Spatial Resolution for Pre-Measurement in Wireless Sensor Networks for Event Detection

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1. Introduction

In recent years, dynamic frequency sharing using radio sensors to observe radio wave usage has been attracting attention in response to the shortage of frequency resources. When the radio sensor detects the radio signal strength indicator over the certain threshold, it informs the RSSI to the data center. It is an event-driven access control system. The authors have previously proposed a three-step information aggregation method for event-driven access control [1]. In the proposed method, the data center selects the cluster composed of multiple sensors for informing the sensing data to it. For deciding the selection of cluster, the prior-measured RSSI tendency is used but the suitable spatial resolution for evaluating the prior-measured RSSI tendency has not been decided, yet. In this paper, we investigate the spatial resolution suitable for evaluating the trend of pre-measured RSSI.

2. Proposed Data Gathering

The specific proposed method is described in [1].

2.1 Defining Areas

A city space divided evenly is called an area. It is used for constructing the information for estimating the location of PS(TX). If the area is too large. If the area is too small, due to PS(TX) position estimation error. Therefore, it is necessary to design an appropriate area.

3. Simulation Results and Conclusions

The aggregation time by the number of area divisions is shown in Figure 1. 4, 81, and 1225 areas were compared, and the areas per area were 640000[m^2], 31605[m^2], and 2090[m^2], respectively. First, comparing the 81areas with and without pre-measurement, the time was reduced by 20.0[s]. This confirms that the pre-measurement was effectively used in the proposed method. Next, 4 and 81 areas were compared, and the total time of the second and third reports was reduced by 4.4[s]. This was due to the fact that the terrain information could be used to better advantage by properly dividing the area. In the case of 81 areas compared to 1225 areas, the time was reduced by 3.7[s]. This is due to the fact that the system was able to accurately guess the sensor location above the noise level and reduce the number of second reports due to the effect of learning.

Table 1 Simulation parameters

th_1	-40 [dBm]
th_2	-85 [dBm]
Number of area divisions	4, 81, 1225

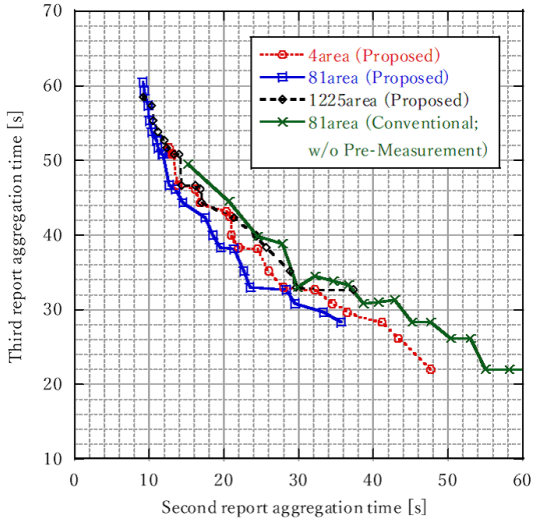

Fig. 1 Simulation Result

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References

[1] Tsuyoshi KOBAYASHI, Taiki SUEHIRO, Osaumu TAKYU, and Yasushi FUWA, "Examination of efficient aggregation method of sensor information in wireless sensor network for event detection", ICUFN 2021.

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