Efficient Game-Theoretic Hypergraph Matching

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Feature Matching

- Feature matching is a basic task in computer vision.

- Straightforward comparison of feature descriptors does not generate high-accuracy matching results.

- Graph matching uses pairwise relationship bertween features to improve accuracy.

- Hypergraph matching further uses higher-order constraints among multiple features.

Hypergraph Matching

- Existing hypergraph matching algorithms usually solve an assignment problem.

- All model features, including outliers, are assigned matches.
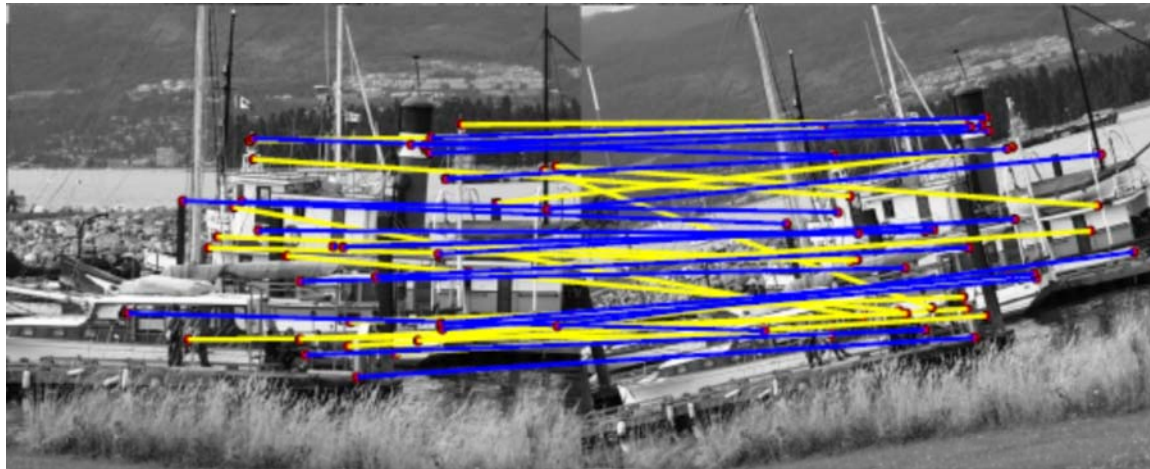
many false matches (yellow lines) are caused by outliers, with BCA algorithm

Game-Theoretic Algorithm

- A game-theoretic algorithm
  - case hypergraph matching of features as hypergraph clustering of matches
  - solve the problem with a game-theoretic approach
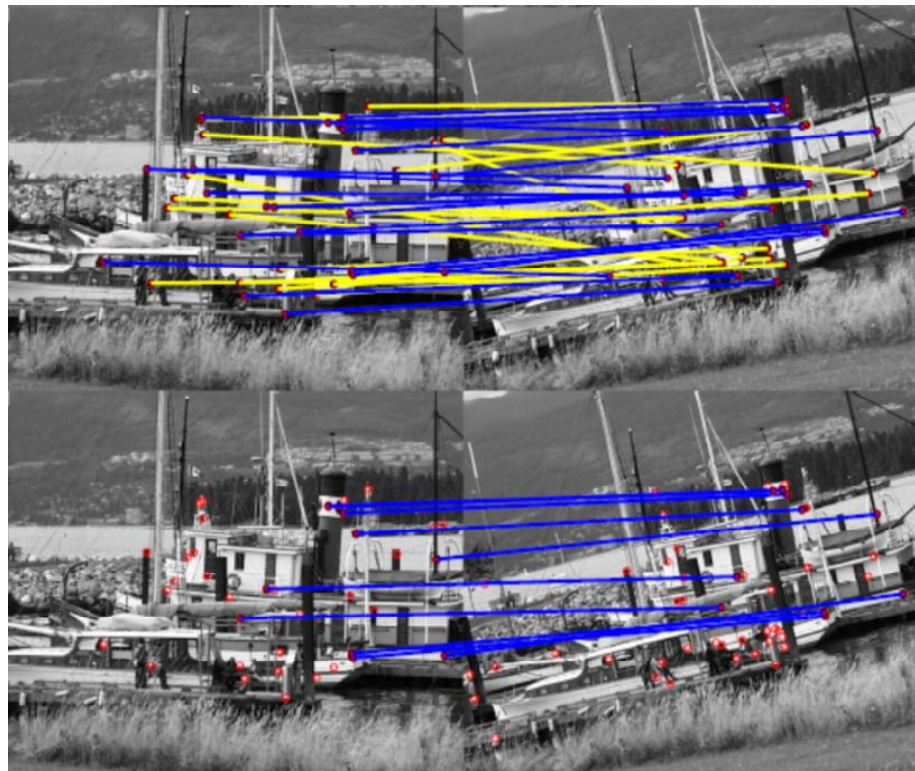 - obtain a group of consistent matches

(a) true matches and triangles
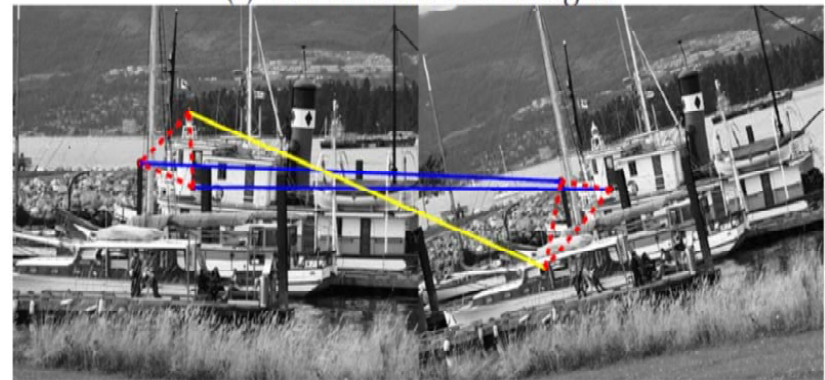
(b) true and false matches, and triangles

Game-Theoretic Algorithm

- generate accurate matching results
- but, the number of matches is small

with BCA algorithm

with game-theoretic algorithm

Game-Theoretic Algorithm

- Reason
    - an over-strict constraint on the internal consistency among matches
    - true matches may be associated with small similarities

Our Algorithm

- Relax the over-strict constraint
  - transform consistency among matches to densities of matches
  - define densities in the third-order hypergraph
  - do group expansion following the density peak algorithm

Results

- increase the number of matches without degrading matching accuracy