Documentation
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Tango Scene Reconstructor Application

Contents

Application Build

Core of the project code is available on github: https://github.com/bashbug/TangoProject

Project Build Dependencies

- Android NDK r10e http://developer.android.com/ndk/downloads/index.html
- PCL 1.8 https://github.com/PointCloudLibrary/pcl
- OpenCV for Android 3.1.0 http://opencv.org/downloads.html
- g2o https://github.com/RainerKuemmerle/g2o
- Boost 1.55.0 http://www.boost.org
- Eigen 3.2.8 http://eigen.tuxfamily.org
- FLANN 1.8.4 http://www.cs.ubc.ca/research/flann/#download
- projective-scan-matcher-3d (not open source, ask Bastian Steder)
- multiframe-scan-matcher-3d (not open source, ask Michael Ruhnke)

Cross-Compilation

- PCL: Use the following shell scripts https://github.com/bashbug/pcl-for-android
- OpenCV : Has a Android.mk make file. Just include the path into the Android.mk file of the project as follows.

  ```
  CVROOT :=
  $(PROJECT_ROOT)/third-party/OpenCV-android-sdk/sdk/native/jni
  include $(CLEAR_VARS)
  OPENCV_INSTALL_MODULES:=on
  OPENCV_LIB_TYPE:=STATIC
  include $(CVROOT)/OpenCV.mk
  ```

  After that, make sure adding stuff with `+=`

- g2o: Follow the instructions for Cross-Compilation for Android in README.md on https://github.com/RainerKuemmerle/g2o

Project Android.mk

This is the makefile for compiling the native code. You have to include all shared and static libraries of the cross-compilation build as modules. It also compiles and links your project *.cc and *.h files. For more details look into: https://github.com/bashbug/TangoProject/blob/master/TangoSceneReconstructor/app/src/main/jni/Android.mk

Application Usage

IMPORTANT: Please, hold the device steady until the reconstruction appears!

Reconstruction mode

You can **start** the reconstruction by clicking the record button  . To **stop** the reconstruction, you have to click the button again  . The reconstruction will be **reset**ed, if a new reconstruction is started.

Optimization mode

After stopping the reconstruction, the optimization button is activated. The optimization uses the activated optimization methods of the settings.
It may show up a dialog “Tango Scene Reconstruction application isn’t responding”. Please click wait and the optimization will continue.

Model mode

This mode changes in a third-person view. After optimization is finished, radio buttons will appear in the upper left corner. You can toggle between the optimized point cloud object models by clicking these radio buttons. You can zoom in or change the view by touch gestures.

 Settings

In the settings menu you can set the optimization methods. Default: both methods are activated. The settings are stored and will be set again after restarting the application.

 Save Dialog

All generated files are stored in

`sdcard/../Documents/TangoSceneReconstructor/yyyyMMddHHmmss`

You have three options for saving the reconstruction:

1. **pcl VTK mesh**: If you activate this option, a `pcl::PolygonMesh` will be generated of each optimization. These meshes are stored as `FTFSM_mesh.vtk`, `MFSM_mesh.vtk`, `RAW_mesh.vtk` in `./`.
   WARNING: The meshes will be first generated and this will take a while.

2. **single PCD point clouds**: If you activate this option, each point cloud of the reconstruction and for each optimization method will be stored as a single `*.PCD` file in folder `./PCD`
3. **merged PCD point clouds**: If you activate this option, the point clouds of the reconstruction of each optimization will be merged to one *.PCD file and are stored in `./`.

Zip&Share Dialog

If you have not saved the reconstruction yet, the Save Dialog will appear. After that, or if you have already saved the reconstruction files in

```
sdcard/../Documents/TangoSceneReconstructor/yyyyMMddHHmmss
```

Will be zipped (may take a while) and a Dialog will appear where you can choose the application you'd like to use to share the archive with.

Info Dialog

Shows the computation time of the optimization methods. If Frame-to-Frame Scan Matching was activated, the overall number of matched frames and the number of matched frames which are actually used for the graph-based pose optimization will be displayed.

Max-Depth Slider

The slider in the lower left corner can be used to increase or decrease the max depth of z-values of the point clouds. Default: 2.5m. It can be set min 0.5m and up to 4m. You should keep in mind, that the optimization will take forever if the point clouds have too many points.

ADB - Copy reconstruction via usb on host

Connect host with Tango device. Usb debugging in developer option has to be activated.

List the saved reconstructions.

```
adb ls  /sdcard/Documents/TangoSceneReconstructor
```

Choose and copy reconstruction.

```
adb pull
/sdcard/Documents/TangoSceneReconstructor/yyyyMMddHHmmss
DEST/path/on/host
```

Troubleshooting

Nothing is rendered, or point cloud is colored black

Seriously, cameras will occasionally crash and cannot be opened. A reboot is usually required when this happens.

Occasionally, or when under high CPU load, the depth flash may appear in the color image, or no depth points are returned. Let the device cool down and/or reboot.

More kown issues: https://developers.google.com/tango/apis/known-issues

Application crashes after a while

This may happen, if the RAM/memory is leaked or full. The reconstruction is lost. For bigger reconstructions, you should scan partly.

Reconstruction is a mess

You have to hold the device steady when application started and before reconstruction starts.
You have to go very slowly and do not change the horizontal direction.
Also Tango motion tracking uses only image for pose estimation. If you are in an environment without (e.g. white walls) or not enough features, the motion tracking will fail and a reconstruction reset is necessary.

Optimization is a mess

This will happen if the Tango poses are poorly estimated. Please look above “Reconstruction is a mess”.