Universiteit Antwerpen

Progress Report Week 7

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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 Intermediate paper

Due to the deadline for my intermediate paper, I have spent most of my time doing extra research and bundling the preliminary results of my thesis.

1.2 Research yaw rotation

In order to obtain a better understanding of quadcopter physics, I conducted a brief research on this topic. It is obvious how throttle, roll and pitch can be controlled by changing the motor speeds. However, controlling yaw is more complicated.
The motors of a quadcopter spin in the opposite direction than its neighbour. If all motors would spin in the same direction, the quadcopter would spin in the opposite direction than its motors. This is due to the conservation of angular momentum and Newton's third law of motion (*"for every action, there is an equal and opposite reaction"*). Thus, the motors are

placed in opposite directions in order to cancel out this effect [4]. We can also use this effect to our benefit. Figure 1 shows that the quadcopter will yaw when two opposing motors are slowed down.

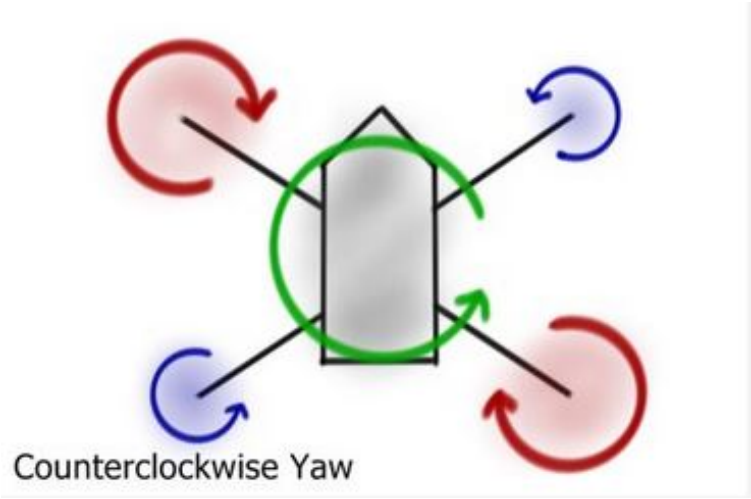

Figure 1: Counterclockwise yaw by slowing down a pair of motors. [4]

2 Planning week 8

- Test flights
- Mount the landing gear on the Erle-Copter
- Test the Microsoft Kinect
- Supply the Kinect with power from the Erle-Copter battery

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.

[4] S Hatfield. The Physics of Quadcopter Flight. *Black Tie Arial [Online]. Available: http://www. blacktiearial. com*, 2014.