Link Correlation and Network Coding in Broadcast Protocols for Wireless Sensor Networks

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Background

- Correlated packet reception can be beneficial for sensor network broadcast protocols
- Link correlation based single packet flooding has been devised without requiring explicit ACK
- Reduced transmissions
- Rateless Deluge
- PRR = 0.7
- NC + LC
- Multihop network
- 18-30 battery-powered TelosB motes were placed in different indoor environments

Testbed Setup

<table>
<thead>
<tr>
<th>Environment</th>
<th>Topology (Motes)</th>
<th>Tx Power Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilevel Classroom</td>
<td>5x6 Grid (30 motes)</td>
<td>2</td>
</tr>
<tr>
<td>Community Lounge</td>
<td>Random (20 motes)</td>
<td>1</td>
</tr>
<tr>
<td>Apartment Room</td>
<td>3x6 Grid (18 motes)</td>
<td>1</td>
</tr>
</tbody>
</table>

Testbed Results

- Multi-packet flooding problem becomes challenging due to varying link correlation
- Reliability degradation
- Redundant data transmissions

Introducing network coding over link correlation

Performance Comparison

- NC is unaffected by changes in link correlation
- CF performs better than NC in case of high link correlation
- CF lacks perfect reliability
- NC+LC performs better than both

Future Works

Devise a protocol exploiting both link correlation and network coding to disseminate a large object with fewer transmissions and minimum delay.

- Rateless Deluge is no better than Deluge when link correlation is high
- For links with low PRR, NC+LC performs significantly better than both
- For networks with high PRRs and link correlation, performance is dominated by the link qualities rather than the link correlations