Relocalization under Substantial Appearance Changes using Hashing

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Changes in the environment lead to challenges in recognition

- Seasonal changes
- View point changes
- Day / night changes
Preserve sequence information

Matching image sequences can be formulated as graph search problem

Naseer et al., AAAI 2014
Preserve sequence information

Data associations are obtained by computing shortest path in the graph

Naseer et al., AAAI 2014
Online sequence matching

**Nodes** are created only in the regions that support **path** hypothesis.
Easy: Query and reference trajectories mostly overlap
Hard: Flexible trajectories

Reference trajectory contains loop

Query trajectory deviation

- A → B → C → D
- E → D → E

Legend:
- reference
- query
- same place
- lost
Previous approach fails

Reference trajectory contains loop

Query trajectory deviation
Proposed approach succeeds

Reference trajectory contains loop

Query trajectory deviation
We propose

- Enhanced graph construction strategy that connects *similar places* in reference trajectory

- **Efficient relocalization** strategy using locality sensitive hashing

- **Fast** candidates *retrieval* approach suited for very high-dimensional features
Our approach can efficiently deal with flexible trajectories
Summary

- Quickly **relocalizes** the robot in case it gets lost
- Can be executed in **online** fashion, requiring small number of image to image comparisons
- Deals with **loops** in reference trajectory without GPS priors

See you at the poster