# Large-Scale Direct SLAM

1. 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 te 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.

