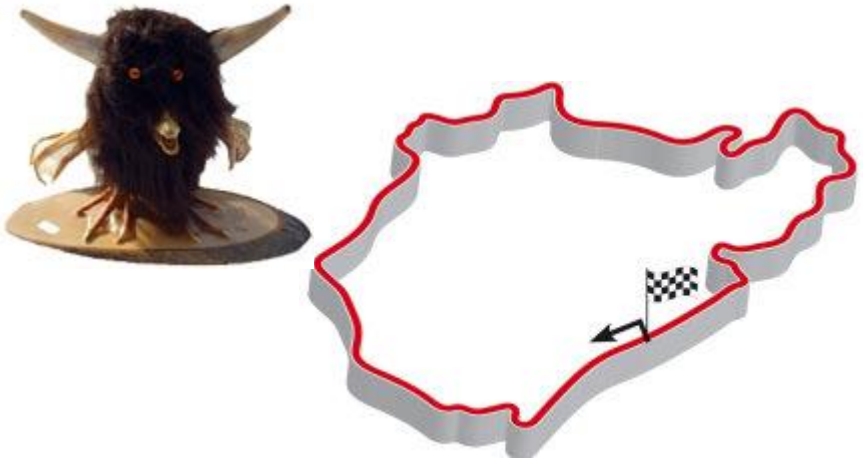
SeqSLAM

Route-Based Navigation



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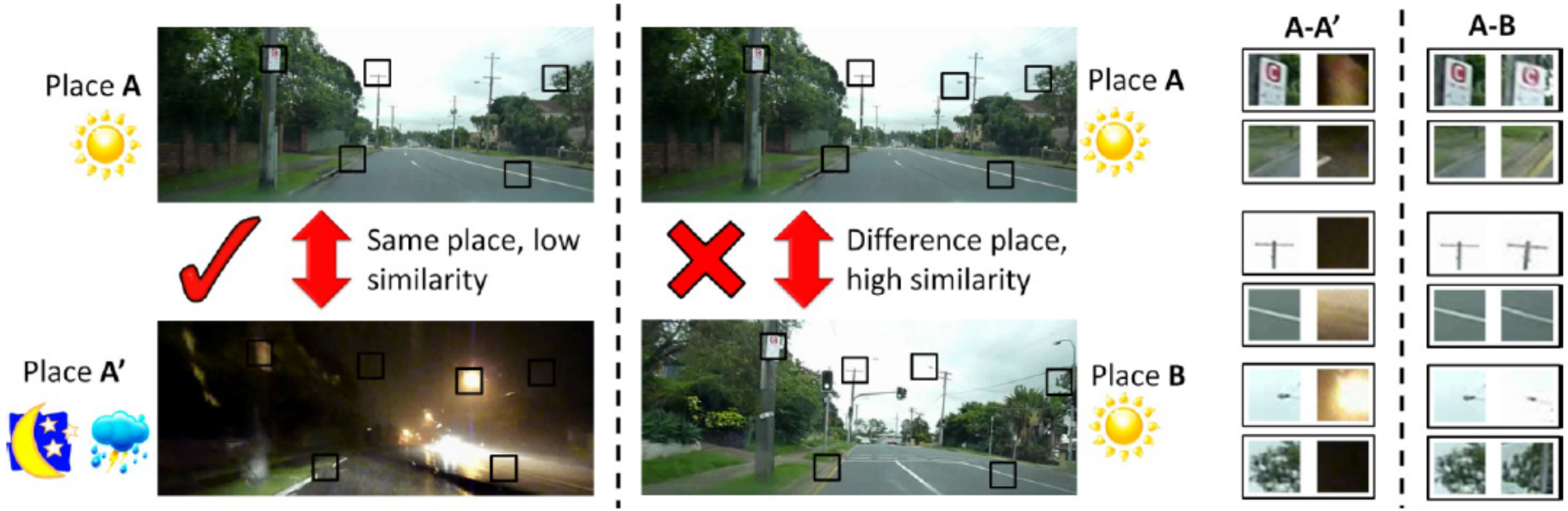
Overview

Goal: Recognize a location from a learned video sequence - robust to changes in lighting and vegetation conditions (e.g. daytime / weather / seasonal changes).

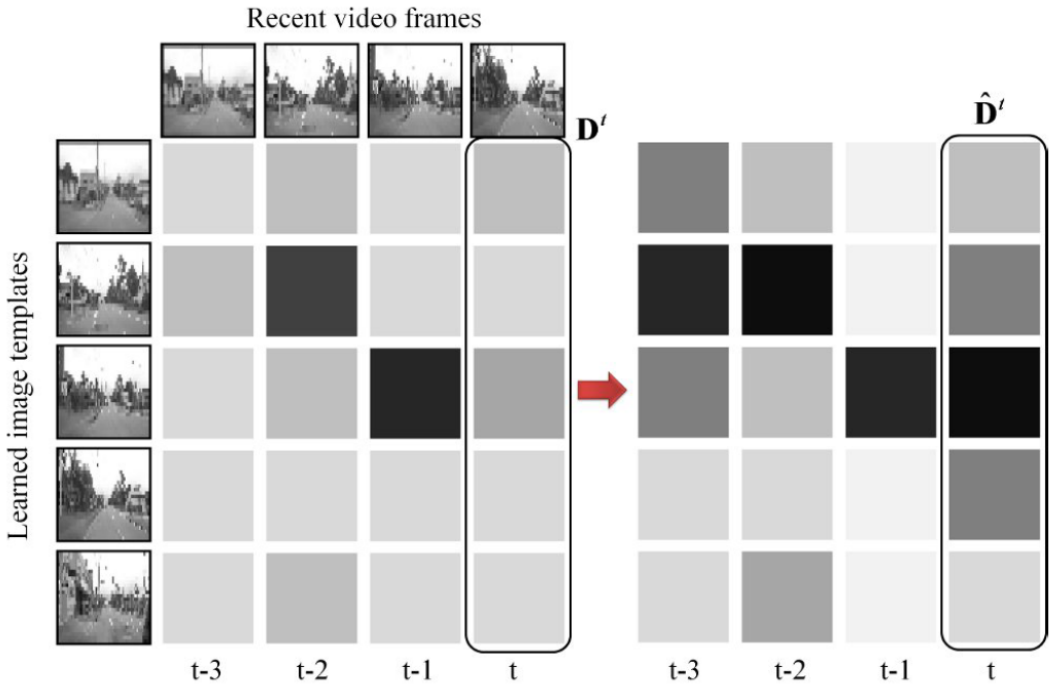
General approach: No feature based global matching, instead matching in local sequences and finding coherent best match sequence.



Implementation (1)

Local Best Match

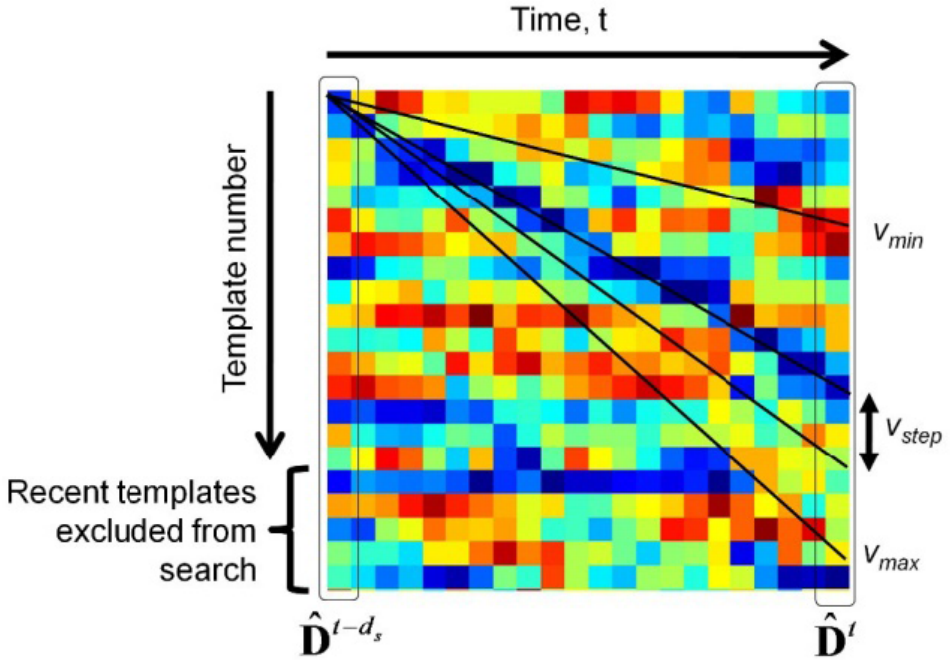
- Build image difference vector for every frame by computing pixel intensity difference to every learned template
- Perform local contrast enhancement of image difference vector



Implementation (2)

Localized Sequence Recognition

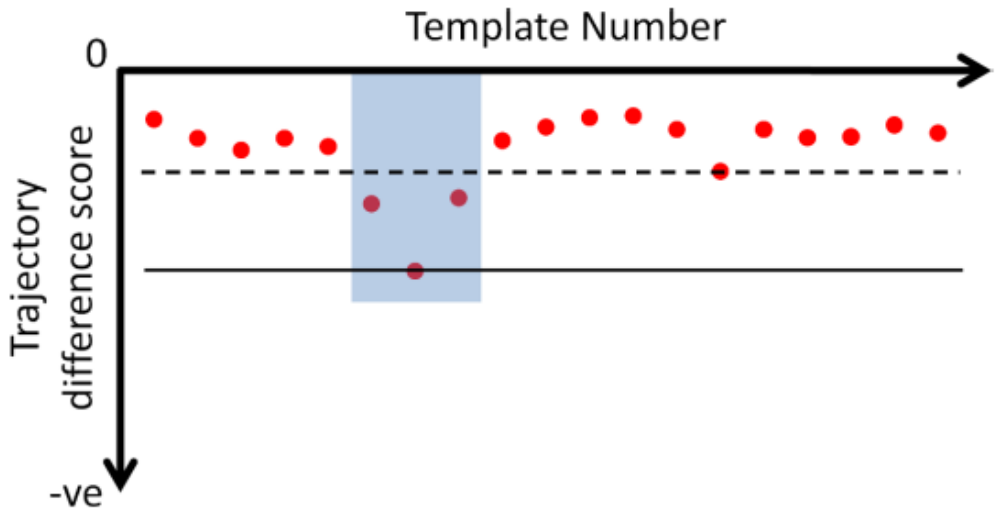
- Compute summed differences for trajectories through the local space of image difference vectors and save min for every starting template
  - Use appropriate velocity range to compute trajectories
  - Exclude recent templates from search



Implementation (3)

... Localized Sequence Recognition

- Use sliding window to find confident match by requiring difference values outside window to be significantly higher than inside window



Schedule

Week 1	● Read paper ● Understand topic ● Create schedule
Week 2	● Start implementation ● Preprocess datasets and create bagfiles ● Generate first basic output (matches side by side)
Week 3	● Implementation: final stage ● Testing ● Bug fixing ● Evaluation of matching quality
Week 4	● Parameter tuning ● Improvements (quality / performance) ● Enhancements (-> see next slides) ● Final presentation

Difficulties

- Real-time computation
- Original datasets partially not available
- Original datasets need to be preprocessed
- Ground Truth data not available

Enhancements

- Own video recording
  - Campus Garching (day / night, clear sky / raining)
  - Alternatively get a BMW from BMW and drive around the Tegernsee
- Test different frame comparison models (e.g. patch-based)
- More sophisticated odometry model (non-linear)
- Comparison to other approaches: neural network