ekf_localizer #2247

New issue

Merged

gbiggs merged 30 commits into `autowarefoundation:master` from `TakaHoribe:feature/kalman_filter` on May 16, 2019

TakaHoribe commented on May 12, 2019 • edited Contributor

New feature implementation

Implemented feature

The fusion localizer based on EKF algorithm. This is a rewrite of #2131, and there has been no major change from the old one.
As minor changes,

- add twist_generator (following EKF design for stable localization autoware_ai#581) in runtime_manager window
- move kalman_filter libraries to amathutils_lib package

Related issues are below.

autowarefoundation/autoware_ai#581 : kalman filter design
autowarefoundation/autoware_ai#461 : localization overall architecture

Implementation description

In this PR, I added 2 new packages

- ekf_localizer
- twist_generator

and modified 1 package

- amathutils_lib

Reviewers

amc-nu ✓

sgermanserrano ●

Assignees

No one assigned

Labels

type:new-feature version:autoware-ai

Projects

None yet

Milestone

No milestone

Development

Successfully merging this pull request may close these issues.

None yet

5 participants

ekf_localizer reads EGO_TWIST(now `/can_twist`) and EGO_POSE(now `/ndt_pose`) message to generate robust less-noisy ego-pose(`/ekf_pose`) and ego-twist (`ekf_twist`) with vehicle dynamics information. Some other features in EKF include time delay compensation (mainly for large time delay of NDT localization), or mahalanobis gate (for outlier measurement data) and so on.
The more detail is described in README .

twist_generator aims to generate twist message from some resources. In this PR, `/vehicle_status_converter` node is implemented in the package, which converts `/vehicle_status` to `/can_twist`. This node includes `enable_adaptive_estimate` parameter which enables estimation of correction coefficients for conversion with recursive least square. This function is for parameter mismatch, such as wheelbase or steering gear ratio.
In this PR, this node is very similar to `/can_status_translator` in autoware_connector pkg in that it converts `/vehicle_status` to twist (`can_status_converter` converts vheicle_status to odom). But, twist_generator provides twist estimation algorithms (discussed based on autowarefoundation/autoware_ai#581, such as fIMU & CAN fusion, or adaptive estimation described above). So I implement it separately.

In amathutils_lib packjage, I added kalman filter libraries as discussed in #2131 .

how to run test

You can test wish rosbag and gazebo simulator.

gazebo test

With gazebo, please see this video. Note: To use gazebo simulator, you have to setup this.

rosbag test

1. Download rosbag file from this link. This rosbag includes

- `/points_raw` (just for visualization)
- `/ndt_pose` (input for `/ekf_localizer`)
- `/vehicle_status` (input for `/twist_generator`).

2. Run autoware.

```
$ cd ~/Autoware/ros
$ source ./install/setup/bash
```

```
$ ./run
```

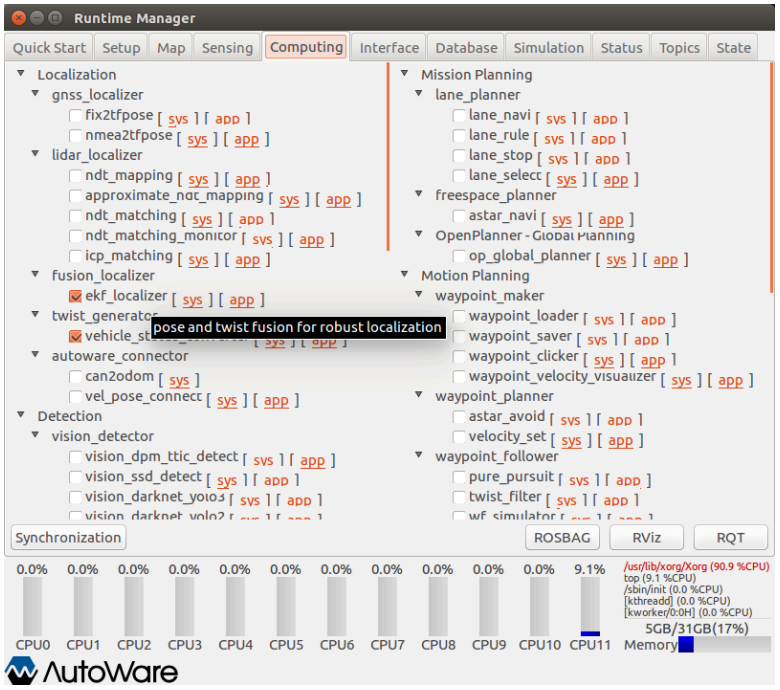
3. Play rosbag: go to the runtime_manager simulation tab, play rosbag.
4. Launch `ekf_localizer` and `twist_generator` : go to the runtime_manager computing tab, check following 2 files as following picture.

- Localization/fusion_localizer/ekf_localizer
- Localization/twist_generator/vehicle_status_converter

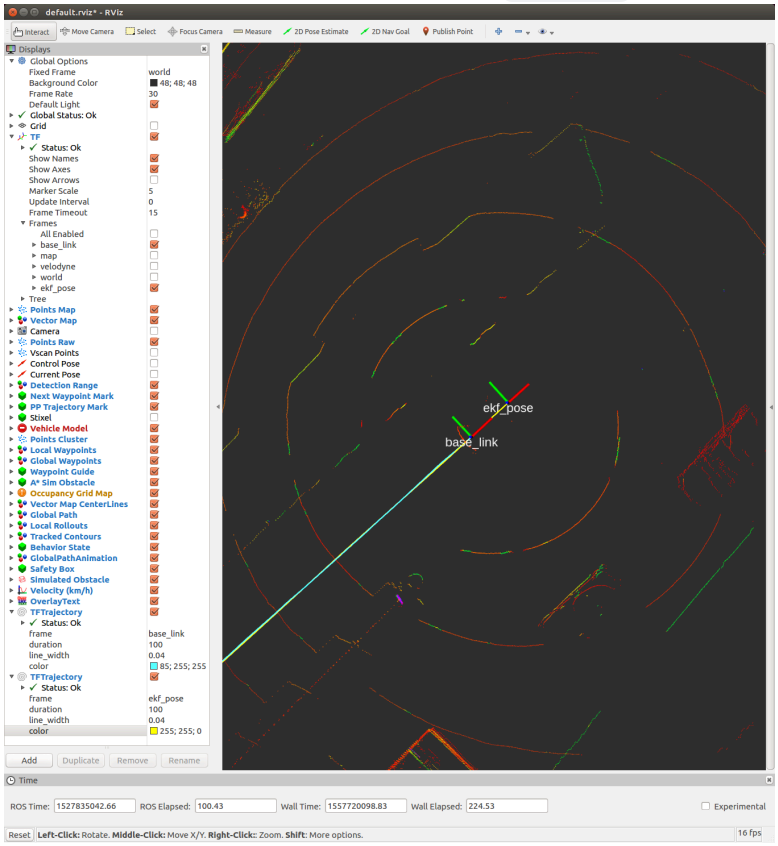
Also you can launch above with this command.

```
$ roslaunch ekf_localizer ekf_localizer.launch
run ekf_localizer
$ roslaunch twist_generator
vehicle_status_converter.launch # run
twist_converter
```

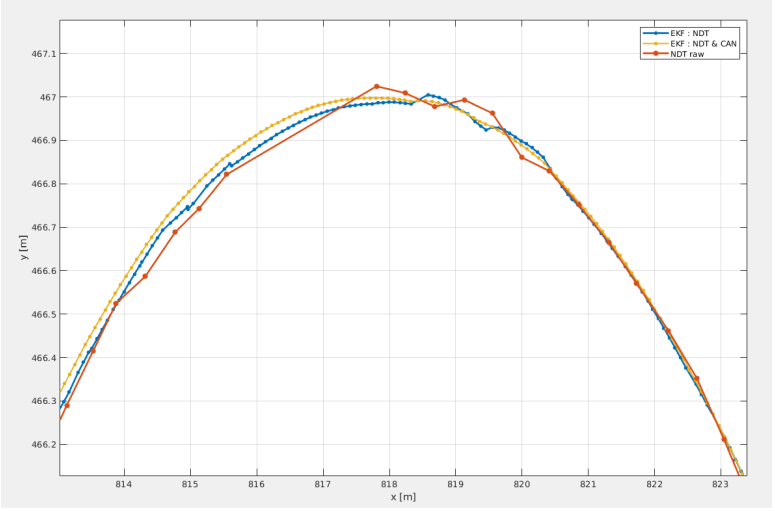
5. Open Rviz, display TF `ekf_pose` and `base_link` (see picture below for Rviz setup). Note, the ekf_pose is placed ahead of the base_link, which is the effect of time delay compensation.



This picture includes TF and TFTrajectory. You can also check geometry_msgs::PoseStamped `ekf_pose` in Rviz.



The result pose trajectory with default value is as below.



Only for pose measurement, EKF can compensate for low frequency for pose measurement.
For with twist measurement, EKF can generate smooth pose trajectory.

gbiggs changed the title ~~Feature/ekf_localizer~~ **ekf_localizer** on May 12, 2019

gbiggs added the type:new-feature label on May 12, 2019

gbiggs added this to the **v1.12** milestone on May 12, 2019

gbiggs requested review from amc-nu and sgermanserrano 5 years ago

gbiggs commented on May 12, 2019

Please add the DCO sign-off to your commits.

gbiggs commented on May 12, 2019

This PR includes many unrelated commits. Please clean up your branch.

gbiggs commented on May 12, 2019

Can #2131 be closed?

TakaHoribe mentioned this pull request on May 12, 2019

kalman filter for localization #2131 Closed

2 tasks

TakaHoribe added 18 commits 5 years ago

`kalman_filter: add all commits for signoff` ··· Verified `1ecfafa`

`kalman_filter: change const to constexpr` ··· Verified `4813d85`

`kalman_filter: modify xml format & license format` ··· Verified `976c679`

`kalman_filter: add figures for kalman filter quation` ··· Verified `ad4b2b8`

`kalman_filter: move kalman_filter libraries from kalman_filter_locali…` ··· Verified `7371c6d`

`kalman_filter: fix CMakelists for colcon build error & change initial…` ··· Verified `fe0ca1d`

`kalman_filter: modify yaw calc functiuon` ··· Verified `6e0e83f`

`kalman_filter: update readme` ··· Verified `cf175de`

`ekf_localizer: change package name from kalman` Verified `a20e468`

filter localozer ···

twist_generator: add pkg ··· Verified 8ade1a8

ekf_localizer: add use_ndt_pose_with_covariance option ··· Verified 0c3116a

twist_generator: modify in runtime_manager.yaml ··· Verified 8166dd9

ekf_localizer: bug fix of yaw error > 2*pi & add debug messages ··· Verified de8f26d

twist_generator: add runtime_manager & change node name ··· Verified 038c853

ekf_localizer: change params & default values ··· Verified ae29d09

ekf_localizer: remove config file & modify readme ··· Verified ecaaa49

ekf_localizer: change parameters ··· Verified d77e5db

ekf_locakizer: change initial param values ··· Verified a59e576

TakaHoribe commented on May 13, 2019 • edited Contributor Author

> Please add the DCO sign-off to your commits.

> This PR includes many unrelated commits. Please clean up your branch.

They are solved. (This was because this feature branch was created from develop. I recreated from master, cherry-pick, and push -f to solve this.)

> Can #2131 be closed?

Yes, I closed.

ekf_localizer: remove ndt name, change to pose ··· Verified 3de85d1

amc-nu suggested changes on May 13, 2019 View reviewed changes

amc-nu left a comment Member

Thanks for the clean and concise PR. Can you please attend my comments?

ros/src/common/libs/amathutils_lib/include/amathutils_lib/kalman_filter.hpp — Show resolved

ros/src/common/libs/amathutils_lib/include/amathutils_lib/kalman_filter_delayed_measurement.hpp — Outdated — Show resolved

ros/src/common/libs/amathutils_lib/src/kalman_filter.cpp — Show resolved

ros/src/common/libs/amathutils_lib/src/kalman_filter_delayed_measurement.cpp — Outdated — Show resolved

ros/src/common/libs/amathutils_lib/test/src/test_kalman_filter.cpp — Outdated — Show resolved

5 hidden conversations
Load more...

.../computing/perception/localization/packages/twist_generator/src/vehicle_status_converter.cpp — Outdated — Show resolved

.../computing/perception/localization/packages/twist_generator/src/vehicle_status_converter.cpp — Outdated — Show resolved

ros/src/computing/perception/localization/packages/ekf_localizer/README.md — Outdated — Show resolved

ros/src/computing/perception/localizatio — Outdated — Show resolved

n/packages/ekf_local
izer/README.md

ros/src/computing/pe
rception/localizatio
n/packages/ekf_local
izer/README.md

Outdated

Show resolved

2 hidden items

Load more...

amc-nu reviewed
on May 14, 2019

View reviewed changes

ros/src/computing/perception/l
ocalization/packages/ekf_local
izer/src/ekf_localizer.cpp

Show resolved

gbiggs commented on May 14, 2019

Using a rosbag covers the node-level test. If you have good tests that can be run on the individual classes, and can implement them, then please do so. We don't necessarily need unit tests for every function. However if the rosbag-based test sufficiently covers the functionality of the node then we can accept that this time. Just remember that the next release cycle is going to get stricter.

👍 1

TakaHoribe added 6 commits 5 years ago

elf_localozer: use doxygen format for kalman filter library & change … ···

Verified

10a8a56

ekf_localizer: change comments for test code ···

Verified

a62ee25

amathutils: change error msg from prntf to std::cerr ···

Verified

f889fa7

twist_generator: split codes into .hpp & .cpp ···

Verified

4021fb1

ekf_localizer: modify readme, add parameters in runtime_manager ···

Verified

3ee0773

ekf_localizer: use docygen format for ekf_localizer.hpp ... Verified 8021192

TakaHoribe commented on May 14, 2019 — Contributor, Author

> Using a rosbag covers the node-level test. If you have good tests that can be run on the individual classes, and can implement them, then please do so. We don't necessarily need unit tests for every function.
> However if the rosbag-based test sufficiently covers the functionality of the node then we can accept that this time. Just remember that the next release cycle is going to get stricter.

Ok, I'll write test code where @amc-nu suggested.

Merge branch 'master' into feature/kalman_filter Verified 6d63e2c

TakaHoribe commented on May 15, 2019 — Contributor, Author

@amc-nu I confirmed the test process written in PR works after master merge. Should I stop commiting? I'm writting some test code for ekf_localizer (if it is not needed, I'll remove this.).

TakaHoribe added 3 commits 5 years ago

ekf_localizer: modify readme (ekf parameter turning) ... Verified 9675537

amathutils_lib: add comments & remove unnecessary variable in kalman … ... Verified 7d0c5ba

ekf_localizer: ... Verified fa92af3

TakaHoribe commented on May 16, 2019 — Contributor, Author

I added test code for ekf_localizer where @amc-nu mentioned. Also adjust some default parameters. The rosbag test written in PR and it's performance is checked after there commits.

👍 1

Merge branch 'master' into feature/kalman_filter Verified b64cc36

amc-nu approved these changes on May 16, 2019 View reviewed changes

gbiggs merged commit **ac7c319** into `autowarefoundation:master` on May 16, 2019

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amc-nu pushed a commit that referenced this pull request on May 16, 2019

Feature/melodic rebase (#2242) ... 421d3ca

amc-nu pushed a commit that referenced this pull request on May 23, 2019

Feature/melodic rebase again (#2273) ... 05602a1

amc-nu added a commit that referenced this pull request on May 24, 2019

Change CUDA compilation flag to envvar (#2271) ... Verified 9023776

gbiggs pushed a commit that referenced this pull request on May 31, 2019

melodic support (#2032) ... 623c51c

hunkyu commented on Jun 12, 2019

@TakaHoribe Hello, I need your permission to download your rosbag, it is convenient to send me a copy?
hunkyu163@gmail.com

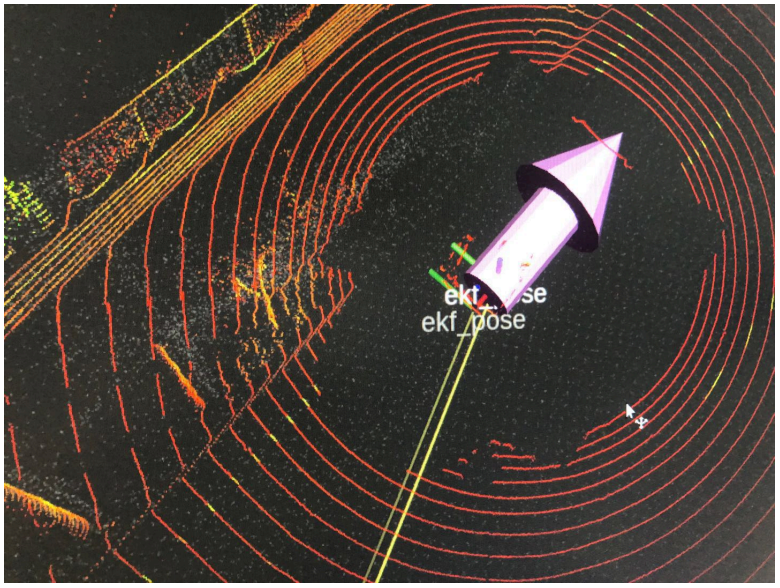
TakaHoribe commented on Jun 12, 2019 • edited Contributor Author

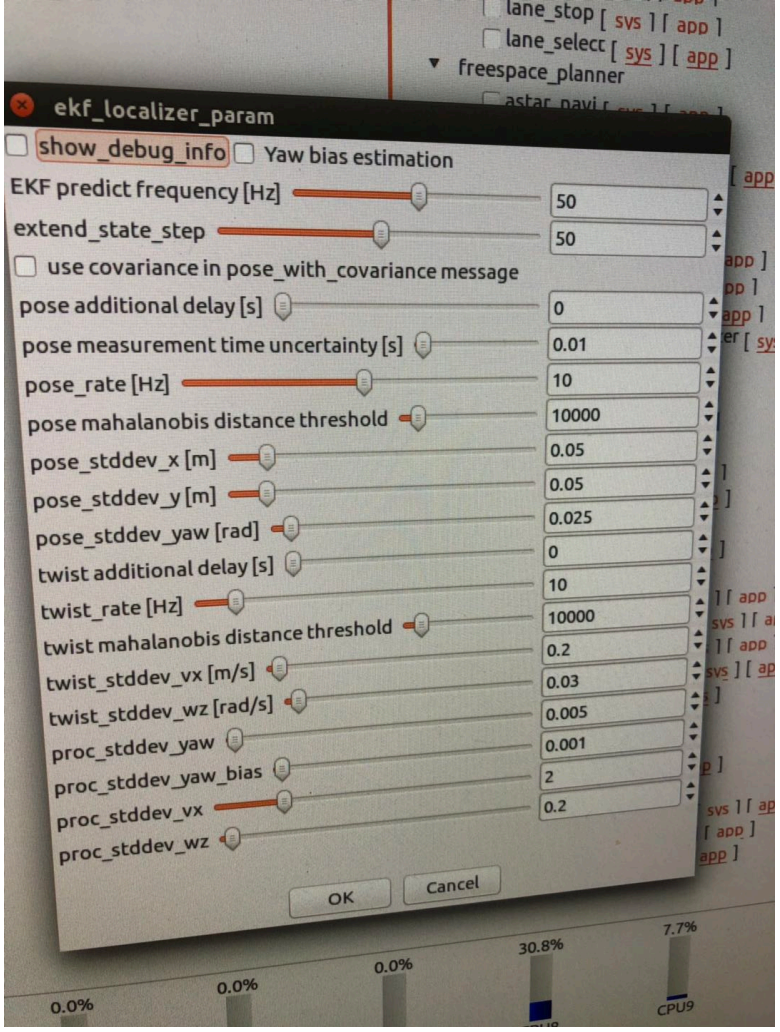
> @TakaHoribe Hello, I need your permission to download your rosbag, it is convenient to send me a copy? hunkyu163@gmail.com

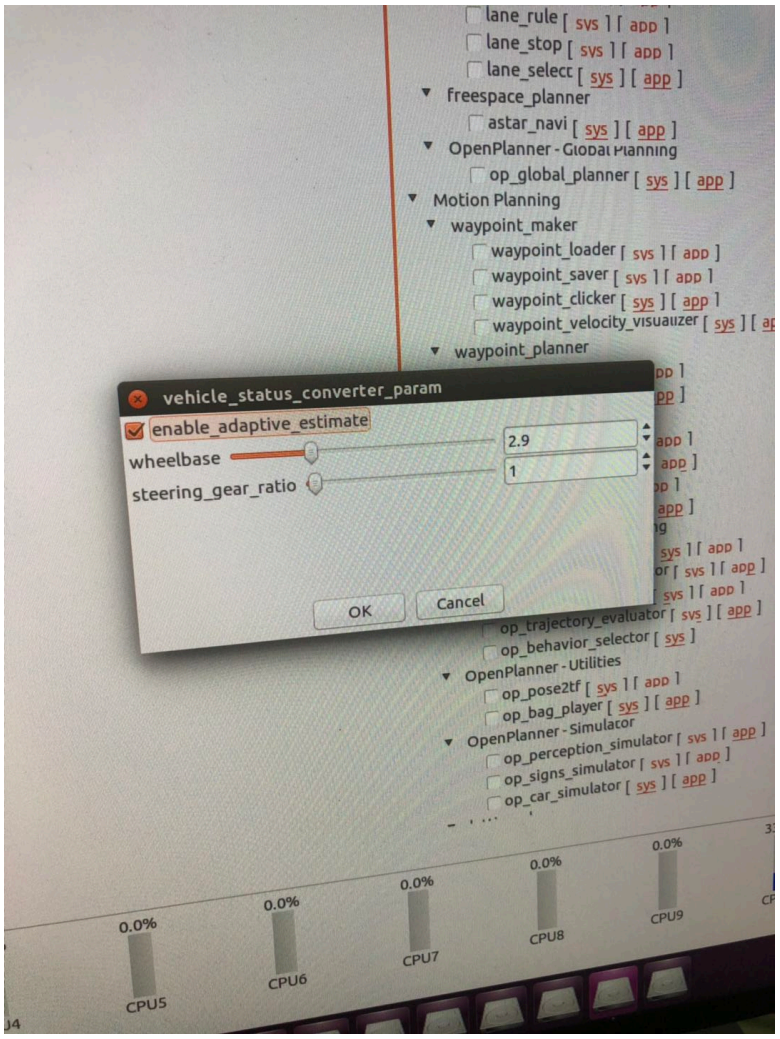
@hunkyu I changed the permission level so that everyone can download. please check it.

hunkyu commented on Jun 13, 2019

@TakaHoribe Well, you can download it and haven't tested this data set yet. I now use sample_moriyama_150324.bag to evaluate the efk_localizer module and found that the efk_pose jitter is quite powerful. Can you trouble me to see what is the reason?







gbiggs commented on Jun 13, 2019

Please ask your question at ROS Answers.

TakaHoribe commented on Jun 13, 2019 • edited

Contributor Author

@hunkyu This discussion should be done in ROS Answers. Would you post the same question there?

http://answers.ros.org/questions/scope:all/sort:activity-desc/tags:autoware/page:1/query:autoware/

(For your question, please confirm the `/vehicle_status` is recorded in the rosbag at first, and your setup `/steering_gear_ratio` = 1 is reasonable.)

anubhavashok pushed a commit to NuronLabs/autoware.ai that referenced this pull request on Sep 7, 2021

`ekf_localizer (autowarefoundation#2247)` ... `26e077b`

anubhavashok pushed a commit to NuronLabs/autoware.ai that referenced this pull request on Sep 7, 2021

`melodic support (autowarefoundation#2032)` ... `04930ef`

mitsudome-r added the version:autoware-ai label on Jun 14, 2022