Data aggregation in sensor networks

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Abstract

A sensor network consists of sensing devices which may exchange data through wireless communication; sensor networks are highly energy constrained since they are usually battery operated. Data aggregation is a possible way to save energy consumption: nodes may delay data in order to aggregate them into a single packet before forwarding them towards some central node (sink). Sensor network can be easily modeled as graph and Data aggregation give rise to a large variety of graph optimization problems depending on the following issues.

- Transmission energy and time can be seen as functions of the size of the packet and the transmission arc.
- Data aggregation introduces latency that affects the quality of the detected data.
- Sensor networks can be modelled as synchronous or asynchronous systems.
- Data is delivered to one or more sinks.
- The overlay routing paths connecting nodes to the sinks can be fixed a priori, (e.g. a tree or a chain) or may also be chosen as part of the optimization process.
- There might be several objective functions; the most natural ones are to minimize the maximum energy consumption over all nodes or to maximize the amount of sensed data arriving at the sinks with a given energy constraint.

In this talk I will survey some of the optimization problems arising in the above scenario.