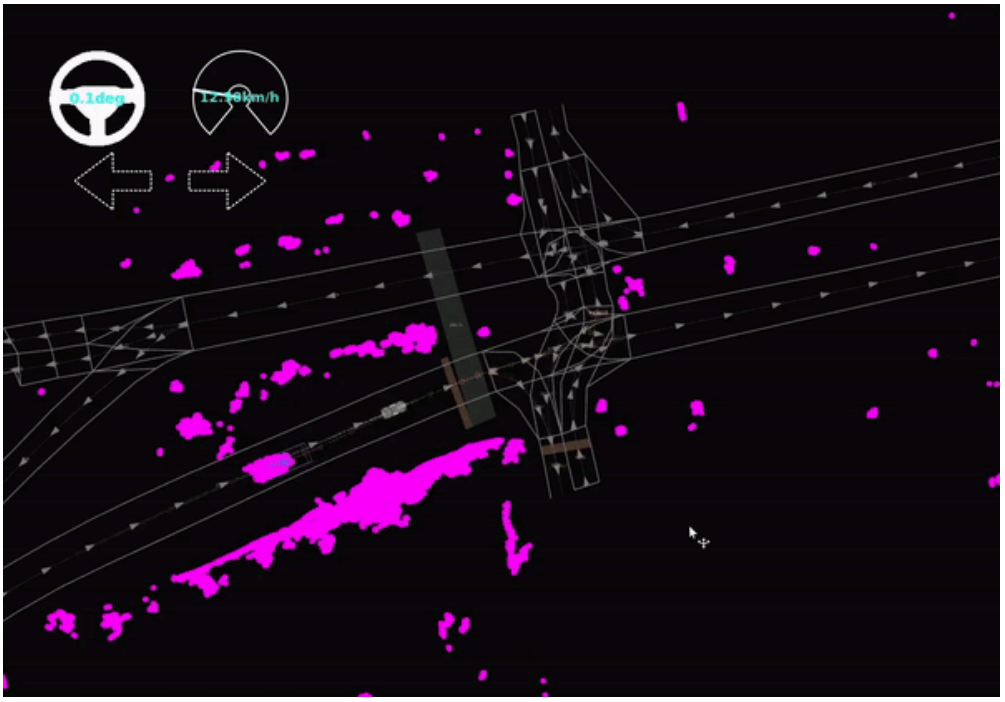
Following the distortion correction, here's the output from the ground remover:

Category
Ideas

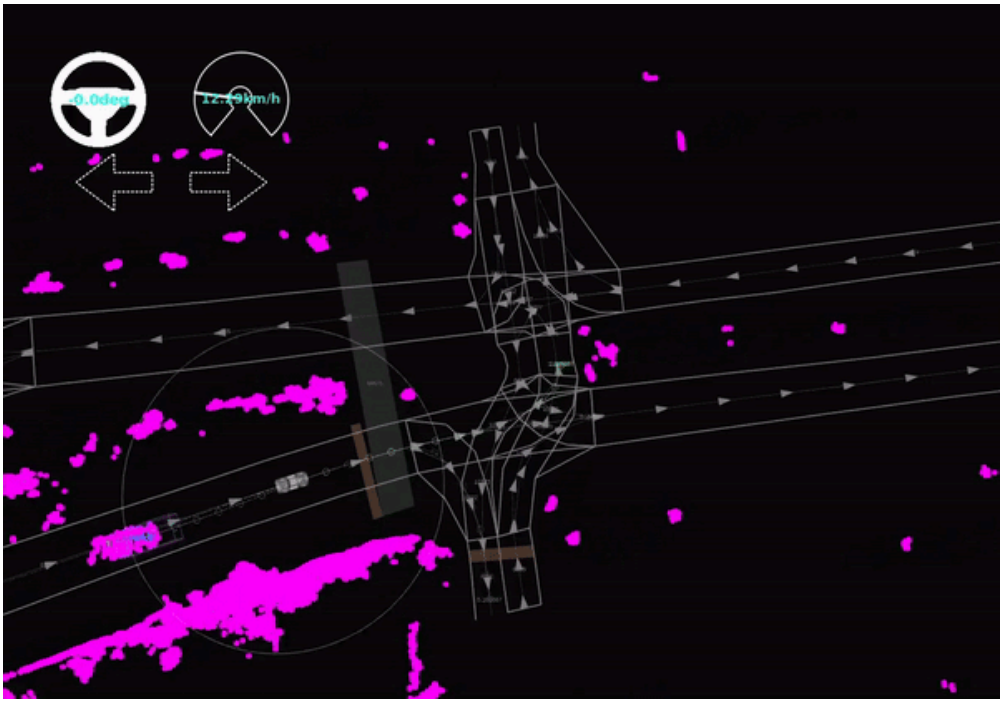
Labels
component:percept...
component:sensing

3 participants

Ground Remover Output Before Changes (Non-ground points are shown)



Ground Remover Output After Changes (Non-ground points are shown)



Objective and Benefits:

- Better handle scenarios with vertical motion, such as driving over speed bumps or through uneven terrains.

Seeking Community Feedback:

- Your thoughts on the potential impact of this enhancement on the overall performance and accuracy of the point cloud preprocessing.
- Suggestions for further improvements or alternative approaches to Z-axis distortion correction.
- Any considerations regarding the integration of this enhancement with existing or future Autoware modules.

I believe this straightforward yet impactful enhancement could significantly improve the utility of the distortion corrector, especially in complex driving environments. I'm eager to hear your feedback and engage in discussions on how we can further refine and integrate this improvement.

Thank you for considering this proposal. I look forward to your insights and suggestions!

↑ 3 ❤️ 3

2 comments

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brkay54 on Feb 9 Collaborator

As I know, distortion corrector, undistorts the point cloud by using the linear velocity x and yaw rate. To get better results on speedbumps, I think we should also consider using the pitch rate in the undistort process. In the current implementation, it only undistorts on the X-Y Plane, to be able to undistort on the Z axis, we should also include the pitch rate (and also roll rate) in the calculation side.

↑ 2 0 replies

hzkkk1997 on Oct 11

@batuhanbeytekin Hello, I'm sorry to bother you, but I had such a problem (https://github.com/orgs/autowarefoundation/discussions/5328) when compiling the autoware_pointcloud_preprocessor function package. Could you please help me solve it? Thank you in advance.

↑ 1 0 replies