Positioning in cooperative communication networks

Samuel Van de Velde
Samuel.vandevelde@telin.ugent.be
promotor: Heidi Steendam

Ghent University - Department of Telecommunications and Information Processing - http://telin.ugent.be

WHY?

While GPS has been great in the past, it faces some problems:
- the GPS signals are too weak to receive indoor
- GPS is not very accurate (~3m)
- GPS takes a lot of battery power

While GPS relies on satellites, indoor positioning has to have its own infrastructure: wireless ultra-wideband (UWB) sensors at fixed positions called anchors. In principle 3 anchors are necessary for positioning but by introducing cooperation between users, we can reduce this number and at the same time get higher accuracy.

APPLICATIONS

swarm
robotics
emergency 911
wireless sensor networks
asset tracking
supply chain management
finding friends or landmarks
health-care
monitoring

HOW CAN WE DO IT?

For 100m x 100m area with 100 users and 13 anchors with radiorange 20m:
- 90% of all users located with accuracy <13cm

Without cooperation, accuracy is very low, many anchors are needed.

With cooperation, very good accuracy but the messages we are sending are quite big.

RESULTS

- Using UWB we can have a low power, accurate indoor positioning system. But there is still some ground to cover: current state-of-the-art algorithms are still too complex and real-life experiments are needed. Here are some thoughts for the future:
  - We should test this with working UWB equipment
  - There are so many users, is there no interference?
  - Can we make use of the reflections?
  - Where do we place the anchors?

CONCLUSIONS

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