Context-aware Crowd-sensing in Opportunistic Mobile Social Networks

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Introduction

Opportunistic mobile social network: A social network of mobile devices.
- Each vertex is a mobile device, each edge is a wireless contact between devices
- The network is dynamic, temporal, spatial, and social

Crowd-sensing: To sense the environment in order to answer the question about the crowd

Proposed Approach

Sensing model

- Problem: How to intelligently choose an set of sensing nodes to maximize the coverage and take into account the socio-temporal & spatial context of devices.

Related work

Sensor cover problem for sensor placement
- Static setting
- Distributed scenario

Crowd-sensing
- Centralized vs. distributed crowd-sensing
- Incentive vs. voluntary mechanism

Graph coverage problems
- Vertex cover problem
- Approximation algorithms

• Crowd-sensing as a graph optimization problem
• Context-aware crowd-sensing, leveraging social, temporal, and spatial context.

Motivations

- Behind mobile devices are human users & their social relationships
- The crowd is dynamic and thus, the sensing effectiveness should also be adjusted dynamically

Conclusions

- We have modelled the crowd-sensing problem as an optimization problem and draw the connection to the vertex cover problem
- We propose the notions of node observability and coverage utility score and design a new context-aware approximation algorithm and human-centric bootstrapping strategies for crowd-sensing task

Future work:
- Include location information of the devices that can be inferred from WiFi access points
- Adaptively adjusting the sensing parameters

Evaluations

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<th>UIM</th>
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<tr>
<td>V</td>
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</tr>
</tbody>
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Datasets of real-world mobile traces

Sensing coverage comparison

Bootstrapping strategies comparison

Sensing parameters study

- Unified crowd-sensing framework:
  - Algorithm 3: Crowdsensing by Vertex Cover Approximation
    - Problem: How to intelligently choose an set of sensing nodes to maximize the coverage and take into account the socio-temporal & spatial context of devices.

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