Measurement-calibrated Conflict Graphs for Dynamic Spectrum Distribution

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Building Conflict Graph

Conflicts Graph

\[ L = 10 \, n \, \log_{10}(d) + C \]

Problems:
1. Exhaustive measurement is not practical
2. Simplified propagation model is inaccurate

Methodology

Exhaustive RSS Measurement
Sampling
Monitored RSS Data
Calibrated Propagation Models
Predicted RSS Data
Actual Conflict Graph

Graph Similarity

Correct Extraneous Missing

Spectrum Allocation Benchmarks

Allocation Reliability = \( \frac{\text{# of users with reliable allocation}}{\text{# of users}} \) (user with reliable allocation: 95% of clients with SINR>10dB)
Allocation Efficiency = \( \frac{\text{Average amount of spectrum per user}}{\text{Total amount of spectrum}} \)

Difference from Measured Graph

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Uniform</th>
<th>Two-Ray</th>
<th>Street</th>
<th>Terrain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Graph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurate Edges</td>
<td>23%</td>
<td>22%</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td>Missing Edges</td>
<td>0.4%</td>
<td>0.8%</td>
<td>0.4%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Location dependent error pattern
→ more extraneous edges in estimated conflict graphs!

Spectrum Allocation Benchmarks

Estimated graphs are conservative
1. More reliable allocation (extraneous edges reduces spatial reuse but mitigate cumulative interference)
2. Bounded efficiency loss