Yunpu ZHANG, Qiang FU, Ganlin SHAN, 2023. A multi-sensor-system cooperative scheduling method for ground area detection and target tracking. *Frontiers of Information Technology & Electronic Engineering*, 24(2):245-258. https://doi.org/10.1631/FITEE.2200121

# A multi-sensor-system cooperative scheduling method for ground area detection and target tracking



**Key words:** Sensor scheduling; Area detection; Target tracking; Road constraints; Doppler blind zone

Corresponding author: Qiang FU
E-mail: fq007895@163.com
ORCID: https://orcid.org/ 0000-0003-3414-3272

# Motivation

1. Due to the complexity and diversity of the reconnaissance environment, the high requirements for real-time information processing, and the numerous constraints of sensor working capabilities, difficulties in multi-sensor cooperation are greatly increased. Therefore, it is necessary to find an effective multi-sensor scheduling method to obtain the maximum operational benefits, and this is the topic of this paper.

2. Most previous work on sensor scheduling for target tracking has focused on tracking aerial targets, while neglecting ground targets.

# Method

1. An area detection model is built, and the method of calculating the detection risk is presented to quantify the detection benefits in scheduling.

2. Combining the information on road constraints and the Doppler blind zone, a ground target tracking model is established, in which the posterior Carmér-Rao lower bound is applied to evaluate the tracking accuracy in the future.

3. An objective optimization function is developed with considering the requirements of detection task, tracking task, and controlling energy consumption

# Major results

1. Test results of our model and related methods in the area detection performance

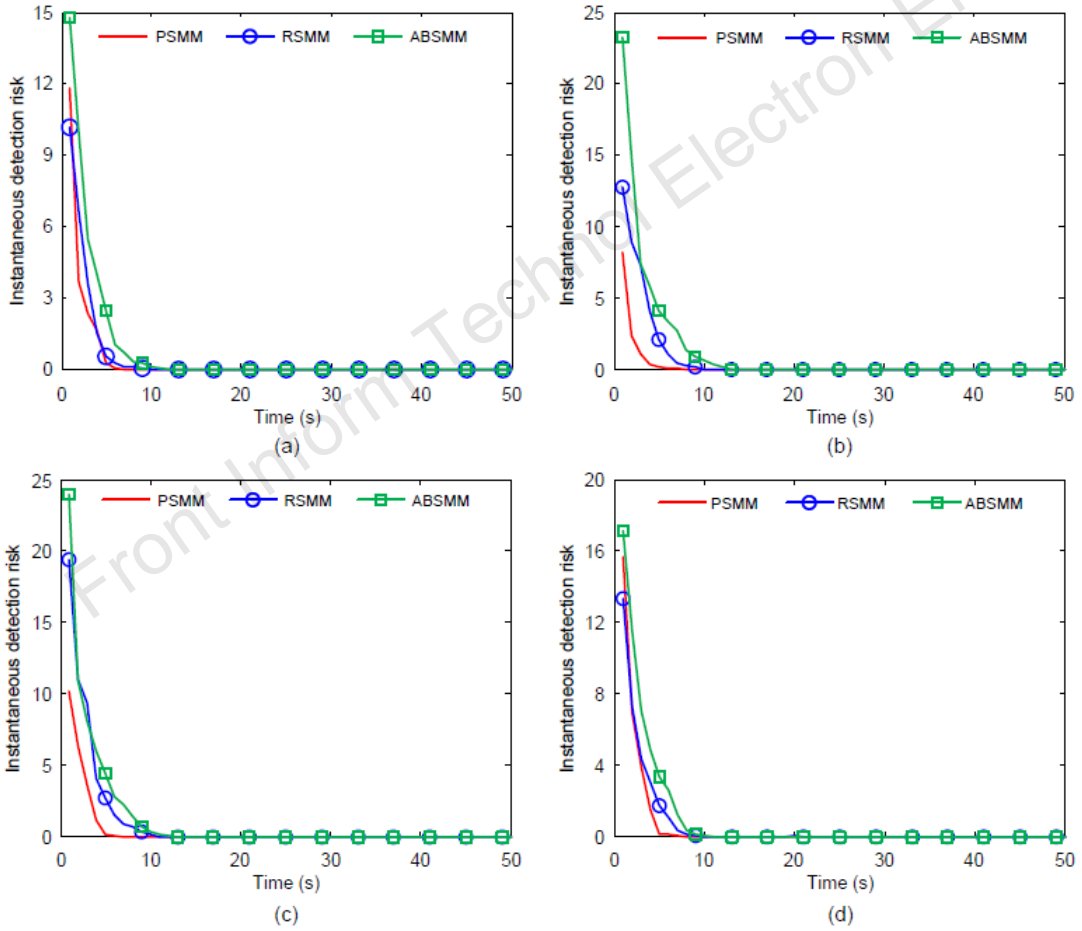




Fig. 5 Instantaneous detection risk with different scheduling methods: (a) area 1; (b) area 2; (c) area 3; (d) area 4

# Major results

2. Test results of our model and related methods in the energy consumption performance

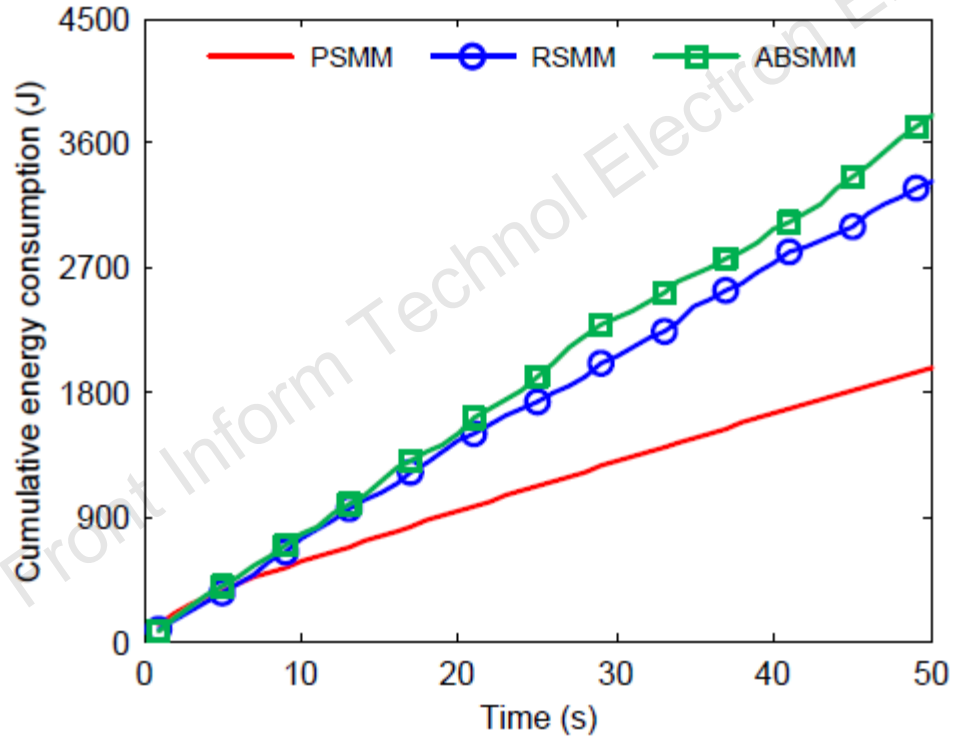




**Fig. 10 Cumulative energy consumption with different scheduling methods**

# Conclusions

The proposed sensor-scheduling method can select suitable sensors to complete the required combat tasks, and provide good performance in terms of area detection, target tracking, and energy consumption control.

Yunpu ZHANG received the BS and MS degrees in control science from Army Force Engineering University of China. Now, he is pursing the PhD degree in Army Engineering University of China. His main research interests include sensor management and target tracking.

Qiang FU received the BS and MS degrees in control science from Army Force Engineering University of China and the PhD degree in control science from Tsinghua University of China. He is currently a lecturer at Army Engineering University of China. His main research interests include target tracking, deep learning, and image processing.

Ganlin SHAN received the BS, MS, and PhD degrees in control science from Nanjing University of Science and Technology, Nanjing, China. He is currently a professor at Army Engineering University of China. His main research interests include sensor management, deep learning, and fault diagnosis.