

SAGE: SLAM

- 1) Depth buffers consist of a set of depth variations that explains scene geometric variation.
- 2) Descriptor map^{set} is used as descriptors in pair-wise feature matching that are involved in the reprojection factor and sparse matched geometry factor
- 3) Feature map set is used for the computation of the feature metric factor because illumination varies from same viewpoint in RGB from endo light source
- 4) N.N for feature map same as depth Netun except for two output branches.

1) Video []

- 1) video sequence is of 800 video frames
- 2) Estimates camera trajectory and dense geometry per key frame
- 3) Loop closure [explain]
- 4) After SLAM run finishes a camera pose and a dense depth estimate per key frame will be produced
- 5) Then depth fusion + Surface recon to get final Surface recon
- 6) All test cases not training
- 7) Left is endoscope blank right is recon

1) Table 1 Train on all models except lister stage test

only on keyframes

ATE = absolute trajectory error	= quantities whole trajectory RMSE error
RPE = relative pose error	= local accuracy of trajectory over a frame interval
ARD = Absolute relative difference	= estimated depth per keyframe scaled from scale computed from trij. alignment $ARD_{trij} + \#threshold_{trij}$

+ Threshold

medium ratio between GT and estimate $ARD_{scene} + \#threshold_{scene}$

Bow = Bag of words

1) Image pair selected so C.T ratio of scene overlap is larger than 0.6.

1) Training procedure:

1) Each iter 3 img used source, target, far.
large scene overlap

2) Factor Design:

1) feature Metric factor (FM): Processed to form a gaussian pyramid to increase convergence basin.

2) Sparse Matched Geometry factor (SMG): Only FM makes convergence basin small. less ambiguous than 2D filtering based on epipolar geometry

3) Module Design

Cam Tracking: Track new frame to reference (spatially distant) based on appearance sim LM used to solve T_{src}^{tgt} pose factor FM+RP

Keyframe Creation: Ambiguous scale so check if new needed for each key frame "bag of words" created from descriptor map and added to a database for global loop indexing pairwise factors involved FM, CIC.

Mapping: ISAM2 [bags, tree]. The factor graph consisting of pairwise and prior factors from all key frames is optimized in this module

Loop closure: ~~local loop based on~~ selected local connection is linked with pairwise factors same as temporal connections.

Graph optim. terminates if max number of iters reached.

1) Wiki example of (Klein): can be decomposed in factors

1) Training requires C.T of relative camera pose, intrinsics, video mask, dense depth map
dense 2D scene flow map.

Loop detection verification

- 1) Local loop: Filtering candidate keyframe pairs based on spatial distance appearance ver (feature match index [performed in small temporal window])
- 2) Global loop: uses BoW for keyframes and same as local loop [feature match index ratio]

Summary

- 1) Network training done separately and then employed after ~~the network is fully trained~~ sufficient training and good results
- 2) Training again with objective of pair wise image alignment.

R.R. Loss [Relative Response Loss]