

SensIT CSP Workshop Day 2

January 16, 2001
Palo Alto, CA



Schedule

8:30 – 9:00	Breakfast
9:00 – 9:30	Intro Commons
9:30 – 10:30	Tracker Design Aquarium: #5 (2-way traffic) Commons: #7 (perimeter violation)
10:30-10:45	BREAK
10:45-11:15	Summaries: Tracker Design
11:15-11:45	SenseIT Demo Context & Brainstorm
11:45-1:30	WORKING LUNCH – <i>Detailed Demo Discussions</i> <i>3 Breakout groups (Commons & Aquarium)</i>
1:30-2:00	Summaries: Demo Discussions



Tracker Discussions

The Task:

Develop a top-level, end-to-end solution for two benchmark problems. I identify all the pieces.

Why:

- SenseI T teams come from multiple fields, targeting different aspects of the problem:
- This is an opportunity to
 - Get all of the common techniques on the table and discuss informally
 - I identify any technology gaps
 - See how tracker design, signal processing and classification approaches complement each other
 - Synergies between techniques here may make good demo candidates

Note: these are just starting points, feel free to modify scenarios in interesting ways or to fix bugs.

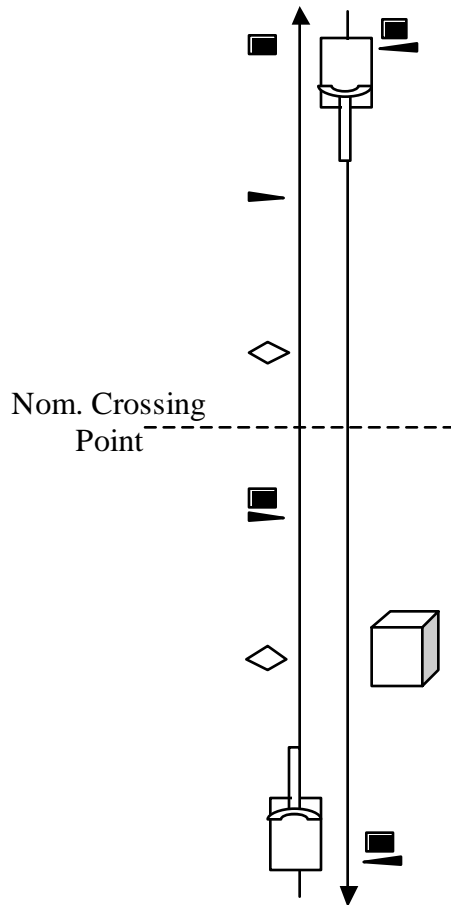


Issues / Subtasks

- Quiescent State
- Target detection / wakeup
- Cluster Formation
- Signal Processing
 - Data Association
 - Sensor Fusion
 - Classification
 - Localization
 - Compression
- Tracking
 - Track generation / destruction
 - Track coalescence / splitting
 - Dynamics
 - Reasoning about persistent identities
 - Reasoning about Global Properties
- Exfiltration
- Query Processing



Scenario #5: Two-way traffic



Task

- Track target positions
- Estimate target crossing time

Challenges

- Vehicles in close proximity, need to use dynamics to keep identities separate

Task-Specific Benchmarks

- Accuracy of crossing time estimate

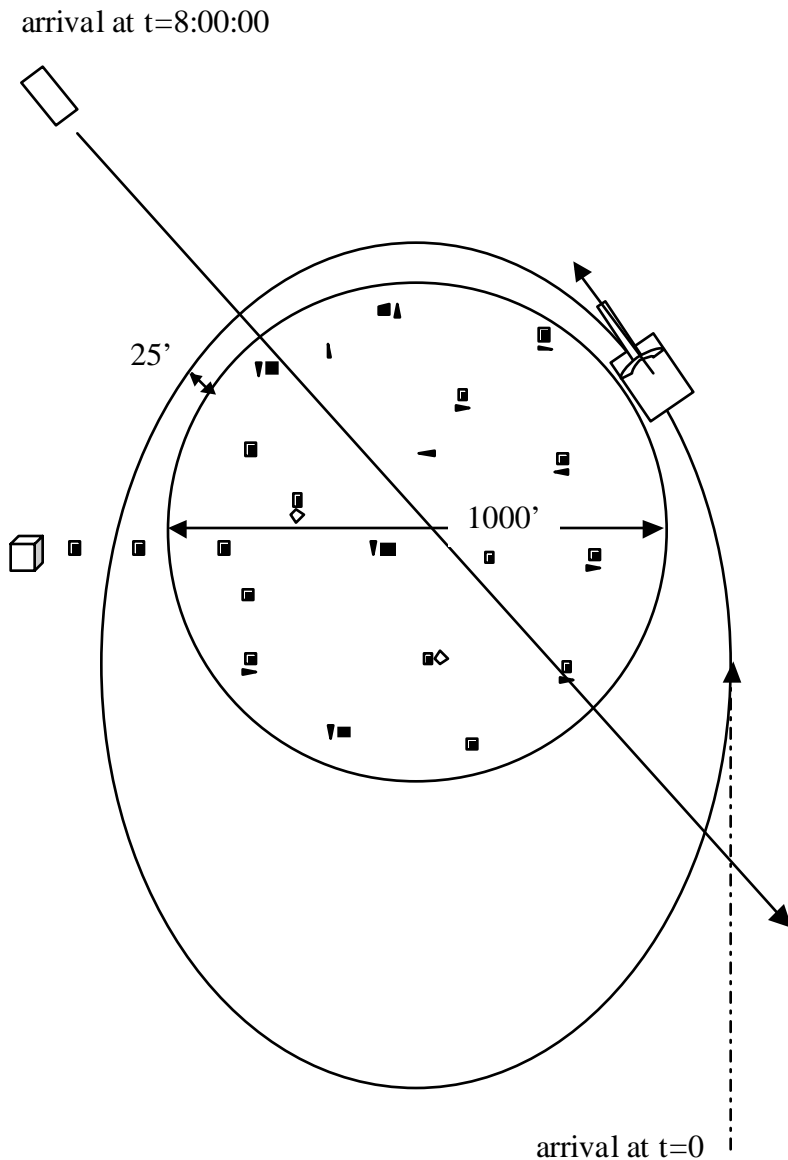


Scenario #5 Assumptions

- Desired output update rate: 0.5 Hz
- Desired position resolution: 25'
- Network behavior
 - Latency: mean 0.1 secs per hop
 - Packets may arrive out-of-order
 - 10% packet loss
 - 19.2 kbps per cluster, each node can join up to 2
- Initial Velocities: 25 ft/sec (each)
- Dynamics
 - Max acceleration: +/-50 ft/sec² (symmetric)
 - Note that tanks can pivot 360 degrees in place while at standstill
- Sensor spacing: 100' between all sensors
- Vehicles: Identical, signature aspect dependent
- Isotropic propagation of sound, vibrations, no wind, no inversion layer - $1/r^2$ attenuation
- Target class known a priori, no gearshifts



Scenario #7: Perimeter Violation Sensing



Task

- Alert on violation of perimeter
- Ignore activity outside of perimeter (distractors)
- Identify violator type and track location

Challenges

- Filter out distractor
- Respond quickly while minimizing quiescent activity

Task-Specific Benchmarks

- Detection delay
- Power usage during periods of no violation
- Frequency of false positives

all vs. distractor/violator
source amplitude ratio



Scenario #7 Assumptions

- Desired detection time: < 2 sec
- Distractor arrives, orbits for 8 hours prior to intruder
- Distractor / Intruder source amplitude ratio: 40 dB
- Constant velocities:
 - Intruder 20 ft/sec
 - Distractor 40 ft/sec
 - Intruder can come from any direction
- Network behavior:
 - latency: mean 0.05 sec/hop
 - Packets may arrive out-of-order
 - Packet Loss: 2%
 - 128 kbps/cluster, each node can join up to 4
- Sensor spacing: 100' between all sensors
- Isotropic propagation of sound, vibrations, no wind, no inversion layer - $1/r^2$ attenuation
- Intruder & Distractor classes unknown a priori, no gearshifts, constant speed



2001 Demo Discussions

The Task

- Develop candidate demos for March/April and November. Identify interests of various teams.

Constraints

- March: Field Experiment using current nodes
- April: Lab Demo, Simulation and/or Data experiment using 29Palms or March 2001 data
- November: Field Experiment
 - WI NS NG nodes:
 - Wireless network
 - May include RPV (i.e. fixed/mobile) complementing ground nodes

