Localization of Mobile Terminal in Emergency Situations



Ezgi Dizdaroğlu

Vodafone Turkey , RAN Design Engineer

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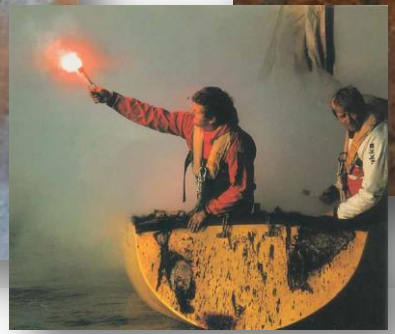
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Introduction



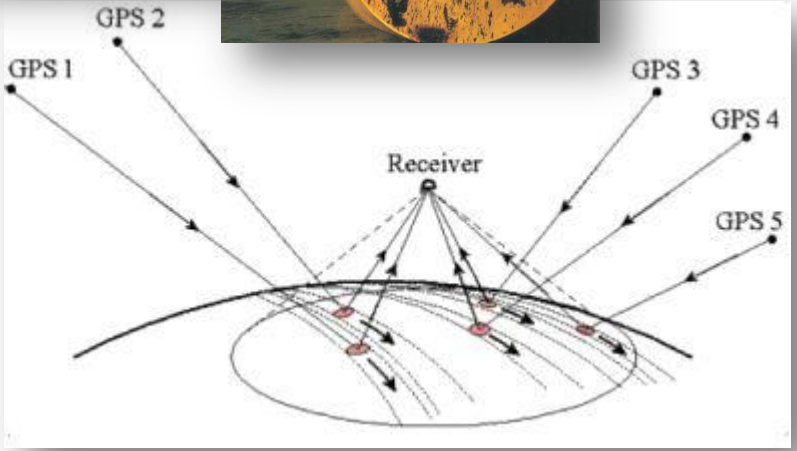




Natural ways



Good old ways





Localization Techniques

- Proximity







Localization Techniques

- Scene Analysis

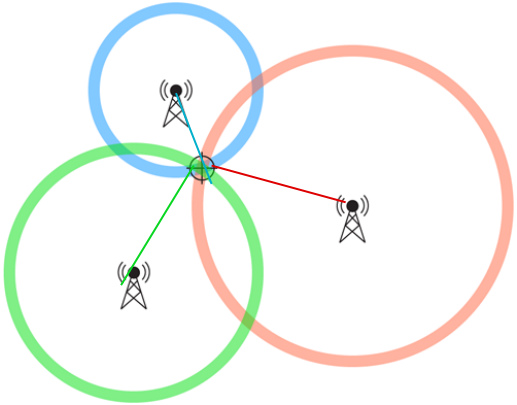
Microsoft Research

Radar



Localization Techniques

- Triangulation









- Existing emergency system requires more than one serving base station, when there is only one serving base station this technique is not singly enough to determine the mobile device's location.
- Our solution is to solve that kind of situations. The estimated location are can be given with my method



Fundamental Objects

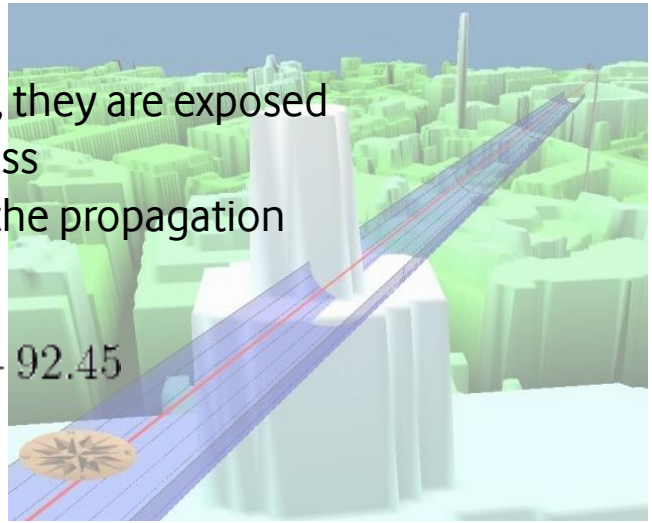
- Mobile frequency bands
  - Higher frequencies carry signal to less distances, lower frequencies can get far.
  - Same frequency-diffirent technology not same distance

LTE 800- LTE 2600

2G/3G on 900 MHz

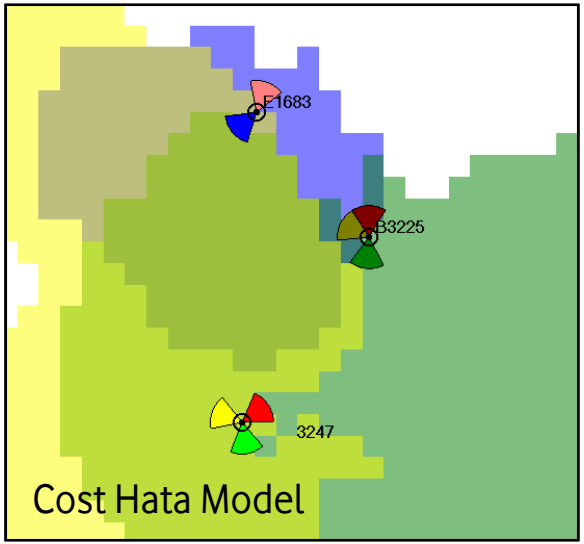
- Pathloss/Distance calculation
  - Radio waves propagate through space, they are exposed to attenuation, this reduction is pathloss
  - Free Space path loss will change with the propagation model

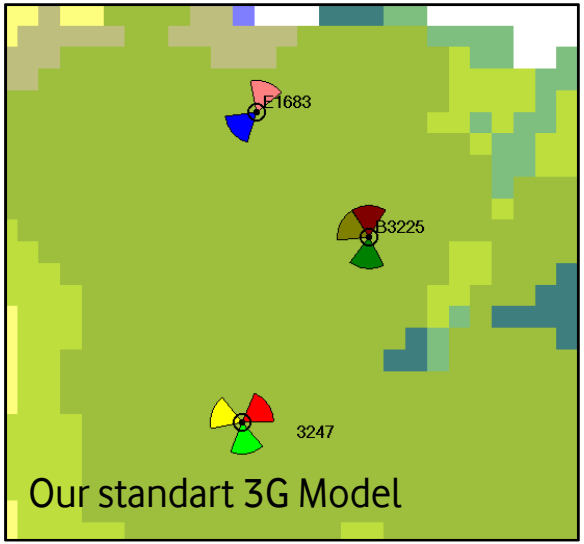
$$\mathrm{FSPL(dB)} = 20\log_{10}(d) + 20\log_{10}(f) + 92.45$$



Fundamental Objects

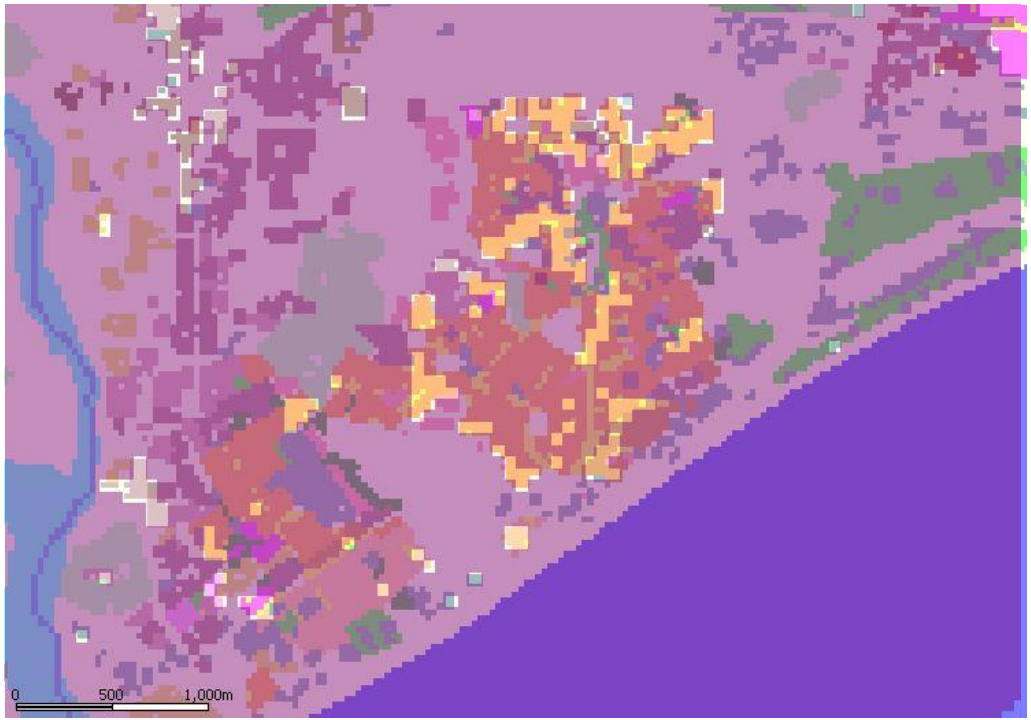
- Propagation Models
  - Empirical mathematical formulation for the characterization of wave propagation as a function of frequency





Fundamental Objects

- Geographic Data
  - clutter classes, clutter heights, digital terrain model etc.



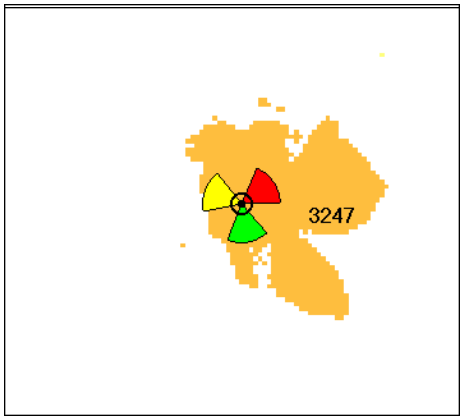
New Localization Algorithm

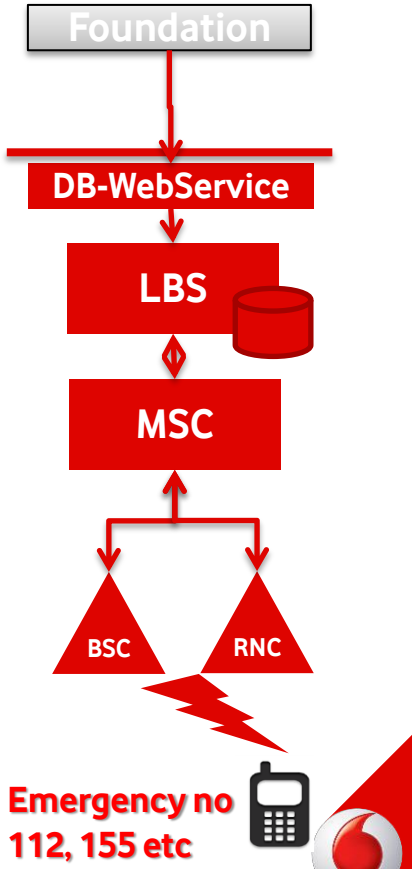
- Coverage,
  - Mobile frequency bands
    - We use 900 MHz GSM and 2100 MHz UMTS band
  - Pathloss/Distance calculation
    - Antenna power gain loss
  - Propagation Models
    - 2G&3G standart propagation model
  - Geographic Data
    - 25 clutter classes like Buildings, Denseurban, Taxarea, Denseblockbuildings, Blockbuildings, Meanurban, Highresidential, Villages, Industrial_Commercial, Parks, Semiopenarea, Sparseforest, Forest, Sea, Openinurban etc.
- Handover relations
- Timing Advance information

Case Study:1 Lycian Way

- The lost students couldn't be found from existing emergency call logs (LBS algorithms) ; 70 rescue staff were searching for.
- They are saved after 3 days, with our 4.5 hour solution on Jan19th 2015







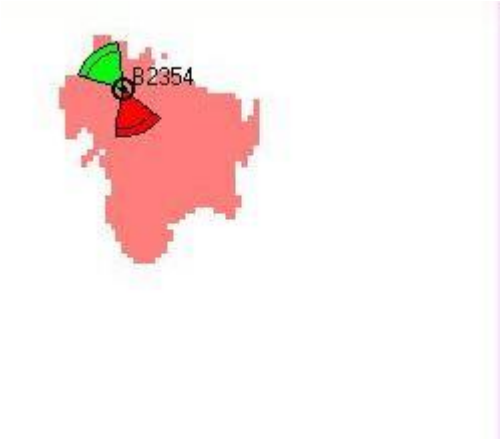
Case Study:1 Lycian Way

- Three people found alive after 5 days in the wilds
- https://



Case Study:2 Bozdag Mountain

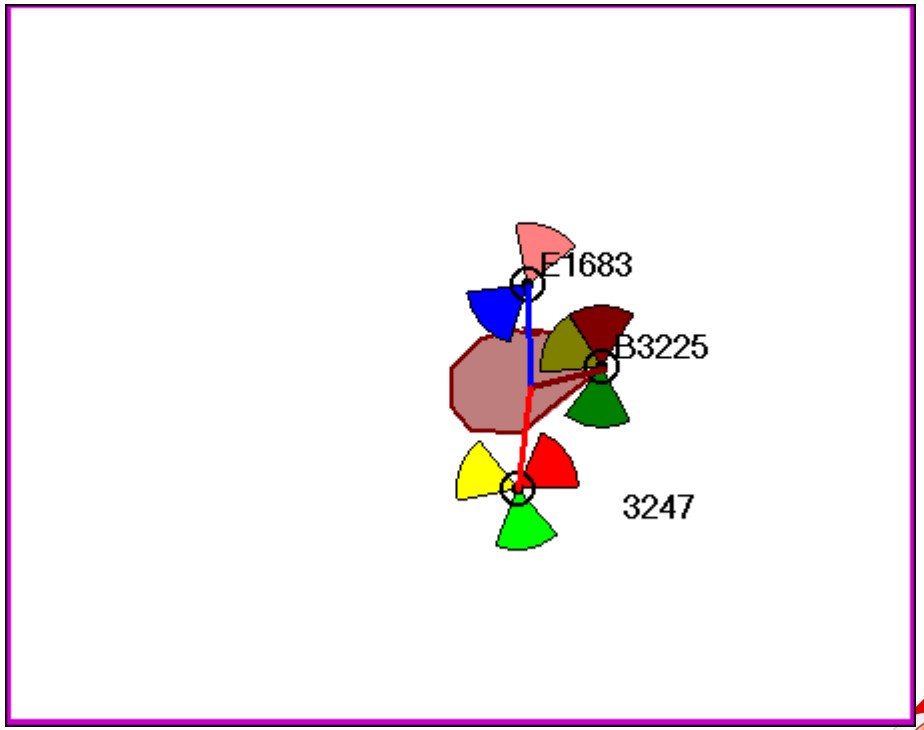
- The mountainers are saved on February 8th in the Bozdag Mountains in Izmir
- The similar method used to reduce the area

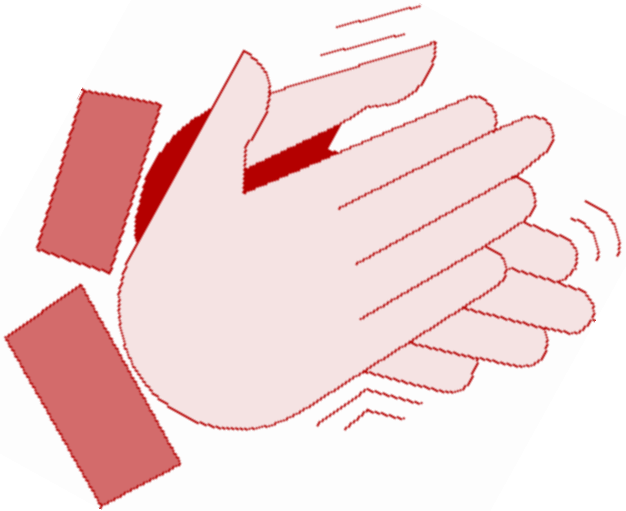


Conclusion&Future Work

- Neighbor effect+ Improve model
- Centralized&Automatized Emergency System with our new algorithm to applicable all mobile operators







Thank You

Any questions



Ezgi Dizdaroğlu
Vodafone Turkey