Scalable Localization with Mobility Prediction for UWSN

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Problem:

• Challenges in UWSN: acoustic communication, node mobility, 3-D networks, and large scale
• Utilizing mobility: underwater objects move with temporal correlation and spatial correlation
• Our objective: design a scalable localization scheme with low overhead while good performance

Proposed Solution: Scalable Localization with Mobility Prediction (SLMP)

**Network Model:** hierarchical network architecture

- Surface buoy: can be localized by GPS or other means
- Anchor node: communicate with buoys to get localized
- Ordinary node: can only communicate with its neighbors

**The Main Idea:**

- Anchor nodes do mobility prediction based on the temporal correlation, and broadcast their model parameters
- Ordinary node do mobility prediction based on the spatial correlation and the received messages.

**Anchor node mobility prediction**

1. Initialization, broadcast localization message
2. For every T, measure location (Sa) and calculate location (Se)
3. If |Sa-Se|>St, run prediction algorithm, get results
4. Broadcast the prediction parameters

**Ordinary node mobility prediction**

1. Initialization, set m=0
2. Listen
3. Is there new msg?
4. Update known reference list
5. m>=4, localized, calculate its confidence value
6. A new reference? Yes
7. Broadcast message
8. No msg in k rounds?
9. Unlocalized, clear reference list
10. Update current location
11. Yes

Performance Evaluation:

![Graphs showing localization accuracy and error over node density for different prediction models.](image_url)