ANR Diaforus
Detecting spatio-correlated events
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Area Monitoring using a Wireless Sensor Network

Pros:
- Easy to deploy
- Reduced cost
- Dynamic configuration
- Redundant & heterogeneous sensors

Challenges:
- Management and Maintenance cost and overhead
- Energy consumption / Network Lifespan
- Security

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Area 1

Map Key
Sensor nodes
Correlation node
Sink

Alert
Alarm

Two levels of Reasoning

Publish an alert because:
\[ f(t) > \text{threshold} \]

\( \Delta t_0: \) Long retention period (example: 1 minute)
\( \Delta t_s: \) Short retention period (example: 10s)
\( \Delta v: \) A significant value change (example: 20%)
\( \Delta t > Y > \Delta t_s \)

Proposition:
- Favor local processing
- Transmit semantic informations (alerts and alarms instead of data)
- Semantic routing to allow in-network usage (Publish/Subscribe)

Source of power consumption:
- CPU
- Radio transmissions
- 1 byte sent \( \approx \) a few ms worth of processing
- Sensors (outside of the scope of the study)

Comparison with the State of the Art

Comparaison with the state of the art: features

Limits & Implications

Few messages arrive at the administrator:
- Difficult to monitor the availability
- Difficult to detect false negative (absence of detection)
- Difficult to know how limit the false-positives/negatives

Nodes should be as autonomous as possible:
- Auto-configuration: React to changing the number of sensors
- Auto-optimization: Learn the error rate of sensors
- Logging: Save the most important events for the administrator

Sensor reputation

\[
\text{reputation}_{fp}(a, s) = \frac{\text{area}\_\text{detection}\_\text{count} \_\text{involving}(a, s)}{\text{sensor}\_\text{events}\_\text{count}(s)} \tag{1}
\]

\[
\text{reputation}_{fn}(a, s) = \frac{\text{sensor}\_\text{correlated}\_\text{count}(a)}{\text{area}\_\text{detection}\_\text{count}(a)} \tag{2}
\]