

## WHY?

While GPS has been great in the past, it faces some problems:

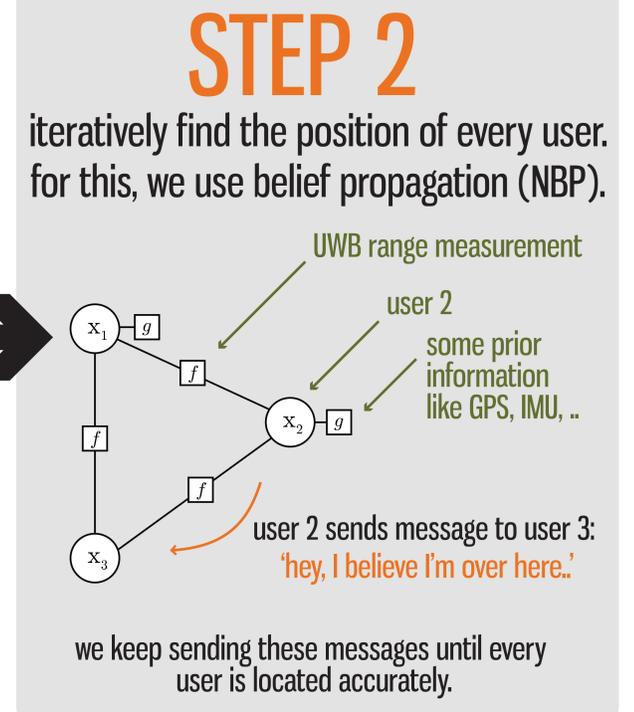
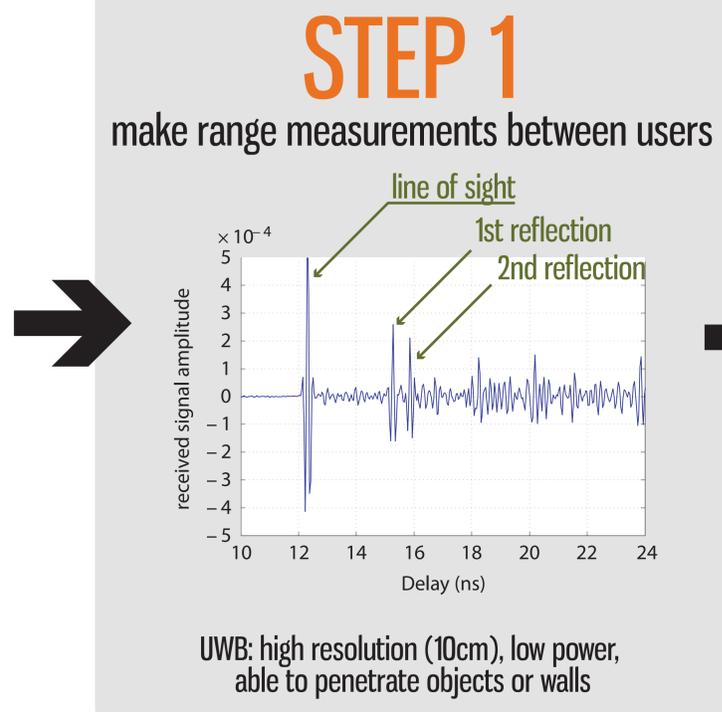
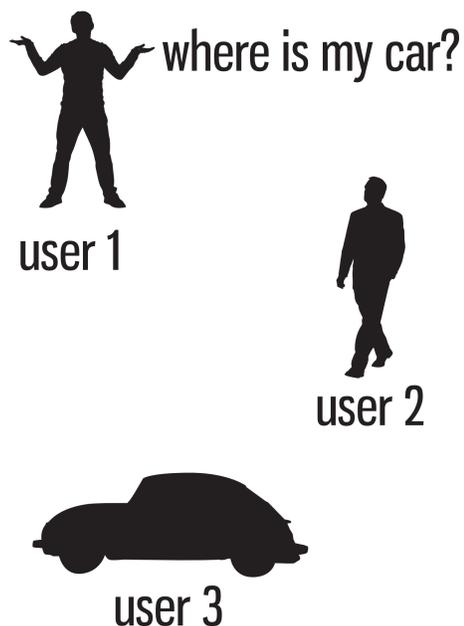
- the GPS signals are too weak to receive indoor
- GPS is not very accurate ( $\sim 3m$ )
- GPS takes a lot of battery power

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

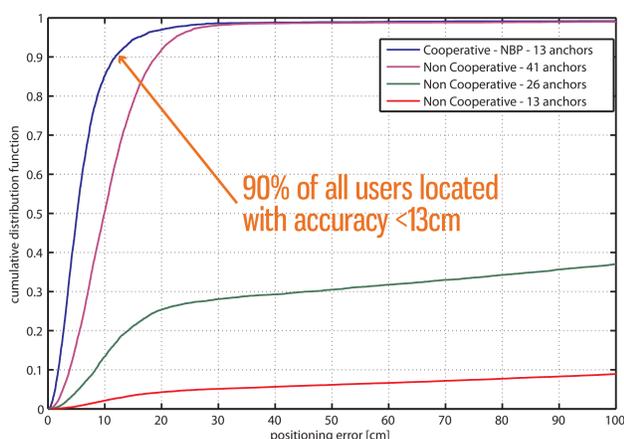
emergency 911  
finding friends or landmarks  
body area network  
asset tracking  
health-care monitoring  
swarm robotics  
activity recognition  
wireless sensor networks  
supply chain management

## HOW CAN WE DO IT?



## RESULTS

for 100m x 100m area with 100 users and 13 anchors with radiorange 20m:



Without cooperation

accuracy is very low, many anchors are needed

With cooperation

very good accuracy but the messages we are sending are quite big

## CONCLUSIONS

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?