Universiteit Antwerpen

Progress Report Week 10

Michiel Aernouts
michiel.aernouts@student.uantwerpen.be

May 20, 2017

Abstract

Optimisation of wireless networks is critical for the localisation of wireless devices. For this purpose, a wave propagation model of the environment can be created. Such a model contains a map of the environment combined with RF measurements that are obtained within that map. In this paper, we compare several visual SLAM algorithms such as LSD SLAM [1] and RGB-D SLAM [2] that can be used to render an accurate 3D map of an indoor environment. In order to test these algorithms, simulation software is used to navigate a drone around a room. A camera that is mounted on the drone provides necessary data for the algorithms. After finishing a SLAM algorithm, the resulting point cloud can be implemented in an OctoMap [3] to generate a volumetric representation.

1 Progress

1.1 Freenect driver

Last week, I installed the open-source freenect driver for Microsoft Kinect on the Erle-Brain. I was able to record bagfiles that include camera images from the RGB-camera as well as the depth camera and the tf-tree. However, this bagfile appears to be useless for RGBD SLAM. When playing the bagfile, RGBD SLAM does not render any result. When playing bagfiles that where recorded with the freenect driver on my laptop, there was no issue at all.

As shown in figure 1, many errors regarding the `depth_image_proc` package occur when launching freenect on the Erle-Brain. These errors do not occur when I launch freenect on my laptop, so it is likely that these errors are the cause of the problem. Therefore, I tried to compile the `depth_image_proc` package by using the method described in my previous report.

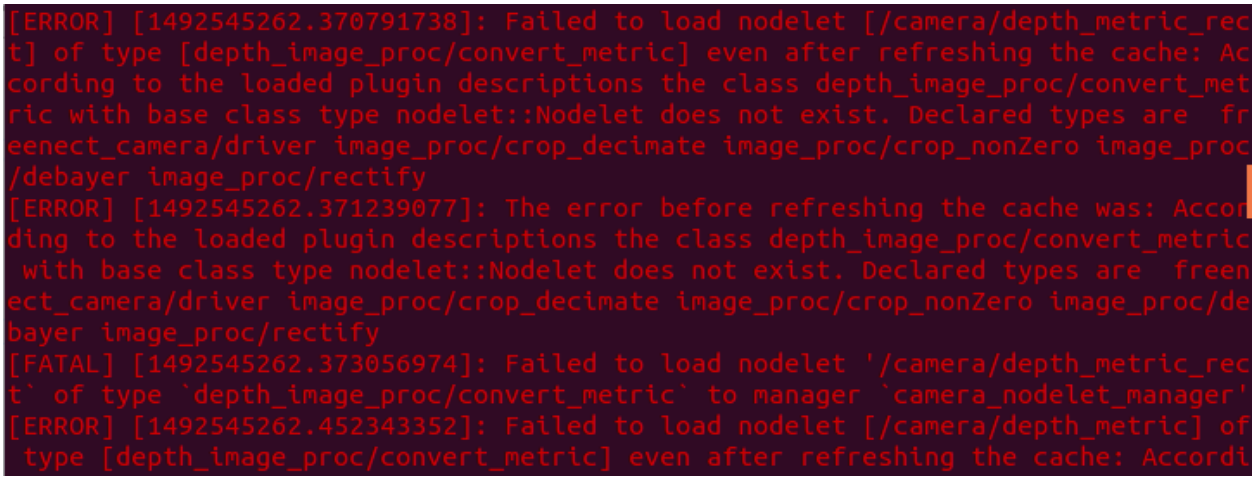

Figure 1: Errors regarding `depth_image_proc` when launching freenect

This appeared to be easier said than done. The Erle-Brain freezes when I try to compile `depth_image_proc`, because this process requires a lot of work from the CPU. A solution to this problem can be cross-compiling the package on my laptop, and copying the resulting code to the Erle-Brain.
Firstly, I created a new user `'erle'` on my laptop so that the compiled code would be compatible with the Erle-Brain. I based this process on this link. Secondly, a toolchain file had to be generated. I followed part 1 and 2 of the tutorial at `https://solderspot.wordpress.com/2014/11/17/cross-compiling-for-raspberry-pi-part-i/` to do so. In order to solve errors regarding dependencies that could not be located, I added the following line in the newly created `pi-toolchain.cmake` file:

```
include_directories(${PIROOT}/usr/include/arm-linux-gnueabihf)
```

Thirdly, I created a catkin workspace for the `erle` user and cloned `https://github.com/ros-perception/image_pipeline.git` into the `src` folder. The command to compile the `depth_image_proc` package with the custom toolchain file is:

```
catkin_make --pkg depth_image_proc --cmake-args -DCMAKE_TOOLCHAIN_FILE=/home
/erle/pidev/pi-toolchain.cmake
```

Unfortunately, I still was not able to compile the package due to an error that is shown in figure 2. More research will have to be conducted to find a solution. For now, I will try to record a bagfile by using the freenect driver on my laptop. This way, I can continue my research on the optimisation of an OctoMap.

```
Linking CXX shared library /home/erle/catkin_ws/devel/lib/libdepth_image_proc.so
/opt/ros/indigo/lib/libcv_bridge.so: file not recognized: File format not recogn
ized
collect2: error: ld returned 1 exit status
make[2]: *** [/home/erle/catkin_ws/devel/lib/libdepth_image_proc.so] Error 1
make[1]: *** [image_pipeline/depth_image_proc/CMakeFiles/depth_image_proc.dir/al
l] Error 2
make: *** [all] Error 2
Invoking "make -j4 -l4" failed
```

Figure 2: Error when cross-compiling `depth_image_proc`.

1.2 Test flight

I did a brief indoor test flight with the Kinect camera mounted on the Erle-Copter. The Erle-Copter can still take-off, but it remains a difficult task to do this in a stable fashion. More flying practice is necessary for this. Of course, this is a low-priority task for now.

2 Planning week 11

- Create a dataset with the freenect driver on my laptop, as the driver does not work on the Erle-Brain yet.
- OctoMap
  - Research
  - Initial guess algorithm
- Solve freenect driver errors

References

[1] Jakob Engel, Thomas Schöps, and Daniel Cremers. LSD-SLAM: Large-Scale Direct Monocular SLAM. *Computer Vision ECCV 2014*, pages 834–849, 2014.

[2] Felix Endres, Jurgen Hess, Nikolas Engelhard, Jurgen Sturm, Daniel Cremers, and Wolfram Burgard. An evaluation of the {RGB}-D {SLAM} system. *2012 {IEEE} International Conference on Robotics and Automation*, 2012.

[3] Armin Hornung, Kai M Wurm, Maren Bennewitz, Cyrill Stachniss, and Wolfram Burgard. {OctoMap}: an efficient probabilistic {3D} mapping framework based on octrees. *Autonomous Robots*, 34(3):189–206, 2 2013.