VSLAM with open algorithms

Is VSLAM ready to assist visually impaired people

Graduate

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Initial Situation: VSLAM - Visual Simultanious Localization and Mapping - has been a research topic for many years. Generally it is a combination of image processing algorithms for feature detection and matching, combined with path optimization algorithms for closed loop detection and new approaches for VIO - Visual Inertial Odometry. The advantage of a visual approach for SLAM is the cost, only a camera is needed, without any other sensors such as IMUs. Commercial players like NVIDIA sell optimised proprietary hardware for faster and more detailed image processing by using CUDA. Other companies create patent restricted specialized stereo cameras with closed source SDKs. There is only a few of them who have open source SDKs with no or optional CUDA integration.

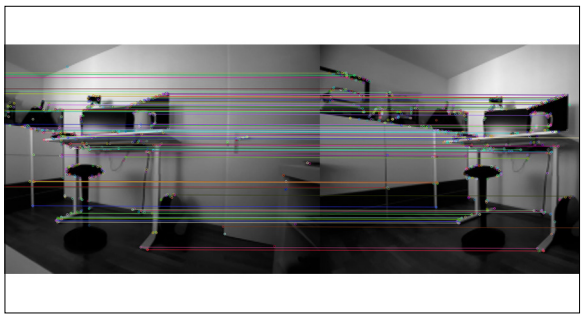
Objective: In this study I focused on open and patent free algorithms which also should not relay on special hardware for image processing. The goal was to show that it is possible to use or implement a VSLAM solution for indoor navigation to, for example, assist visually impaired people in a supermarket.

Conclusion: Most, when not all, algorithms and projects about VSLAM where created years ago and are not maintained anymore, do not perform well indoor or do not work at all.

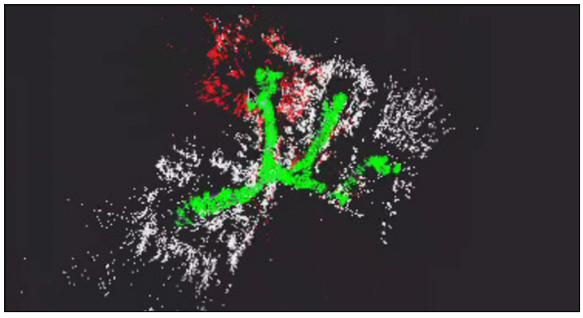
stella_vslam was the only project which was able to capture an indoor scenery successfully. Beside that, the stella_vslam_ros project could be extended with a small patch to publish the atlas as a point cloud in a ROS2 topic. To not pollute a map with dynamic objects like people walking by, a VSLAM system can also be run in a "localization only" mode based on a previously recorded map.

VSLAM with open and patent free algorithms is ready to be used as an inexpensive alternative to LiDAR or radar based SLAM.

Feature Detection and Matching with a Stereo-Camera and free algorithms.
Own presentment



Triangulate matched Features to create a PointCloud and calculate Visual Odometry.
Own presentment



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Subject Area
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