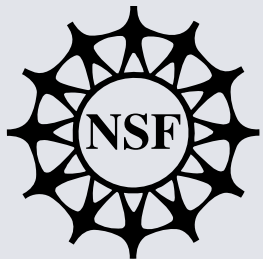
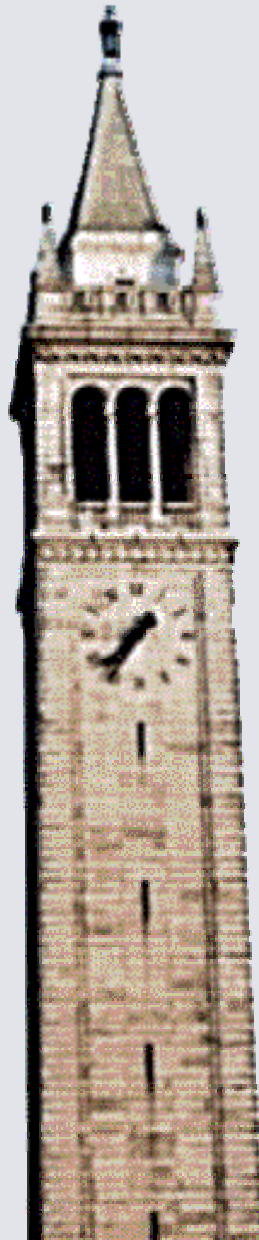


Identity Management in Sensor Networks

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Identity Management



- Keeping track of “who is who” in a sensor network
- **Belief matrix** answers queries such as:
What is the probability of target t having identity j ?

$$B(k) = \begin{bmatrix} B_{11} & \cdots & B_{1T} \\ \vdots & B_{jt} & \vdots \\ B_{T1} & \cdots & B_{TT} \end{bmatrix}$$

target t

identity j

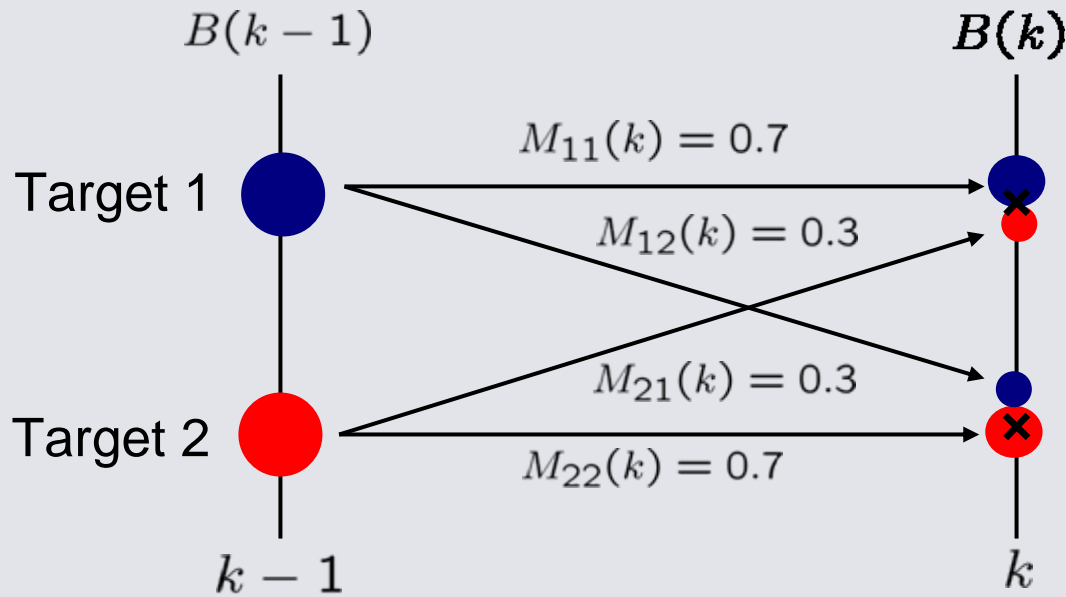
doubly stochastic (rows and columns sum to 1)



Mixing events



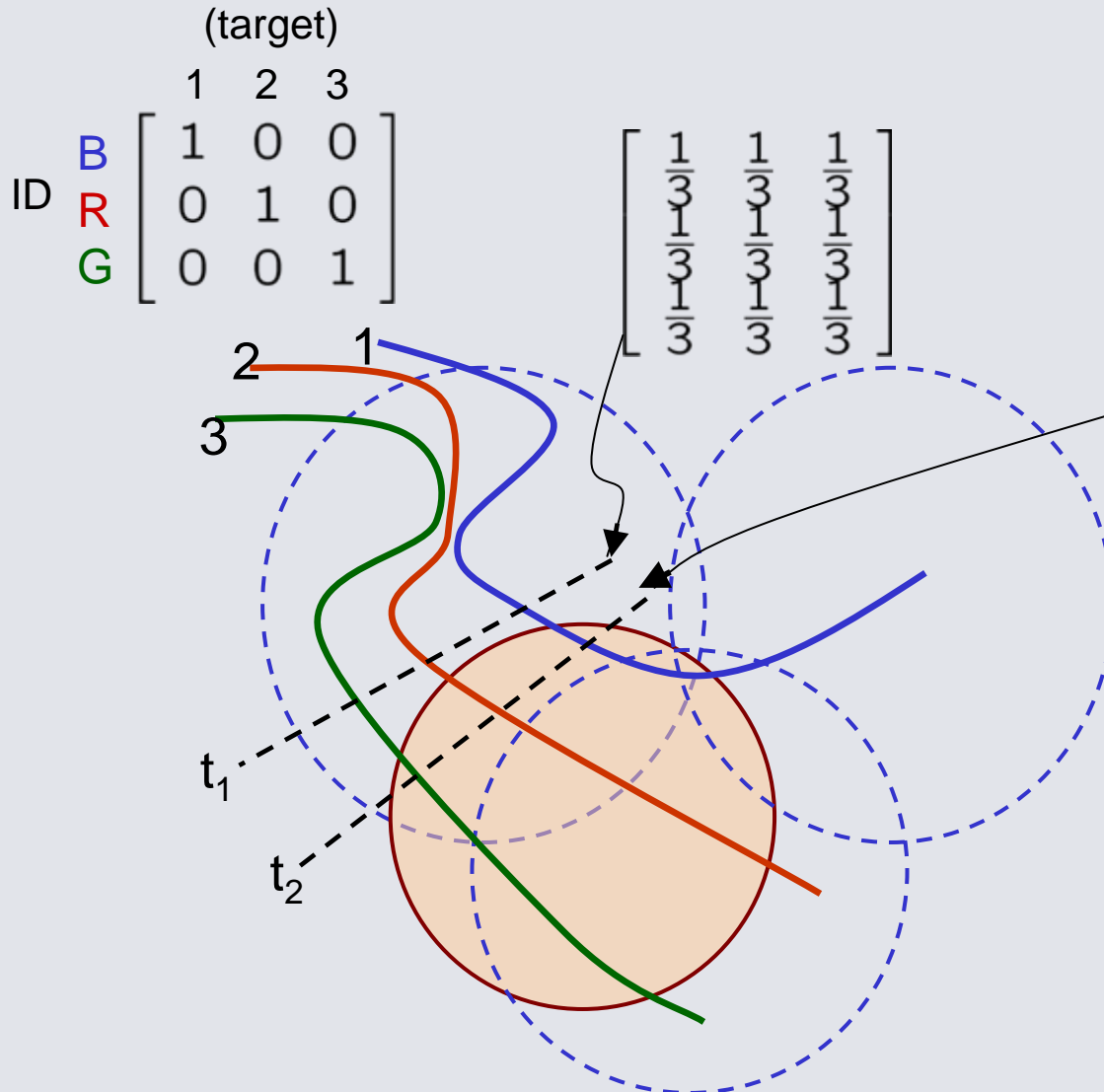
- Two (or more) objects move close to each other, identities become uncertain



$$B(k-1) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad B(k) = B(k-1)M(k) \quad B(k) = \begin{bmatrix} 0.7 & 0.3 \\ 0.3 & 0.7 \end{bmatrix}$$



Local evidence event



- Generic tracking sensor
- Special sensor (local information)

Sensor says: target 3 is **Green**

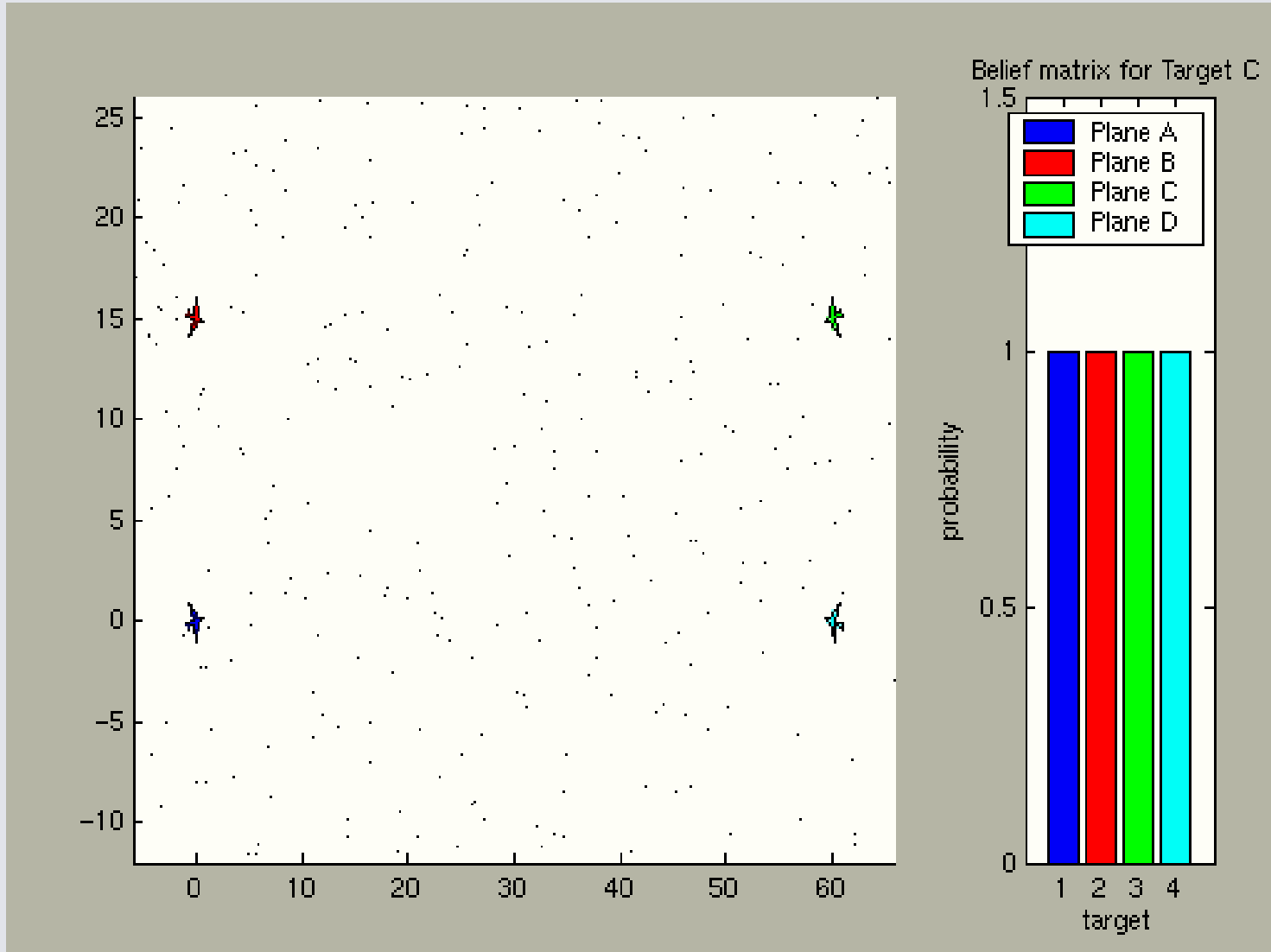
$$\begin{bmatrix} \frac{1}{3} & \frac{1}{3} & 0 \\ \frac{1}{3} & \frac{1}{3} & 0 \\ \frac{1}{3} & \frac{1}{3} & 1 \end{bmatrix}$$

↓

$$\begin{bmatrix} 0.5 & 0.5 & 0 \\ 0.5 & 0.5 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$



Tracking aerobatic maneuvers



Conclusions



- Analysis of various approaches to identity management
- Framework for multiple-target tracking and identity management
- Potential advisory tool for air traffic controllers, for dissemination of aircraft situation data

