

Surveillance Through Real-time Evaluation of Reachability Queries in Large and Evolving Contact Networks



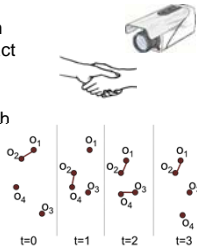
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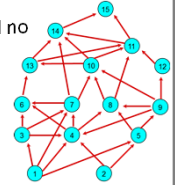
Introduction

- With many applications, individuals in close proximity, in **contact** with each other, transmit items
- **Contact network**: A collection of contacts of a set of individuals during a time interval T
- **Contact path**: A sequence of contacts transferring an item such as virus from an individual to another one in a contact network
- **Reachability query** verifies the existence of a contact path between two individuals
- **Focus problem**: Reachability query in a contact network constructed based on image sequences



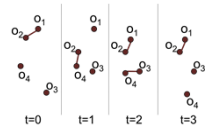
Related Work

- Graph Reachability algorithms focus on memory resident graphs and no spatiotemporal information is embedded with the graph



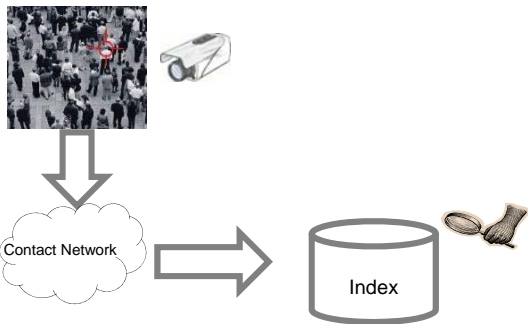
- Contact network analysis approaches focus on the statistical properties of contact networks and not efficient query processing

- Average reachability time?
- Small world?



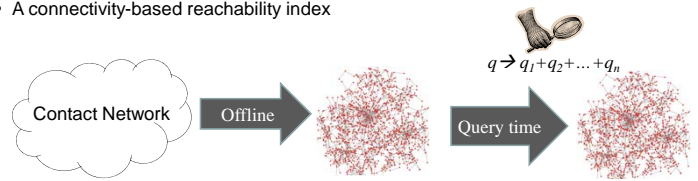
Reachability Query in Contact Networks

- Two parallel steps:
 - Maintaining the contact network by extracting contacts from image sequences
 - Indexing and traversing the contact network to verify reachability query

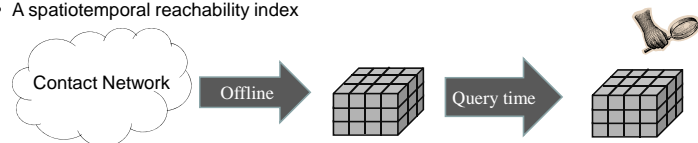


Approaches

- ReachGraph
 - A connectivity-based reachability index



- ReachGrid
 - A spatiotemporal reachability index



- Experiments
 - Reachability in a contact network constructed for a period of a day based on individuals movement in RTH

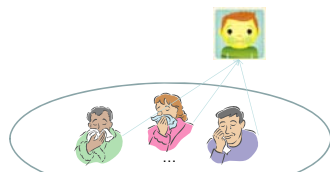


Challenges

- Scale of the contact network



- Real-time reachability query processing



Conclusion and Future Work

- Conclusions
 - Defined reachability in contact networks and proposed two index structures to verify reachability
 - Made the index structures adaptive to update

- Future work
 - Experiment the approaches for more extended periods of time