

A WSN-based Generic Emergency Event Detection Model

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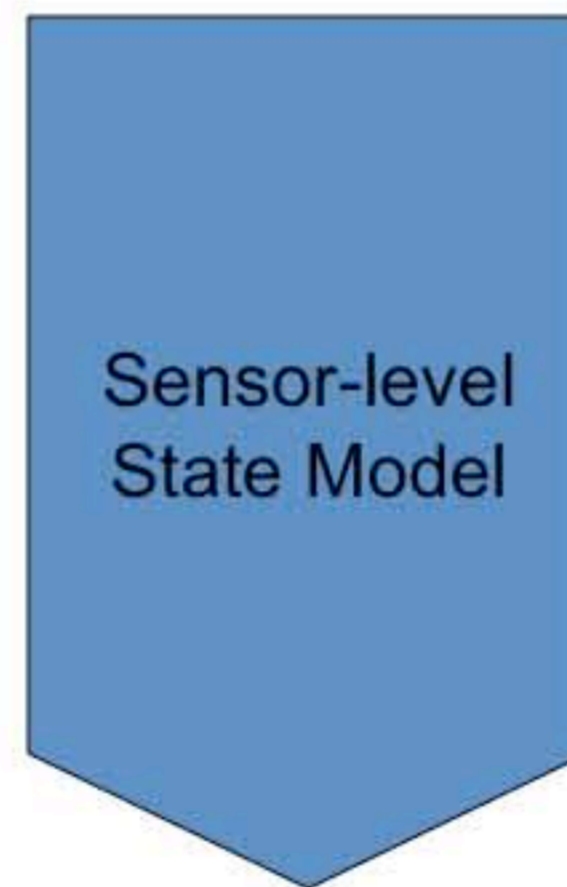
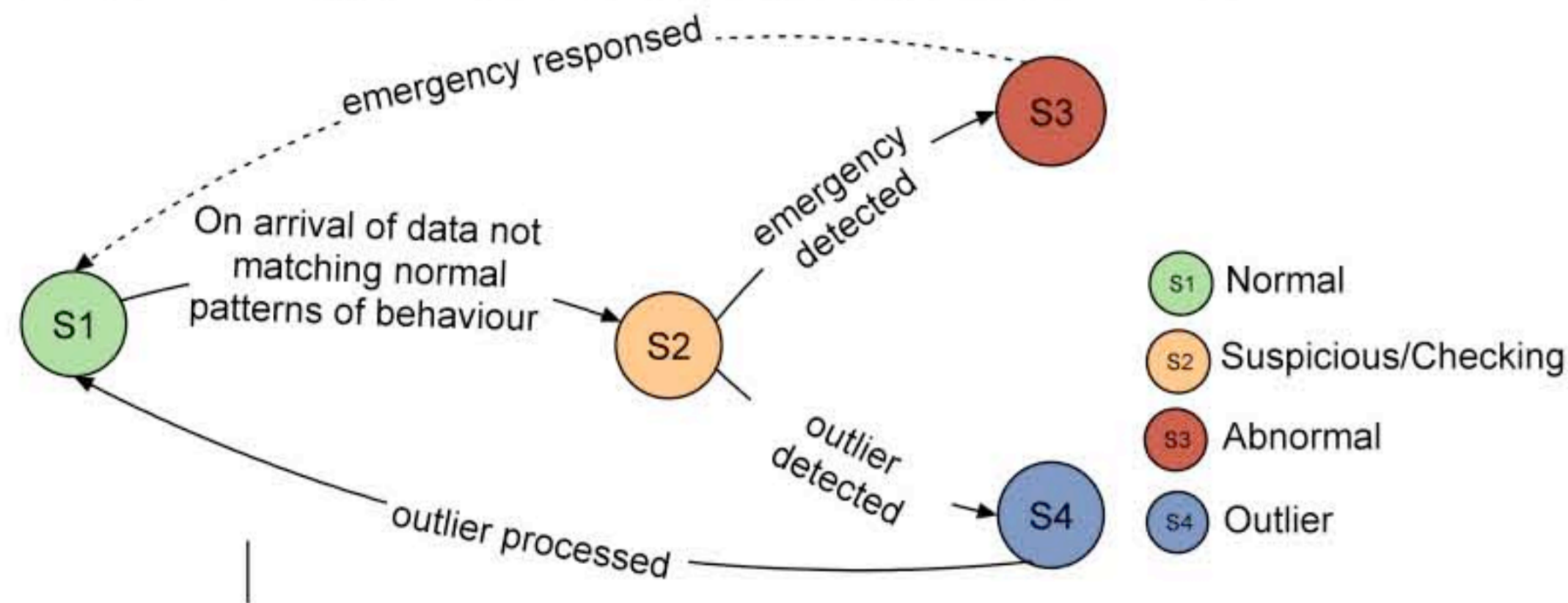


Introduction

Wireless Sensor Network (WSN) applications monitor the physical world and detect “interesting” patterns or behaviour. Various methods of event detection have been proposed. However, the common problem is the reliability issue. Every year (1997-2007), more than half of the fire incidents attended by fire and rescue services were false alarms. The result was not only a waste of resources responding to non-existent incidents, but also a risk of not having enough resources available for real incidents occurring soon after. The proposed Emergency Event Detection Model aims to address the reliability issue and take the features of sensor data into account.

The Proposed Emergency Event Detection Model

Sensor-level State Model is to detect suspicious behaviour.



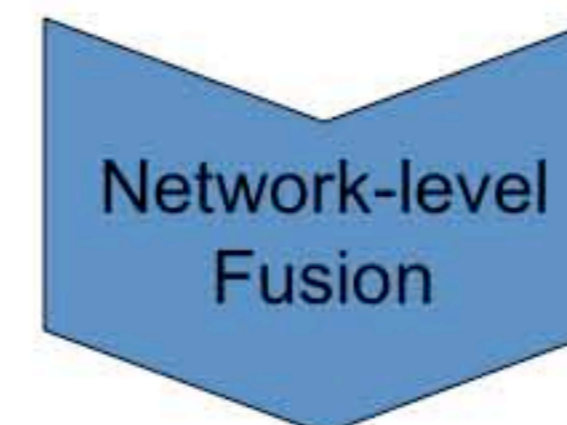
Neighbourhood Support is to confirm the event.

When a sensor node is in a suspicious state, it will check its Neighbourhood Support (NS). NS is defined as the level of support a sensor node gets from its neighbourhood region on its detected suspicious state. Intuitively, sensor nodes in the neighbourhood behave as witnesses to confirm or deny the suspicious state that a sensor node detects. It can be implemented in the format of thresholds or contour map.



Network-level Fusion is to characterize the event.

Any local-level behaviour confirmed by Neighbourhood Support will be alarmed, with associated characteristics of the event (e.g. the affected area, the type and the severity of the event).

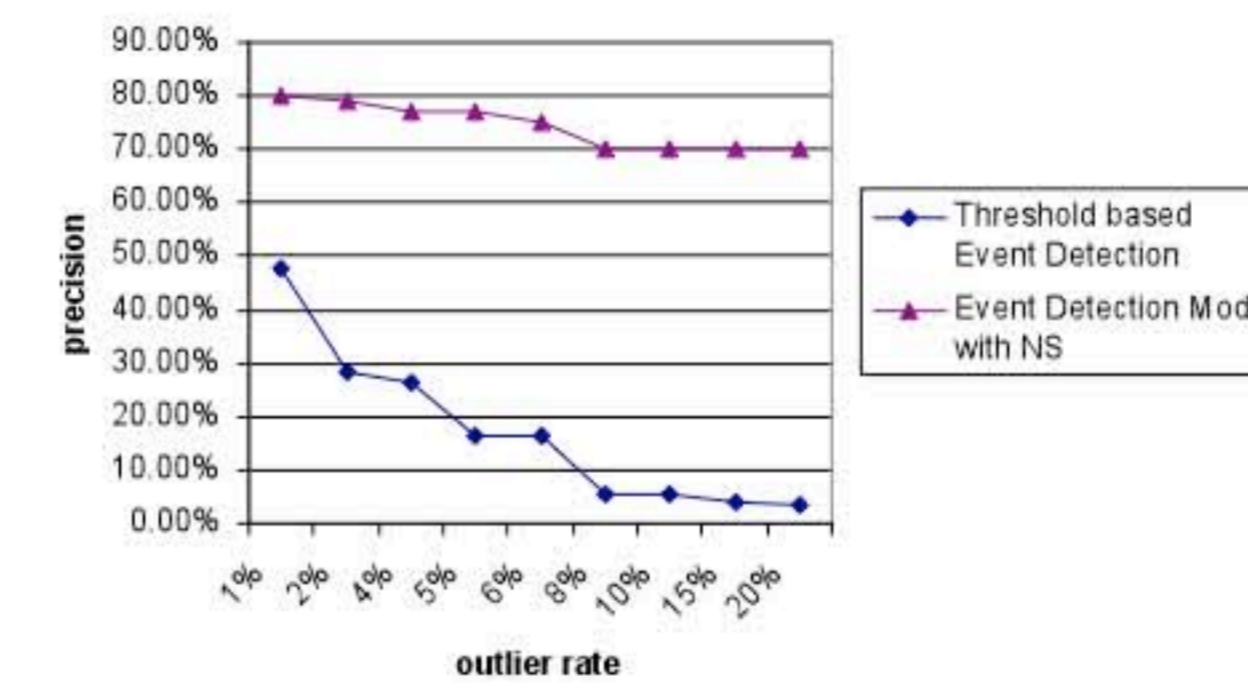
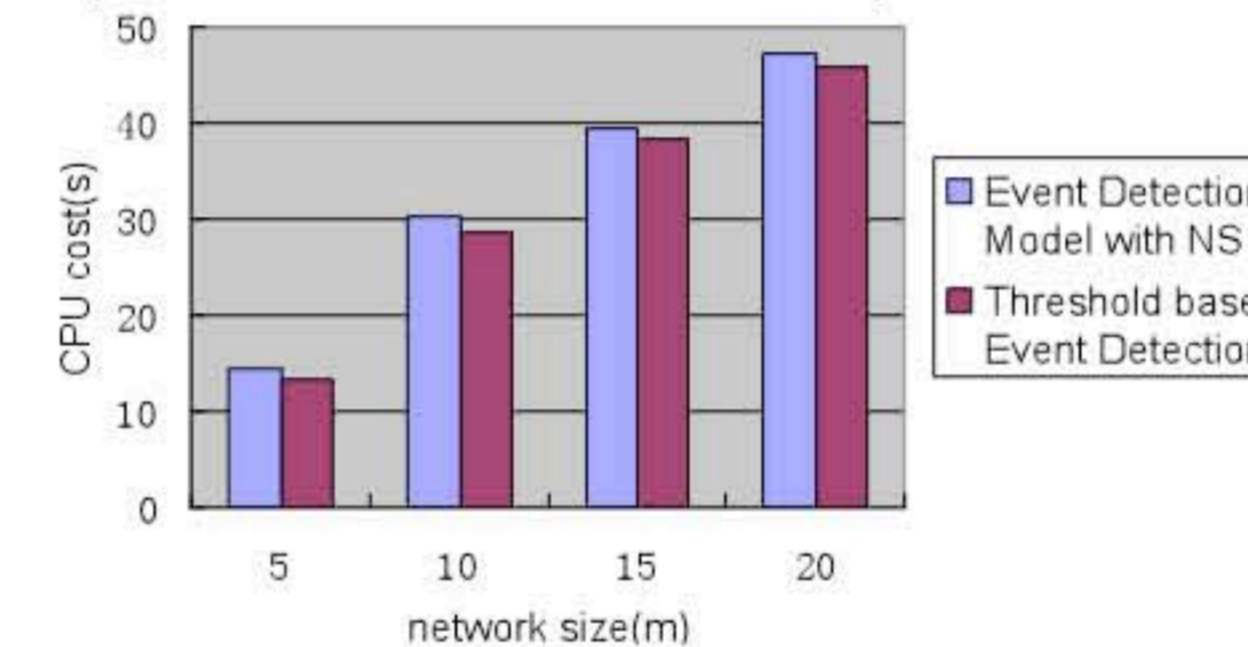


Application of the Model

Category 1: Threshold-based event detection

- Definition of normal patterns of behaviour by thresholds, for example, maximum value, rate of increase, or a combination thereof
- Applying Neighbourhood Support as the ratio of the number of suspicious/abnormal neighbours to the total number of neighbours
- Simulation result showed that applying the model with NS to the chosen example of threshold-based event detection method can

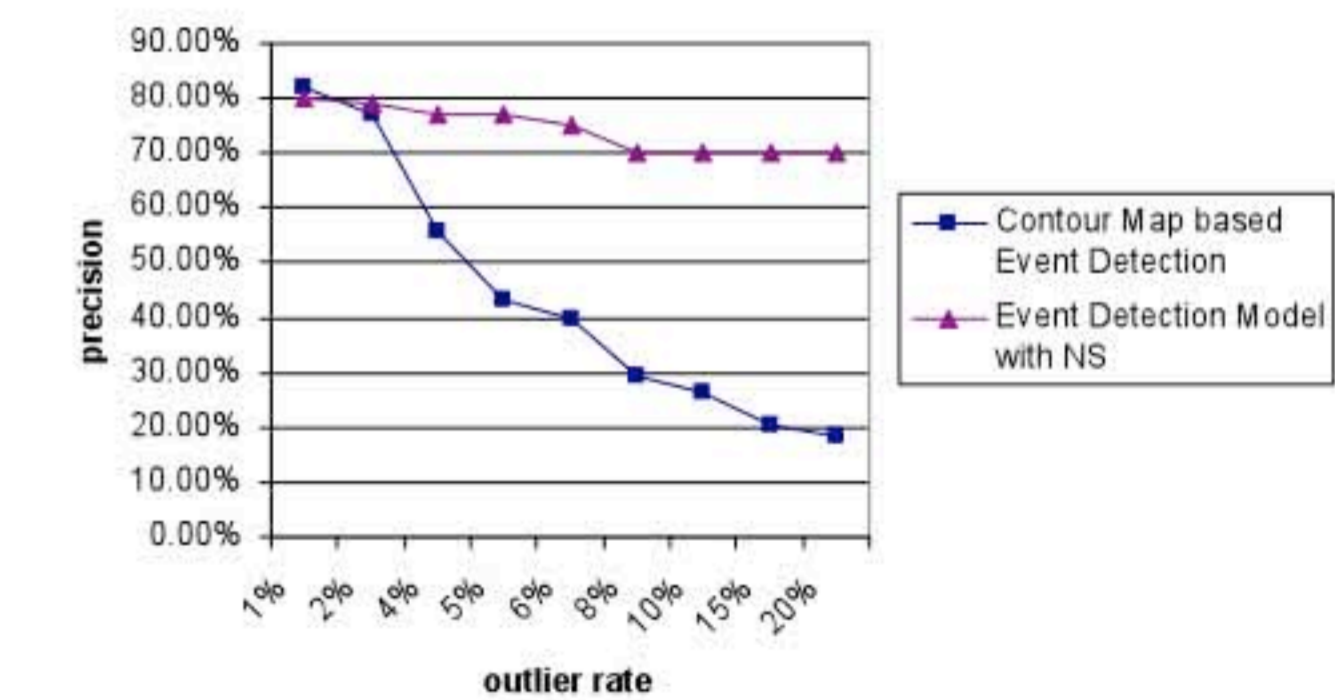
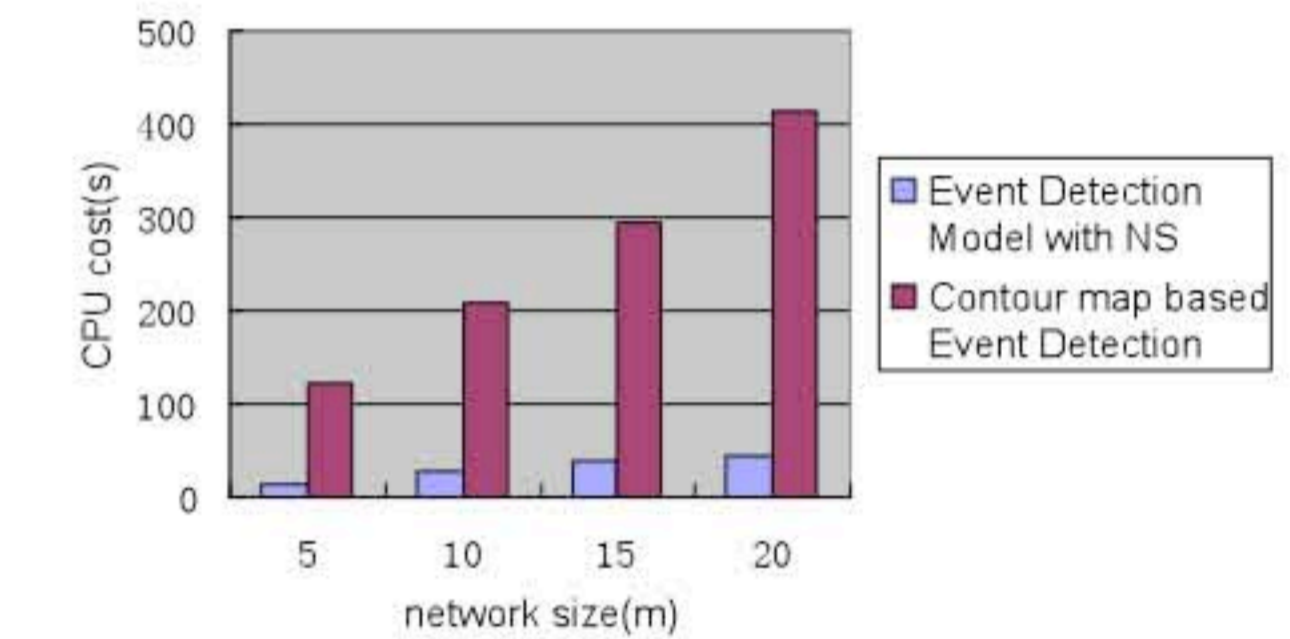
improve the detection reliability.



Category 2: Contour map-based event detection

- Definition of normal patterns of behaviour by contour map.
- Applying Neighbourhood Support in the format of on-detection construction of contour map centred from the suspicious node
- Simulation result showed that applying the model with NS to the chosen example of contour map-based event detection method

can improve the detection efficiency.



Conclusions

The proposed model addresses the reliability issue by introducing a suspicious/checking state. The concept of Neighbourhood Support integrates the high tempo-spatial correlations feature of sensor data.

The model can be applied in both threshold-based event detection and contour map based event detection. Simulation results showed that it can improve detection reliability and efficiency.

