3+3=9 : Real-time Cooperative Positioning

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It's who you know not what

Cooperation *(noun)*

"the action or process of working together to the same end"

Relative *(adjective)*

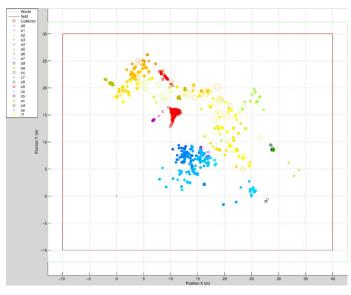*"considered in relation or in proportion to something else"*
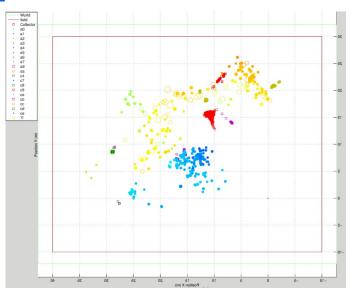
Humans tend to think in relative terms

*More often than not machines act **relative** to others and the environment in which they exist, working to achieve a common goal - **cooperation***
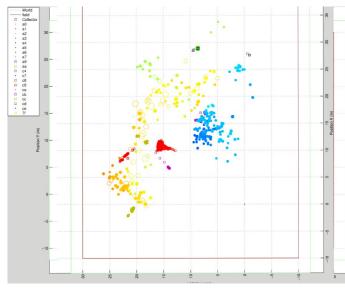
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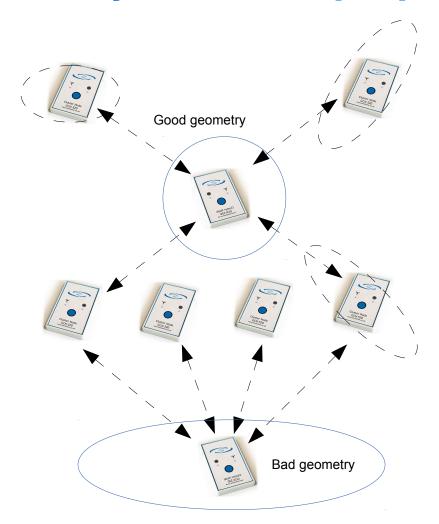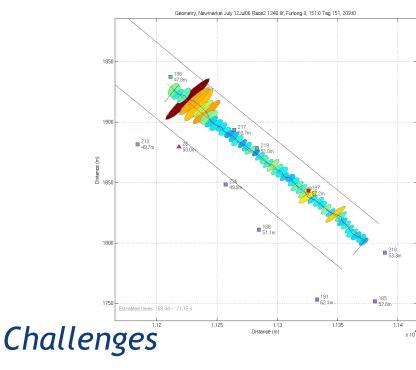
Context may be helpful

... *or essential*

- Coordinate reference frames
- Consistent direction
- Fix one position?
- Or many? - How many
- Can we use mobile neighbours?

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Stability and error propagation

Good geometry

Bad geometry

Challenges

- Neighbour trust
- Repeatability of results
- Measuring confidence
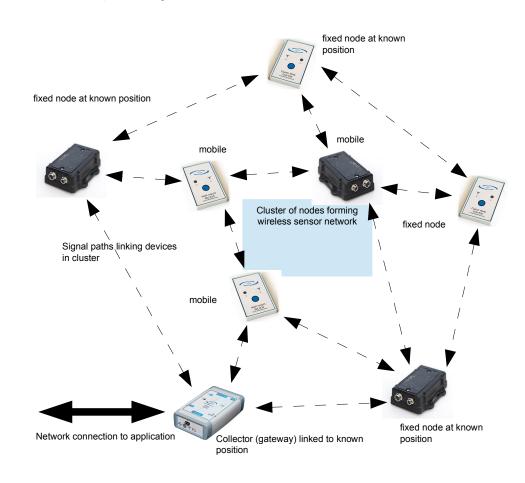- Solution complexity
- Neighbour selection
- Scalability

3+3=9

"The whole is greater than the sum of its parts"

Aristotle

- A single measurement is worthless

- Use all the information available

- Fusion of techniques: radio and dead reckoning etc.

- Relationships matter

- Location and navigation include orientation, direction and velocity

fixed node at known position

fixed node at known position

mobile

mobile

Cluster of nodes forming wireless sensor network

fixed node

Signal paths linking devices in cluster

mobile

Network connection to application

Collector (gateway) linked to known position

fixed node at known position

Closing Thoughts

Cooperative positioning can provide major benefits for many M2M and team-based applications

- Conventional GPS receivers are selfish; cooperation with neighbouring receivers can extent coverage and robustness

- Combining data sources and measurements adds diversity to positioning system improving performance

- There is no reason NOT to use mobile neighbours in the solution

- Relative may be the most appropriate view of the solution

- Cooperative positioning has its challenges

- Velocity, orientation and direction

- Team work pays off = cooperation

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