Track stitching using graphical models and message passing

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Presentation Outline

Problem Statement

- Track stitching (TS) is inherent in the MTT environment.
- Tracks are broken due to a number of factors.
- Highly maneuverable targets cause incorrect track initiation.
- Track stitching to create global tracks from tracklets.
- Long term tracking is important to perform higher level operations.

Research validation

- Persistent tracking/surveillance applications.
- Important in threat assessment algorithms.
- False track initiations cause tracklets.
- Missed updates in tracking environment cause tracklets.
- Occlusions result in broken tracks and produces tracklets.

Real world examples

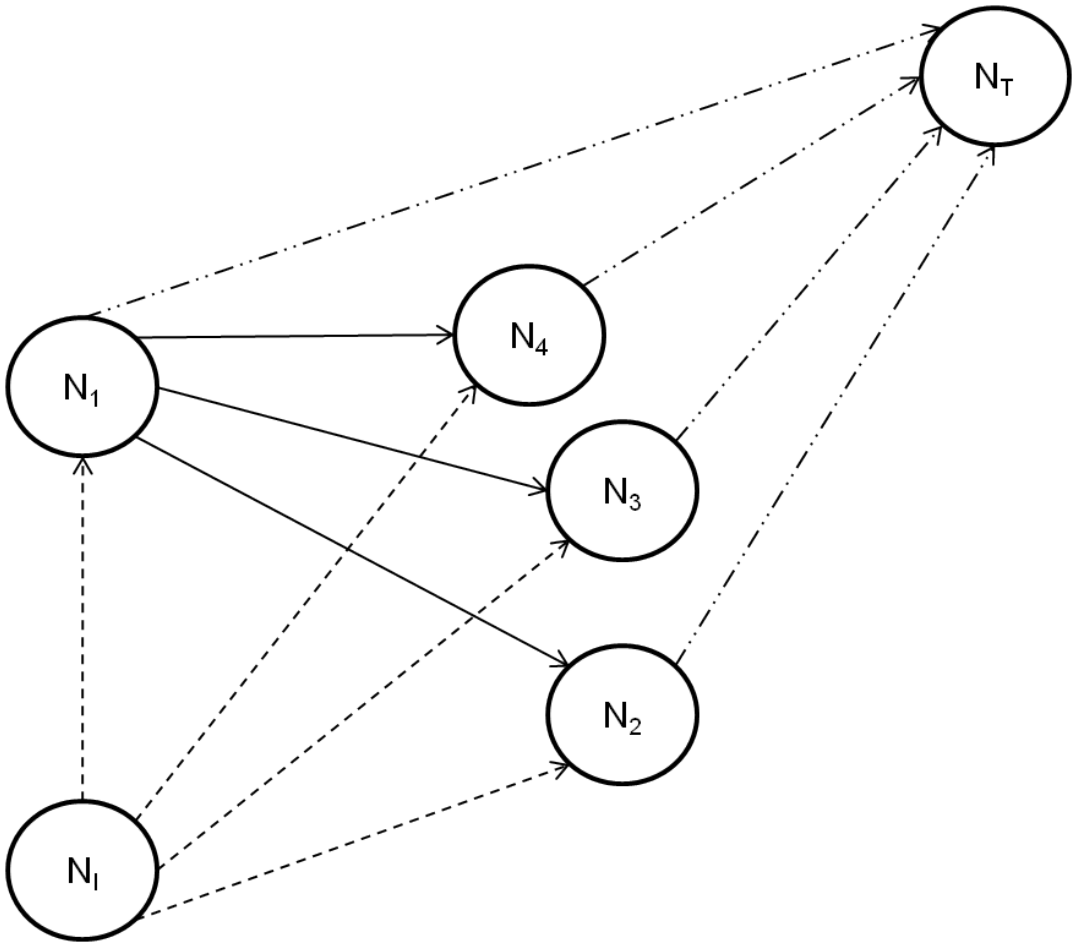
- Track-while-scan radar tracking a highly maneuverable target.
- Airplane occluded by obstacle before reappearing.
- Vessels occluded by waves.
- Satellite tracking applications where update period might be long.
- Missed updates from sensors due to a low detection probability.



Proposed Solution

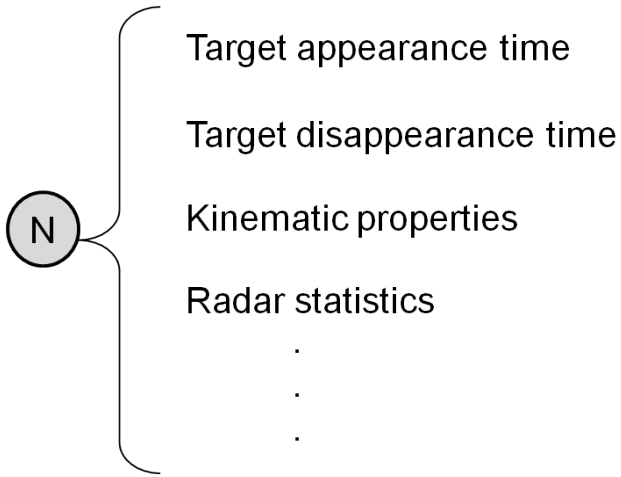
- Use a directed graphical model (track graph).
- Tracklets are inserted into the track graph as nodes.
- Associations between the nodes are represented by arrows.
- Use a message passing algorithm to update associations between tracklets.

Proposed Graph Structure



Node and association definitions

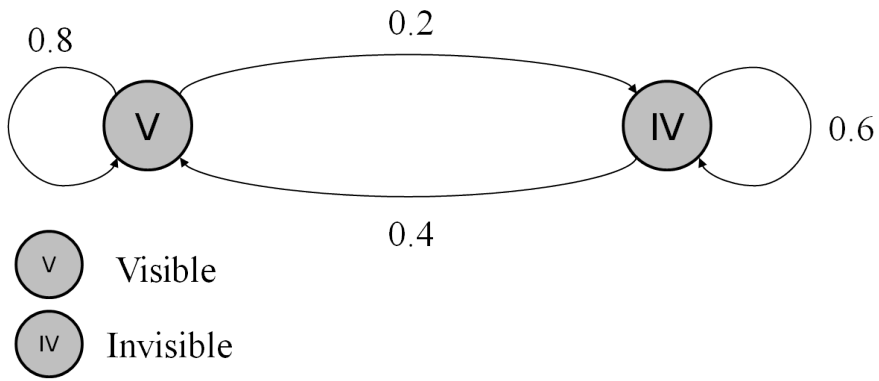
- Nodes take form of state vector.
- Includes filtered measurements from radar.



- Associations (arrows) represent conditional probabilistic relationships between nodes.

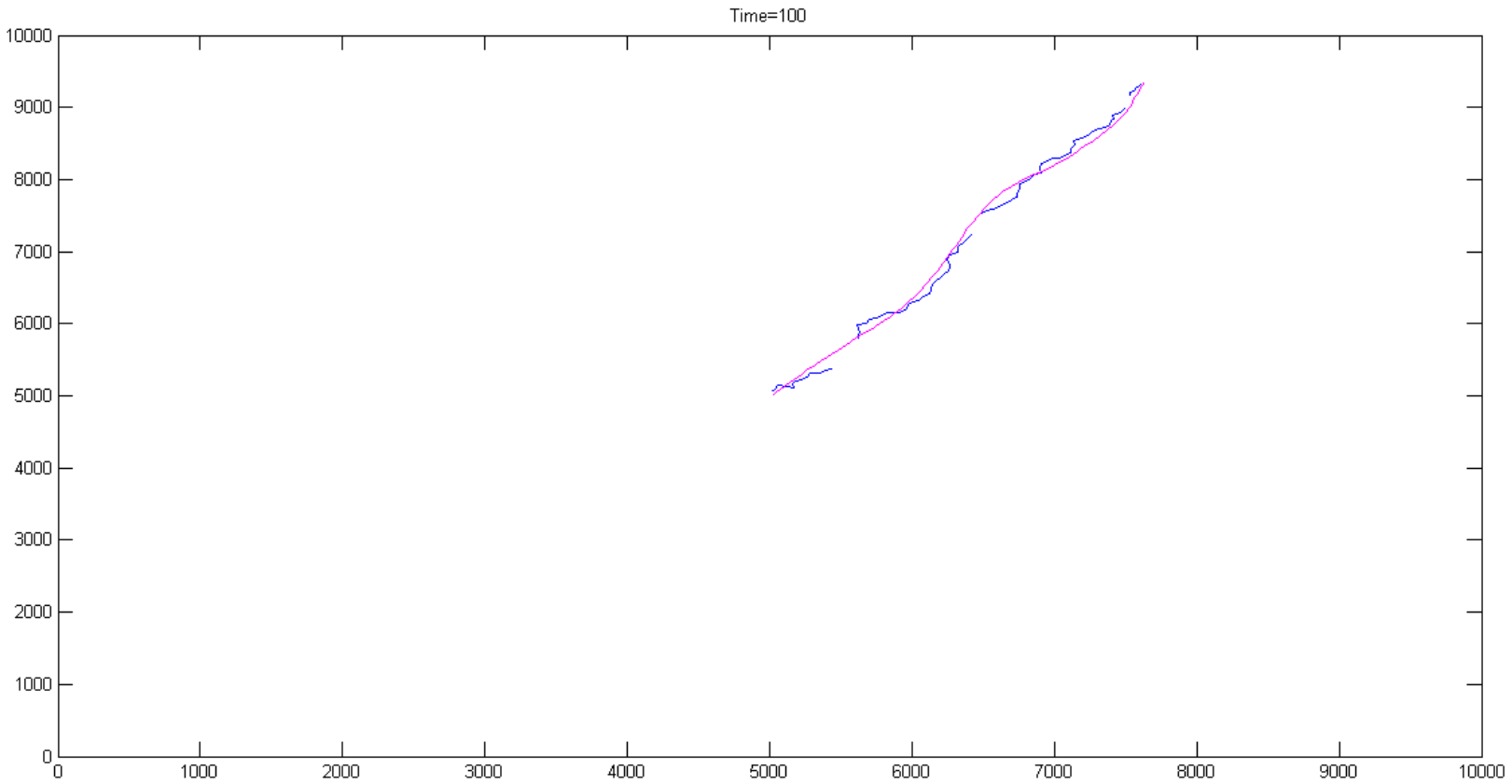
Tracklet Creation

- The tracklets are created using the following Markov model:



- This results in bursts of tracklets.

Tracklet Creation



Questions and Answers

Thank you!