Enhanced Situation Awareness using Random Particles

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Disposition

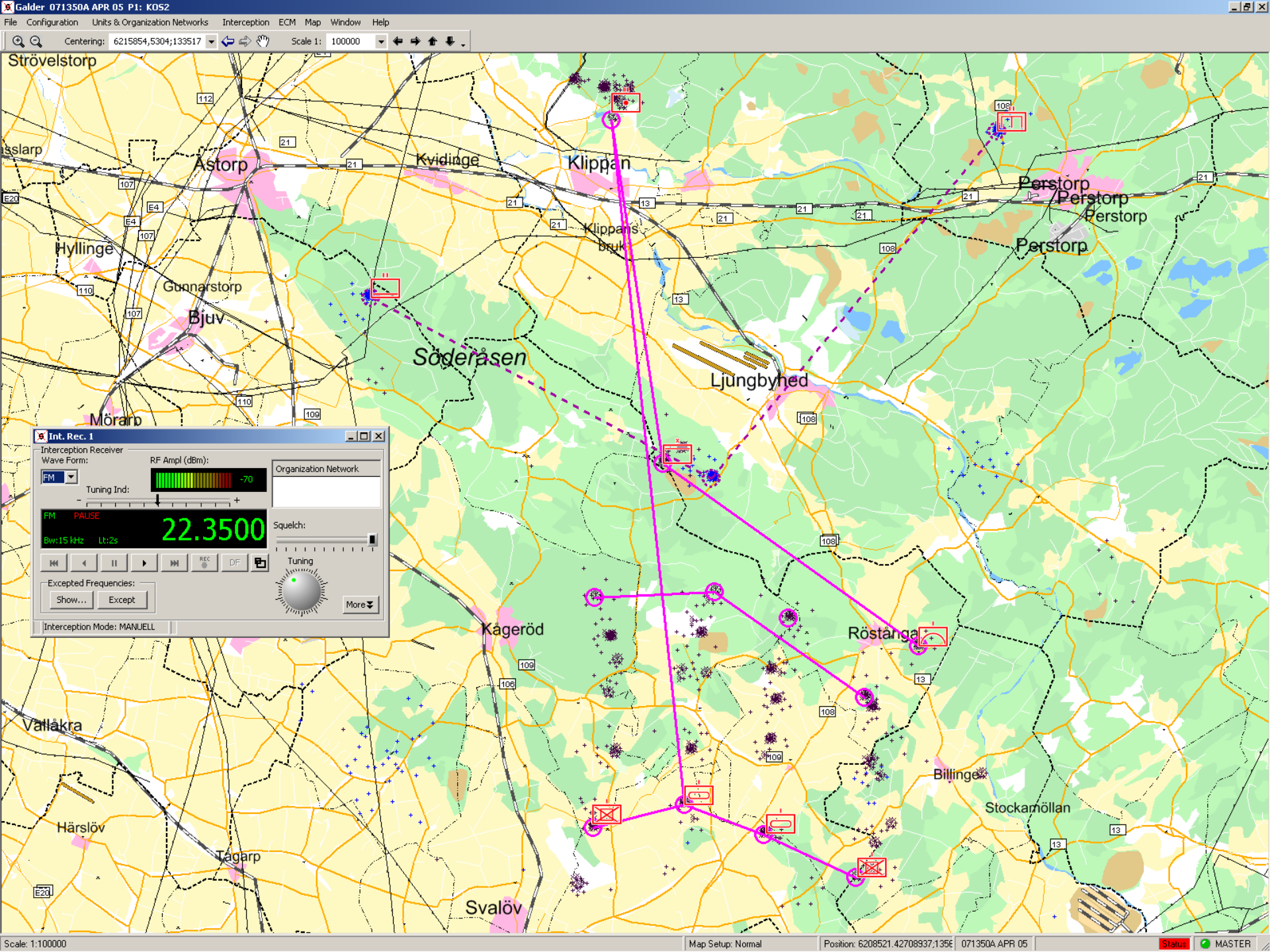
- Ericsson Microwave Systems and target C2 system
- Our work
  - Demonstration
  - Theory
- Conclusions and future work

Ericsson Microwave Systems

Target C2 system:
GALDER - Electronic Warfare System

Our work

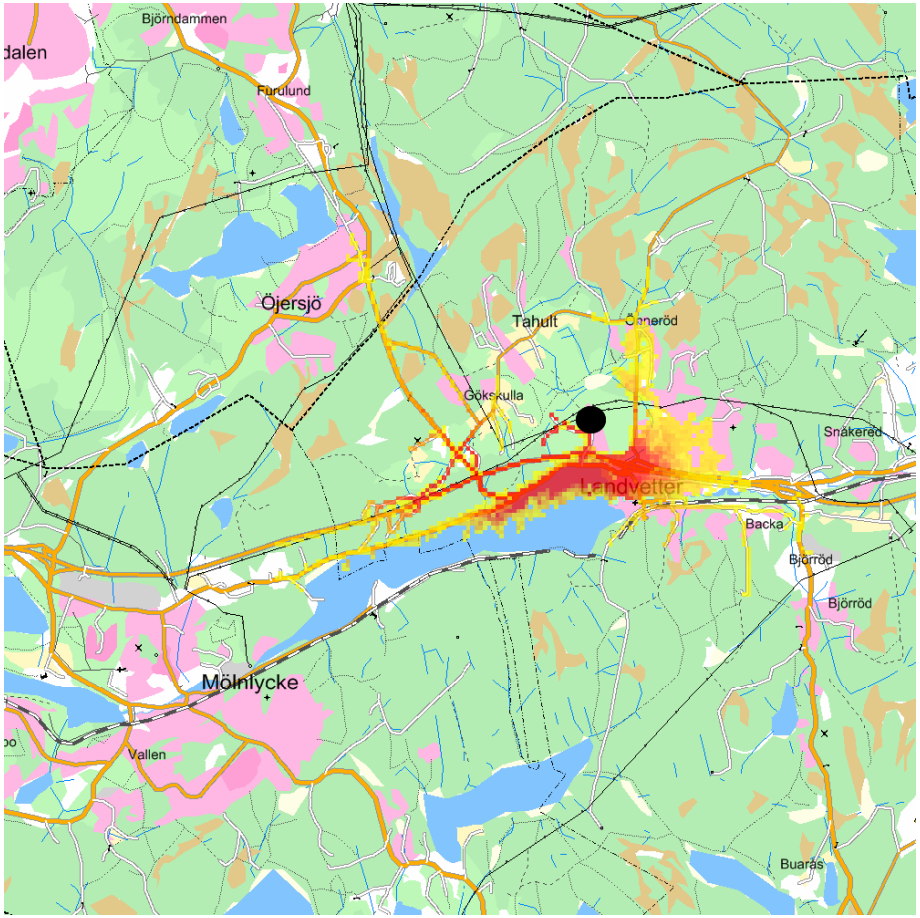
- Created a generic tool for prediction of forthcoming troop movements
- Implemented and tested in a tactical electronic warfare system


Galder 071350A APR 05 P1: KOS2
File Configuration Units & Organization Networks Interception ECM Map Window Help
Centering: 6215854,5304;133517
Scale 1: 100000
Strövelstorp
Astorp
Kvidinge
Klippan
Perstorp
Hyllinge
Gunnarstorp
Bjuv
Klippans bruk
Söderåsen
Ljungbyhed
Mörarp
Kågeröd
Röstånga
Billinge
Stockamöllan
Vallåkra
Härslöv
Tågarp
Svalöv
Int. Rec. 1
Interception Receiver
Wave Form:
FM
RF Ampl (dBm):
-70
Tuning Ind:
Organization Network
FM PAUSE
22.3500
Bw:15 kHz Lt:2s
Squelch:
Tuning
Excepted Frequencies:
Show...
Except
More
Interception Mode: MANUELL
Scale: 1:100000
Map Setup: Normal
Position: 6208521.42708937;1356
071350A APR 05
Status
MASTER

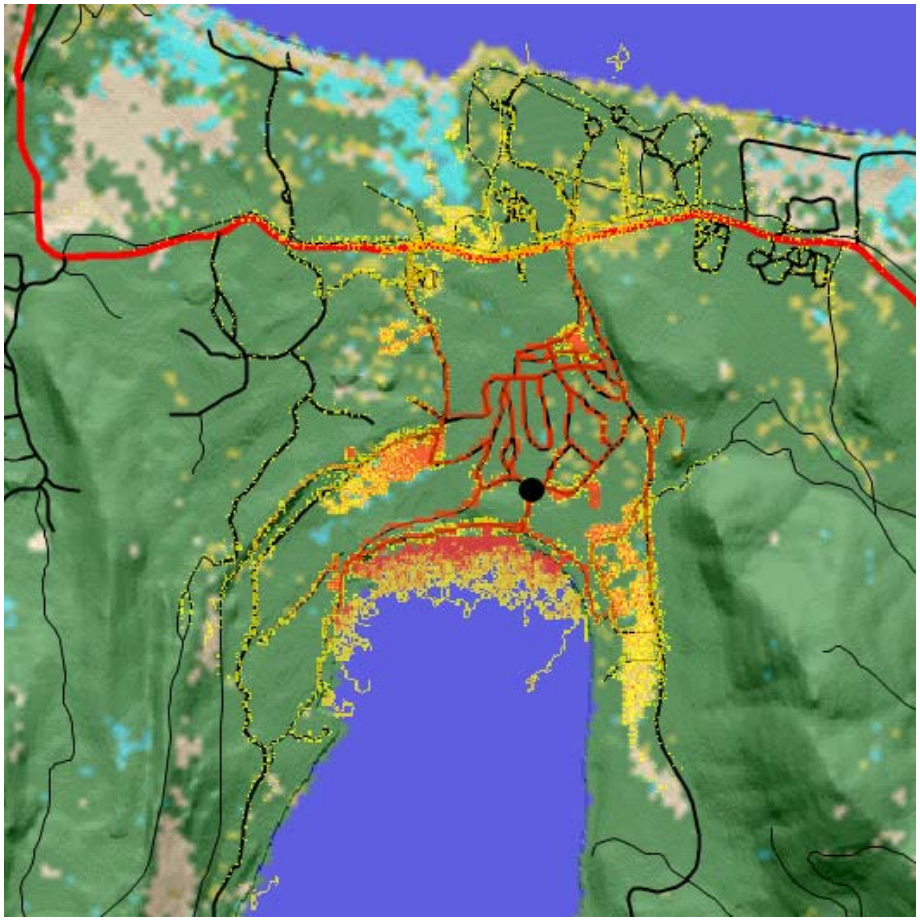
Procedure of usage

1. Operator selects an object of interest on the map
2. Selection of object type, time horizon, precision (current speed and direction)
3. Terrain is transformed to possible maximum speeds
4. Speed matrix is used for prediction calculations
5. Prediction is presented on situation picture

Examples of predictions



Map grid size: 50 by 50 m



Map grid size: 10 by 10 m

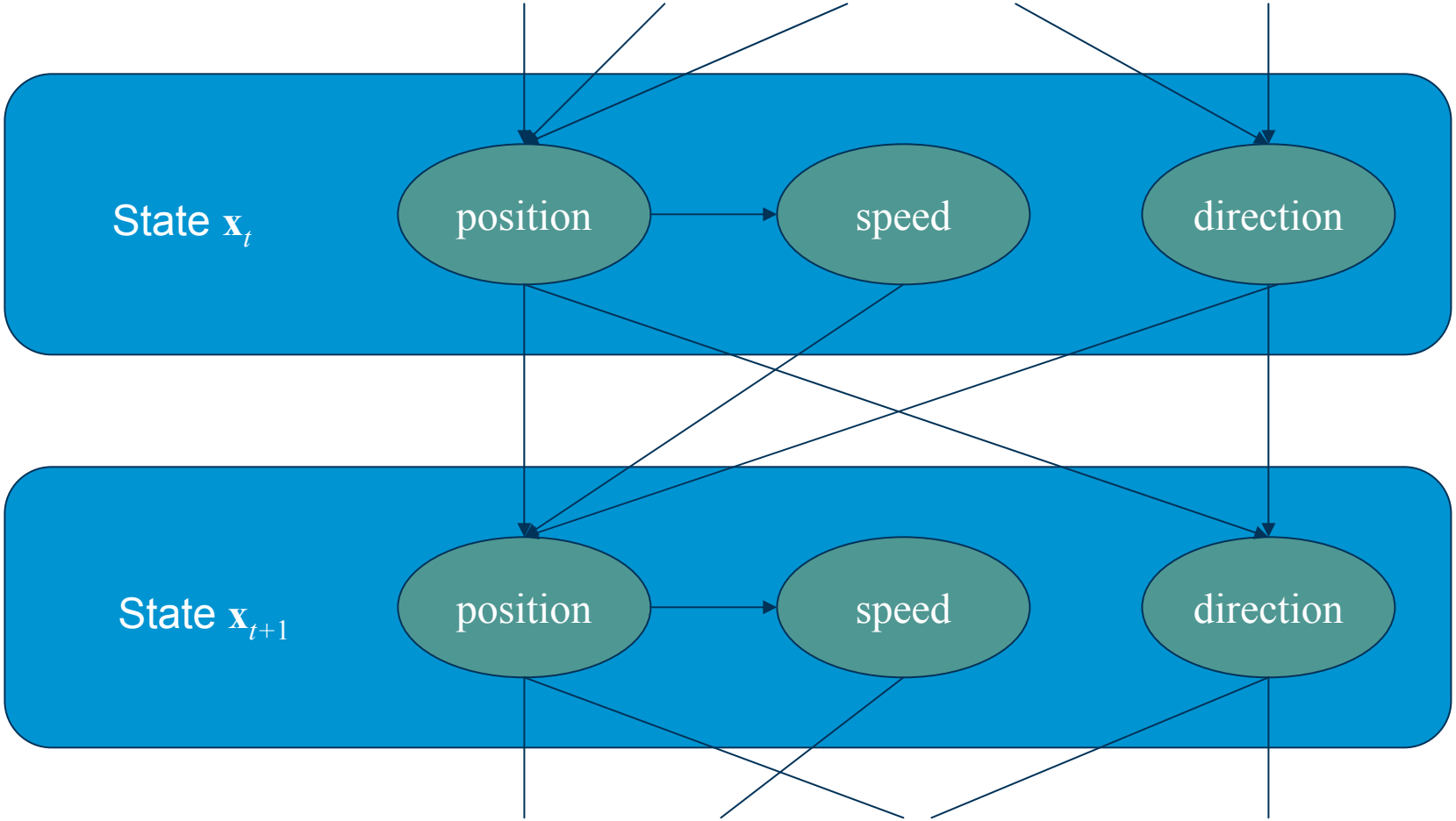
Theory

- Bayesian networks
- Dynamic Bayesian networks
- Particle filtering

Change over time

Approximate inference

Random particles



Conclusions

- Acknowledged during field tests (ASÖ05)
  - Received ideas for future work
    - Warning system
    - Disregarding old obsolete observations
- Our algorithm constitutes as a general tool for solving this type of problem
- Predictions are sound probability distributions
- Included in the next release of GALDER

Future work

- Extended functionality
- Visualization
- Evolution of models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