Introduction

- Mobile videos are prevalent
- YouTube statistics: ~20% mobile videos, ~3 hours/min upload
- Increasingly geo-tagged
- Spatial-temporal video queries are demanding, e.g.,
  “Find videos recorded in front of Tommy Trojan on the 2013 USC-UCLA football game day”

Challenge:
- The fusion of location, time and direction
- Existing indexes are not efficient

How to efficiently index and search the large-scale videos by using the geo-metadata?

Video Frame Model

- Model a video frame \( f \) in form of \((p, \theta, R, t)\)
  - \( p \): camera location
  - \( \theta \): view orientation
  - \( R \): maximum viewable distance
  - \( t \): timestamp

Existing Indexes

- **R-tree [1]**
  - Range query \( q_{\text{range}} \)
    - results: \( f_{11}, f_{12}, f_{15}, f_{16} \)
    - visit: node\#4; FOV\#7
  - Directional query \( q_{\text{dir}} \)
    - results: \( f_{11}, f_{12}, f_{13}, f_{14} \)
    - visit: node\#4; FOV\#8
  - Drawbacks
    - Large “dead space”
    - Large “overlap”
    - No directional info in index nodes
    - Only based on area optimization criteria

- **Grid based index [2]**
  - Drawbacks
    - Need prior knowledge: cell size
    - Store direction info 3rd level only
    - Unnecessary visit: \( f_{15}, f_{16}, f_{17}, f_{18} \)

A New Index: Orientated R-tree (OR-tree)

- Store smaller MBRs
- Incorporate orientations into internal index nodes
- Incorporate combined optimization of
  - Area of camera locations
  - Orientation
  - View distance \( R \)

Experimental Results

Related Work


Conclusion and Future Work

- We proposed a new index called OR-tree to index FOVs for efficient video search.
- Our future direction is to index video considering time of videos
- Highly frequent update also need to be supported.