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Recent advances in multisensor multitarget tracking using random finite set

Key words: Multitarget tracking; Multisensor fusion; Average fusion; Random finite set; Optimal fusion

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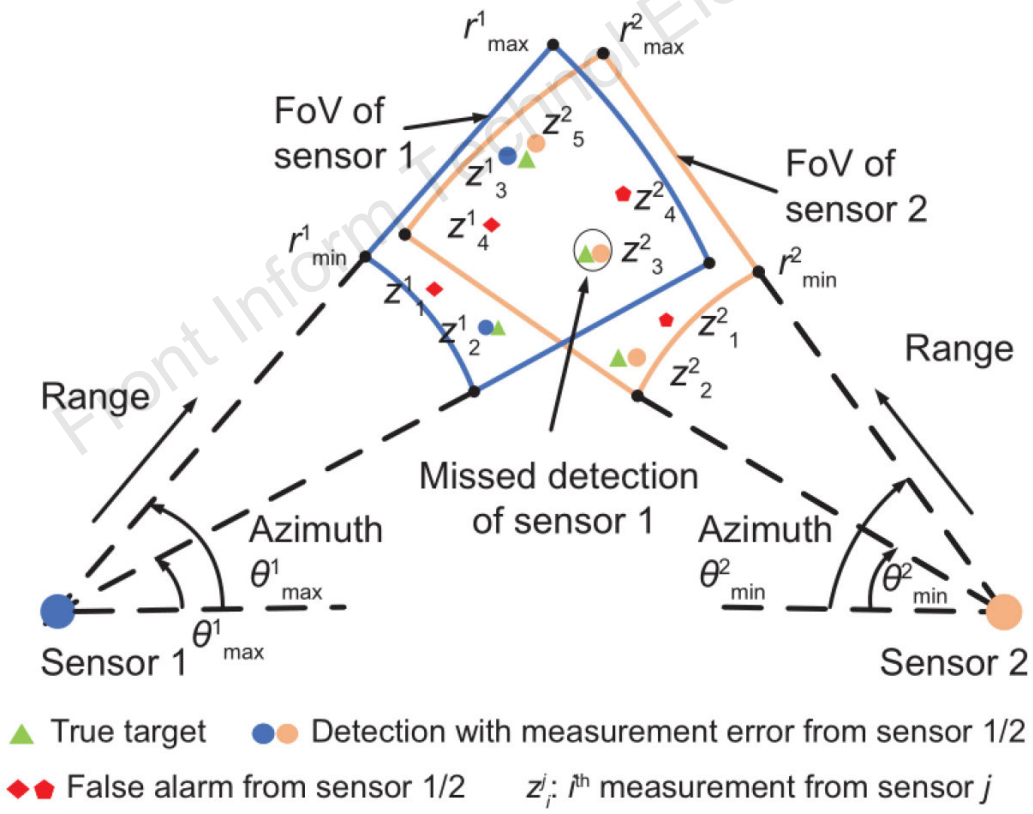
Multisensor multitarget tracking

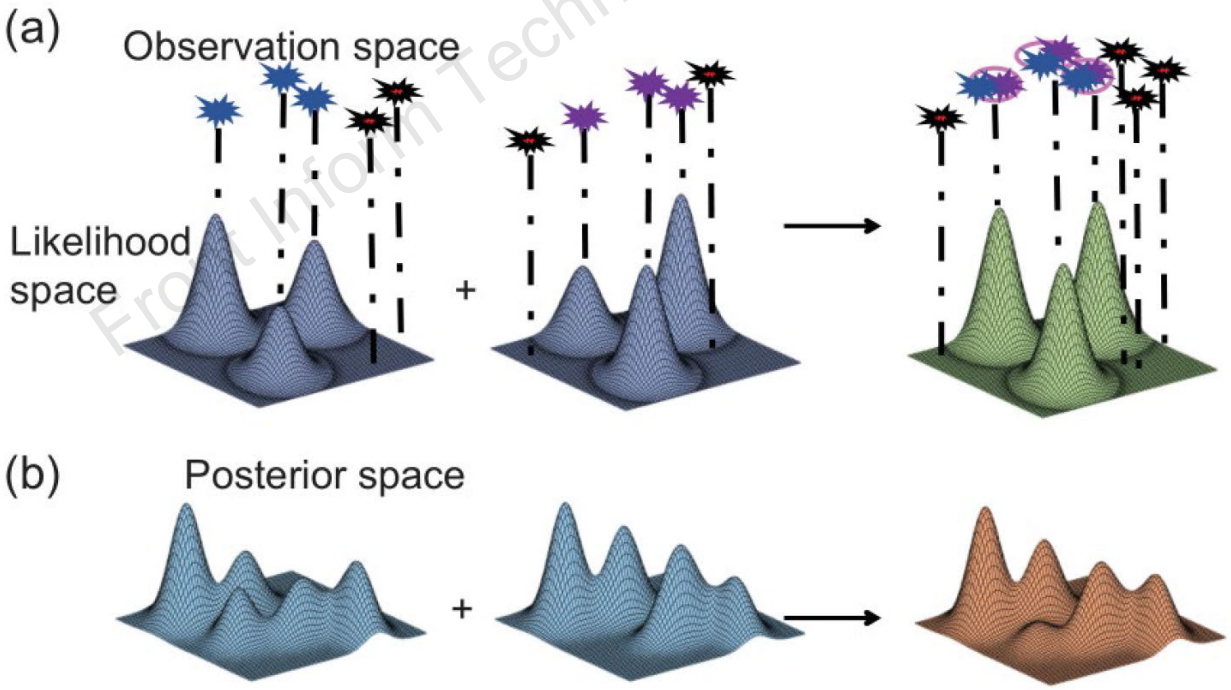
Multitarget tracking (MTT) refers to joint estimation of the number and states of targets from noisy observations in the presence of random target birth/death and missing/false data.



Fusion type

Existing multisensor MTT approaches can be classified into two major groups depending on the type of information shared between sensors:

- Multitarget measurement fusion
- Multitarget density fusion

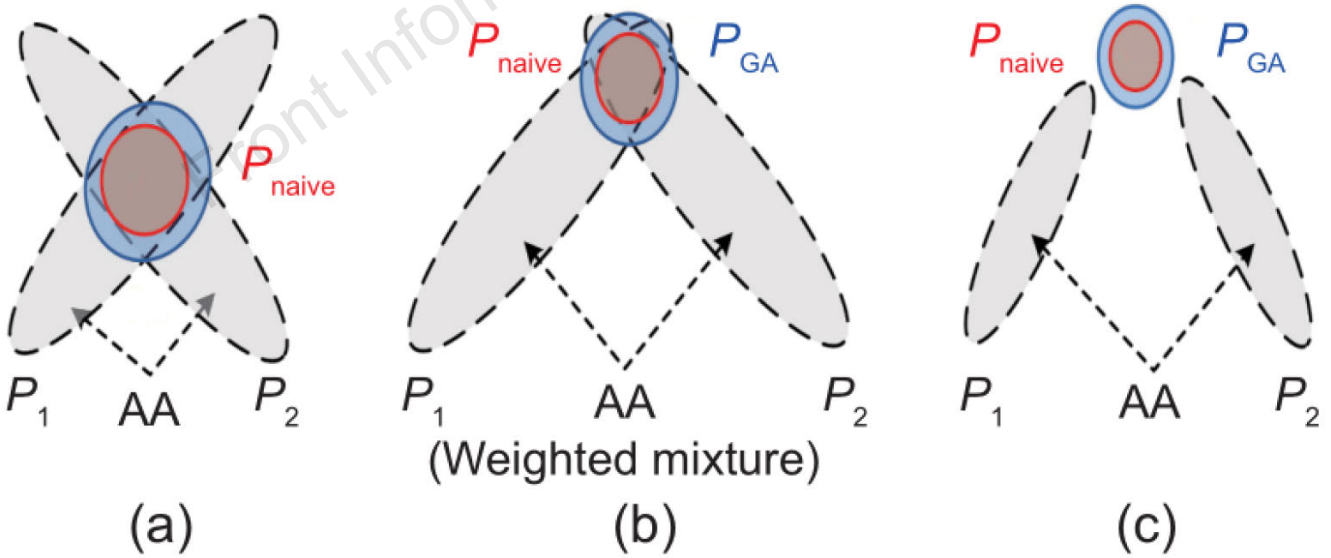


Multisensor measurement fusion

- Two heuristic approaches
- Parallel combination approximate multisensor (PCAM) filter
- Multisensor optimal random finite set (RFS) filters
  - Multisensor Bernoulli filter
  - Multisensor CPHD/PHD filter
  - Multisensor MeMber filter
  - Multisensor GLMB filter

Multisensor density fusion (GA/AA)

- Properties of AA/GA fusion
- Illustrative comparison between AA/GA fusion and naive fusion
- Pros & cons of AA- and GA-MPD fusion
- Formulations of AA- and GA-MPD fusion



Remaining challenges

1. Fusing weight and communication mode

The majority of existing WSN-communication schemes can be classified as shown in Fig. 5.

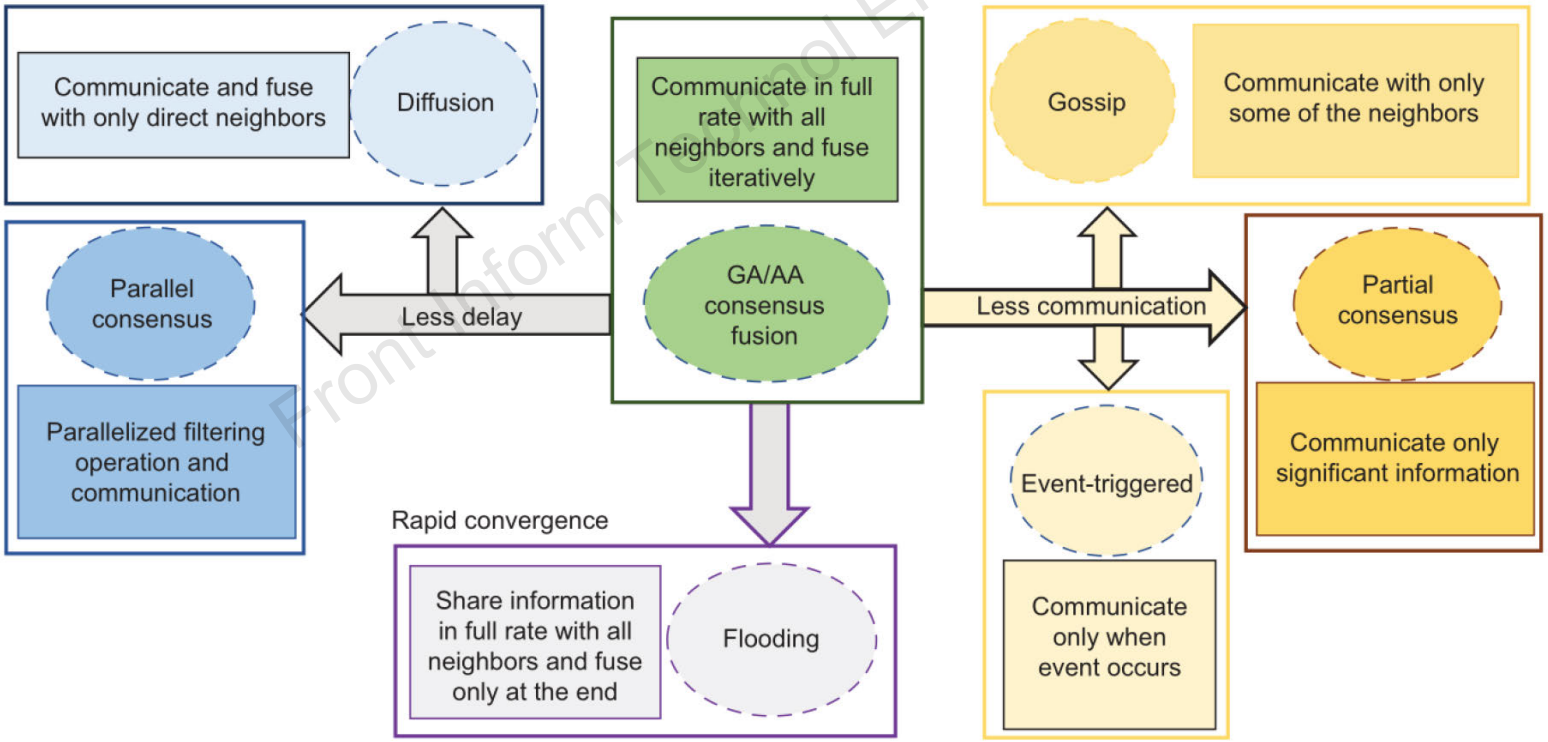


Fig. 5 Various network-communication modes of distinct strengths

Remaining challenges

2. Dynamic or restrictive WSN

The majority of existing multisensor tracking algorithms presume that the relative location of each sensor is known to others.

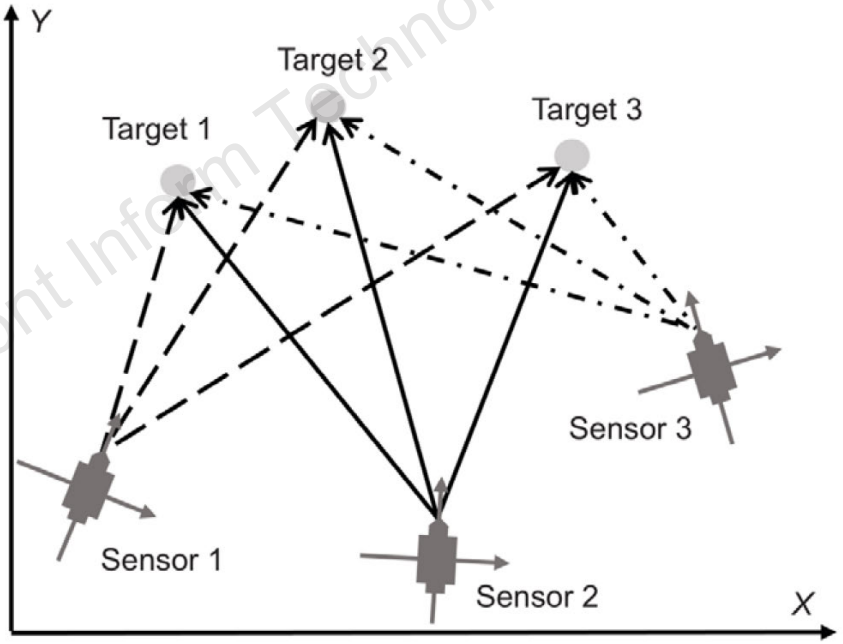


Fig. 7 Matching the coordinates of different sensors through their commonly observed targets

Remaining challenges

3. More open issues

- Fusion beyond state
- Fusion in parallel to the filtering calculation
- Fusion under abnormal/non-standard WSN conditions