Install ParticleSfM on tlinux 3.2 (CentOS 8.5)

1. clone ParticleSfM and related projects

https://github.com/bytedance/particle-sfm.git main

bash Bash

```bash
git clone https://github.com/bytedance/particle-sfm.git
git submodule update --init --recursive
```

2. dependance

install_dependence_locally Bash

```bash
sfm_3d_path=particle-sfm/envs/sfm_3d_root
local_all_path=/particle-sfm/envs/local_all
log_dir=particle-sfm/envs/install_logs_root

export PATH=$sfm_3d_path'/bin':$PATH
export LD_LIBRARY_PATH=$sfm_3d_path/lib:$sfm_3d_path/lib64:/usr/lib64:$LD_LIBRARY_PATH
export C_INCLUDE_PATH=$sfm_3d_path/include:/usr/include:$LD_LIBRARY_PATH
```

a. yum install some libs

```bash
# ceres-solver 1.13.0
yum install -y glog-devel # instal glog with flags

# !!! Important
# Modified /usr/lib64/cmake/gflags/gflags-config.cmake
# get_filename_component (_INSTALL_PREFIX "${CMAKE_CURRENT_LIST_DIR}/../../../../" ABSOLUTE)
# to
# get_filename_component (_INSTALL_PREFIX "${CMAKE_CURRENT_LIST_DIR}/../../../" ABSOLUTE)

yum install -y eigen3-devel
yum install -y lapack-devel
yum install -y blas-devel
yum install -y suitesparse-devel

yum install -y boost-devel # version >= 1.66
yum install -y qt5-qtbase-devel qt5-qtopengl-devel
yum install -y lz4-devel
yum install -y freeimage-devel
yum install -y flann-devel
yum install -y sqlite-devel
yum install -y OpenImageIO-devel
yum install -y rapidjson-devel
yum install -y freeglut-devel
yum install -y hdf5-devel
yum install -y libjpeg-turbo-devel
yum install -y libtiff-devel
yum install -y glew-devel
```

b. Ceres-Solver

Ceres-Sover-install

```bash
git clone https://ceres-solver.googlesource.com/ceres-solver
cd ceres-solver
git checkout 1.13.0 # PaticleSfM uses 2.0.0, but it does not work in CentOS
mkdir build && cd build
cmake .. -DCMAKE_INSTALL_PREFIX=$sfm_3d_path -DFLAGS_ 2>&1 | tee $log_dir'/ceres_1.13.0_all_cmake.log'
make -j16 2>&1 | tee $log_dir'/ceres_1.13.0_all_make.log'
make install 2>&1 | tee $log_dir'/ceres_1.13.0_all_make_install.log'
```

Note:

- suitesparse is not required by Ceres, but required by colmap.

c. colmap

colmap — Bash

```
# colmap 3.6
git clone https://github.com/colmap/colmap.git
cd colmap
git checkout 3.6
cmake -DCMAKE_INSTALL_PREFIX=$sfm_3d_path -DBOOST_LIBRARYDIR='/usr/lib64' -DBOOST_STATIC=OFF -DCMAKE_CUDA_ARCHITECTURES="all"/"all-major" -GNinja .. 2>&1 | tee $log_dir'/colmap_3.6_all_cmake.log'
ninja -j16 2>&1 | tee $log_dir'/colmap_3.6_all_ninja.log'
ninja install 2>&1 | tee $log_dir'/colmap_3.6_all_ninja_install.log'
```

Notes:

- 1. colmap version >= 3.6 is required, or the error: `could not convert ‘tform.colmap::SimilarityTransform3::Estimate(src, dst)’ from ‘void’ to ‘bool`’will appear while compiling `particle-sfm/sfm/gmapper`

error — Plain Text

```
particle-sfm/sfm/gmapper/src/base/reconstruction.cc:606:22: error: could not convert ‘tform.colmap::SimilarityTransform3::Estimate(src, dst)’ from ‘void’ to ‘bool’ if (!tform.Estimate(src, dst)) {
```

- boost is defult to be 1.66 when installing by yum. Therefore, we need to add `-DBOOST_LIBRARYDIR='/usr/lib64' -DBOOST_STATIC=OFF` when cmake colmap project, or boost cannot be found.
- Add `-DCMAKE_CUDA_ARCHITECTURES="all"/"all-major"` when camke, or it will not use gpu.

error Plain Text

```
CMake Error at particle-sfm/envs/sfm_3d_root/lib64/cmake/Ceres/CeresTargets.cmake:59
(add_library): The link interface of target "ceres" contains: glog::glog
but the target was not found.
Possible reasons include:
* There is a typo in the target name.
* A find_package call is missing for an IMPORTED target.
* An ALIAS target is missing. Call Stack (most recent call first): particle-sfm/envs/sfm_3d_root/lib64/cmake/Ceres/CeresConfig.cmake:322 (include) CMakeLists.txt:87 (find_package)
```

- Solution

solution Plain Text

```
find_package(Glog REQUIRED)

if(NOT TARGET glog::glog)
  add_library(glog::glog SHARED IMPORTED)
  set_target_properties(glog::glog PROPERTIES
    IMPORTED_LOCATION ${GLOG_LIBRARIES}
    INTERFACE_INCLUDE_DIRECTORIES ${GLOG_INCLUDE_DIRS})
endif()
```

d. rocksdb （Required by TheiaSfM）

Bash

```
git clone https://github.com/facebook/rocksdb.git
git checkout 6.22.1
cd rocksdb
mkdir build & cd build
cmake .. --install-prefix=$sfm_3d_path 2>&1 | tee $log_dir'/rocksdb_6.22.1_all_cmake.log'
make -j16 2>&1 | tee $log_dir'/rocksdb_6.22.1_all_make.log'
make install 2>&1 | tee $log_dir'/rocksdb_6.22.1_all_make_install.log'
```

Note

- yum install rocksdb-devel not works

e. TheiaSfM

```Bash
git clone https://github.com/B1ueber2y/TheiaSfM
cd TheiaSfM
git checkout particle-sfm
mkdir build && cd build
cmake .. -DCMAKE_INSTALL_PREFIX=$sfm_3d_path 2>&1 | tee $log_dir'/theiasfm_all_cmake.log'
make -j16 2>&1 | tee $log_dir'/theiasfm_all_make.log'
make install 2>&1 | tee $log_dir'/theiasfm_all_make_install.log'
```

f. point_trajectory/optimize （source code are in particle-sfm project）

```Bash
# build point trajectory optimizer
cd point_trajectory/optimize
mkdir -p build && cd build
cmake -DCERES_LIBRARY=$sfm_3d_path/lib64/libceres.a -DCERES_INCLUDE_DIR=$sfm_3d_path/include .. 2>&1 | tee $log_dir'/point_trajectory_optimize_all_cmake.log'
make -j16 2>&1 | tee $log_dir'/point_trajectory_optimize_all_make.log'
cd ../../../
```

Note

- `-DCERES_LIBRARY=$sfm_3d_path/lib64/libceres.a -DCERES_INCLUDE_DIR=$sfm_3d_path/include` should be included explicitly
- -DCERES_LIBRARY should include libs ending with .a rather than .so. Or the following error will appear.

error Bash

```
File "particle-sfm/point_trajectory/trajectory.py", line 23, in <module>


    from .optimize.build import particlesfm
ImportError: particle-sfm/point_trajectory/optimize/build/particlesfm.cpython-39-x86_64-linux-gnu.so: undefined symbol: _ZTVN5ceres11TrivialLossE
```

g. sfm/gmapper （source code are in particle-sfm proje）

```bash
mkdir -p build && cd build
# cmake_prefix_path=$local_base_path'/lib/cmake;'$local_base_path'/lib64/cmake;'
# -DCMAKE_PREFIX_PATH=$cmake_prefix_path
cmake .. -DOpenMP_INCLUDE_DIR=/usr/lib/gcc/x86_64-redhat-linux/8/include -DROCKSDB_INCLUDE_DIR=$sfm_3d_path/include  2>&1 | tee $log_dir'/gmapper_all_cmake_v1.log'
make -j16 2>&1 | tee $log_dir'/gmapper_all_make.log'
cd ../../../
```

Note

- `-DOpenMP_INCLUDE_DIR=/usr/lib/gcc/x86_64-redhat-linux/8/include -DROCKSDB_INCLUDE_DIR=$sfm_3d_path/include` should be included explicitly

h. pip install some other libs

```bash
# pip install -r requirements_3d.txt
pip install timm==0.5.4
pip install cvbase==0.5.5

# uncomment this line if you want to run visualize
# pip install open3d
# pip install pycolmap
```

Now it works !!