Visual Place Recognition (a.k.a. Loop Closure Detection) Part II

Pose-Graph SLAM

• Mapping: visual sampling of environment
  • Key location or key frame detection
  • Loop closure detection (LCD) by matching images
• Localization = LCD
• Metric information from “pose-graph SLAM”
  • Calculate robot poses from odometry and loop closures

Visual loop closure detection (a.k.a. visual place recognition)

Pose-Graph SLAM

• Topological map of key locations, each of which is described by sensory measurements (e.g., laser scan, images) at that location

Keyframes in pose-graph SLAM

1. Acquire new image
   • Skip image if similar to last keyframe
   • Add new keyframe
   • Update node
2. Add new link
3. Loop closure
   • Yes: Update node
   • No: Add node

Start
Challenges in visual place recognition

Mapillary HK

General VPR Framework

Other Whole Image Descriptors

Gabor-Gist

VPR: Whole Image ConvNet Descriptor
Data

Feature

Viewpoint Invariance via ConvNet Landmark Representation

Landmarks-Based VPR

Efficient Landmarks-Based VPR

VPR by Matching ConvNet Landmarks
BoCNF: Efficient Image Matching with Bag of ConvNet Features for Scalable and Robust Visual Place Recognition

Yi Hou
National University of Defense Technology, China
yihou0623@gmail.com

Hong Zhang
University of Alberta, Canada
hzhang@ualberta.ca

BoCNF: LCD accuracy

BoCNF: matching efficiency


ground truth