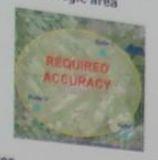




1. Problem

Goal: satisfy requirements of single target localization by radar network for the entire strategic area



Challenges

- Maximize measurement accuracy
- Minimize number of radars (system cost)

Multiple parameters of optimization

Scope

- Increase number of radars & use autonomous
- Decrease number of radars & use cooperative

2. Approach

Performance

Volume of possible target position (error ellipsoid)

3. Results

Signal model

$$s(t) = A e^{j(2\pi f_c t + \phi)}$$

CRLB for FMCW radar

$$\text{Var}(t) = \frac{3}{8\pi^2 S^2 \text{SNR}}$$

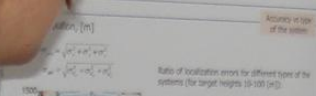
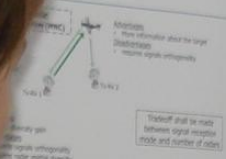
error variance of time delay measurement

$$\text{Var}(v_r) = \frac{6}{T_s M^2 \text{SNR}}$$

error variance of Doppler frequency measurement

Cooperative mode is taken into account

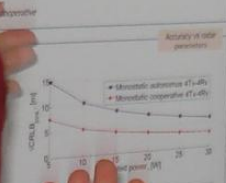
Study



Ratio of localization error for different type of the systems (for target heights 10-100 m):

$$\sigma_{\text{coop}} / \sigma_{\text{aut}} = 2$$
$$\sigma_{\text{coop}} / \sigma_{\text{aut}} = 1.7$$

- Cooperative mode of signal reception allows increasing measurement accuracy
- Spatial diversity in multistatic network allows increase measurement performance without increasing number of radars



Cooperative network use for parameters: signal reception is improved

Cooperative network use for parameters: signal reception is improved