Efficient Data Harvesting in Mobile Sensor Platforms

Vehicular Sensor Network

✎ Gathering valuable information in urban environments.

Difference between a traditional static wireless sensor network and Vehicular Sensor Network:

- The first consists of a large number of small sensor nodes with:
    - Low computational
    - Storage
    - Communication capabilities
- Such limitations no longer apply in a vehicular sensor network.

Vehicular sensor network shares the same ideas as vehicular ad hoc networks (VANET). A vehicular sensor network can be used in many ways. For example:

- Gather traffic information
- Homeland security (vehicles could be equipped with aural and video devices. Mobile sensor nodes collect a stream of images while cruising down the streets and also detect and notify events to the police. Thus, the police can use such information to investigate terrorist activities.)

A mobile sensor network may generate a sheer amount of data depending on types of applications. In a mobile sensor network such as the vehicular network, it is impossible to deliver all the data detected/collected to the sink because:

- Just too much is detected by such powerful sensor platforms;
- The network capacity is too thin because of mobility.

We assume that most of the sensed data stays with mobile node. To access data in the mobile storage, we need to design a protocol that can not only harvest events but also retrieve data from remote storage.

However, providing such services is nontrivial in the following reasons.

- Because sensor nodes are mobile, we need to keep track of their location to retrieve data from a specific node, thus requiring a location service.
- For efficient retrieving and searching of large distributed storage, we need an indexing for ease of access.

Working

Each vehicle responsible for sensing one or more events, routing messages to other vehicles or Infostations and processing sensed data.

✎ 3 important points:

1. The vehicular network has high computation power
2. It must provide high storage space
3. It must have mobile sensor nodes

Moreover, sensed data is carried by each mobile sensor node.

Two storage architectures

- Content-Addressed Storage (CAS)
  - o utilizes Infostations by hashing the key of an event to a specific Infostation
  - o appropriate for time-critical applications
- Mobility-Assist Storage (MAS)
  - o opportunistically disseminates events by "relaying" or sending events only to one's neighbors
  - o delay tolerant applications only if infrastructure is not available

Protocol Design Issues in Vehicular Sensor Networks

Vehicular sensor networks have the following characteristics:

1. No power, computational or storage constraints
2. High but predictable mobility (e.g., travelingon roads)
3. Large-scale deployment (e.g., vehicles in large cities)
4. Unreliable communications due to mobility or network partition
5. Mobile storage that carries vast amounts of generated data

In the section 3 and 4, they propose data harvesting protocols for CAS and MAS: Infostation-based and mobility-assist data harvesting protocols respectively.