

Large-Scale Direct SLAM

This guide demonstrates how to use the monocular LSD SLAM ROS package in combination with a wide field-of-view camera. Make sure to follow the installation instructions first! For more information on the algorithm, check https://github.com/tum-vision/lsd_slam. For a brief demonstration, watch the **lsd_slam_tutorial.mp4** video in this portfolio.

Usage

- Connect a webcam to your laptop. LSD SLAM works best with a wide field-of-view camera, so we use the Genius WideCam F100 which has a field-of-view of 120°.
- In the folder '*lsd_slam/lsd_slam_core/calib*', create a new file named '*widecam_calib.cfg*'. Copy and paste the following lines:
0.527334 0.827306 0.473568 0.499436 0
640 480
none
640 480



These are the distortion parameters for the camera.

- Execute '***roslaunch gscam gscam_640_480.launch***'. This launches an instance of the open source gscam webcam driver. The images are subsampled to a resolution of 640x480, which works best for Monocular LSD SLAM.
- Open the LSD SLAM point cloud viewer by executing '***rosrun lsd_slam_viewer viewer***'.
- Run LSD SLAM by executing '***rosrun lsd_slam_core live_slam /image:=/camera/image /camera_info:=/camera/camera_info _calib:=widecam_calib.cfg***'. This starts an instance of *lsd_slam*, that listens to the */camera/image* and */camera/camera_info* ROS topics. It will also use the distortion parameters that we have set in *widecam_calib.cfg*. A window will pop up, showing the camera image.
- The LSD-SLAM parameters can be set dynamically by running '***rosrun rqt_reconfigure rqt_reconfigure***', and selecting LSD SLAM. The most important parameters are *KFUsageWeight* and *KFDistWeight*. These parameters should be changed empirically, depending on the environment that has to be mapped. High values will result in an accurate trajectory, but generate a high amount of noise. It is best to use low values for these parameters, so that the amount of noise will stay limited. Also, *cameraPixelNoise* and *minUseGradient* should be changed empirically until an adequate result is obtained. These parameters indicate the camera image noise.
- Going around the room in a circle with the camera always pointed at the middle of the room will render the best result.

