

Modified WiFi-RSS Fingerprint Technique to locate Indoors Smartphones: FENG building at Koya University as a case study.

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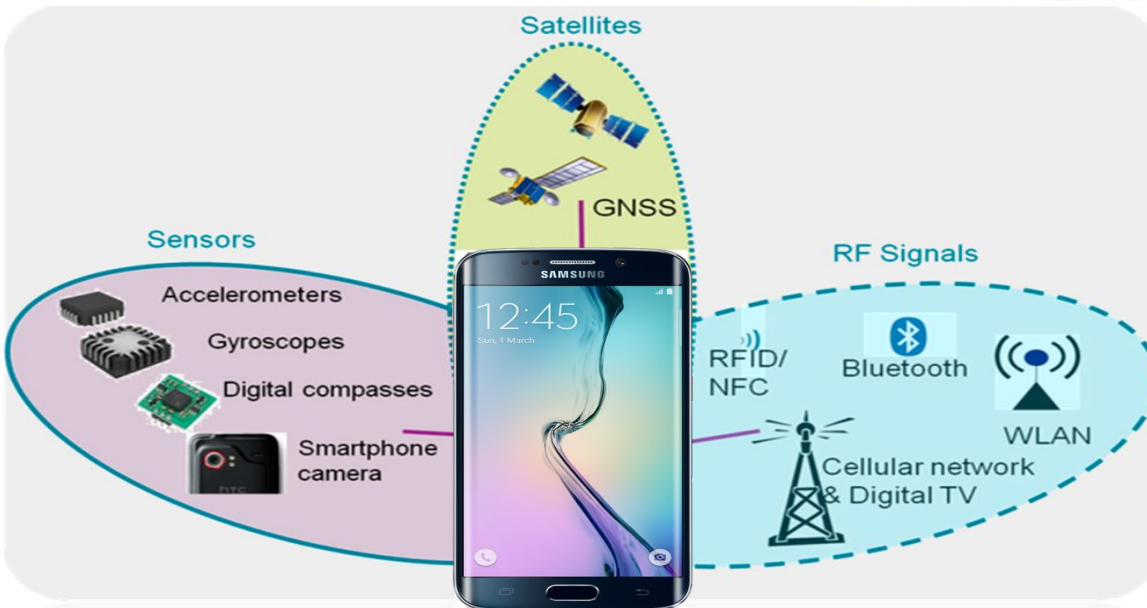
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Outline

- Why WiFi Positioning System?
 - Demand for Location-Based Services
- WiFi Positioning Technique
 - WiFi RSS-Fingerprinting Positioning Technique
- Experiments and Results
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 - Accuracy
 - Cost
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Why WiFi Positioning System?

- To offer **seamless** positioning from outdoors into indoors
- Most of the **LBS applications on Smartphones** need seamless positioning



- To improve localisation performance
 - **Accuracy**
 - **Cost**
 - **On-the-go solution**
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Demand for Location-Based Services



Courtesy: <http://www.gpsworld.com/wirelessindoor-positioningopening-up-indoors-11603/>

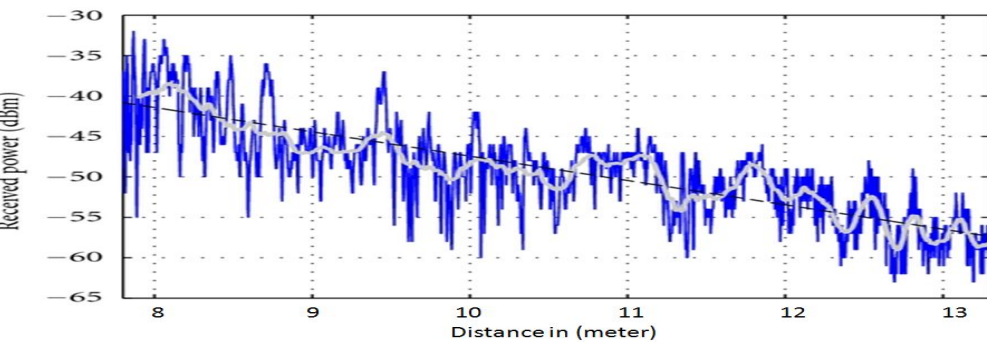
Why WiFi technology for localisation?

- GNSS signals are degraded or do not exist, when Smartphones are in urban areas and indoors
- Smartphones have enabled WiFi to be used to define our location indoors
 - Also available on laptop & tablet
 - WiFi used to access the Internet
 - Exist in most buildings and homes



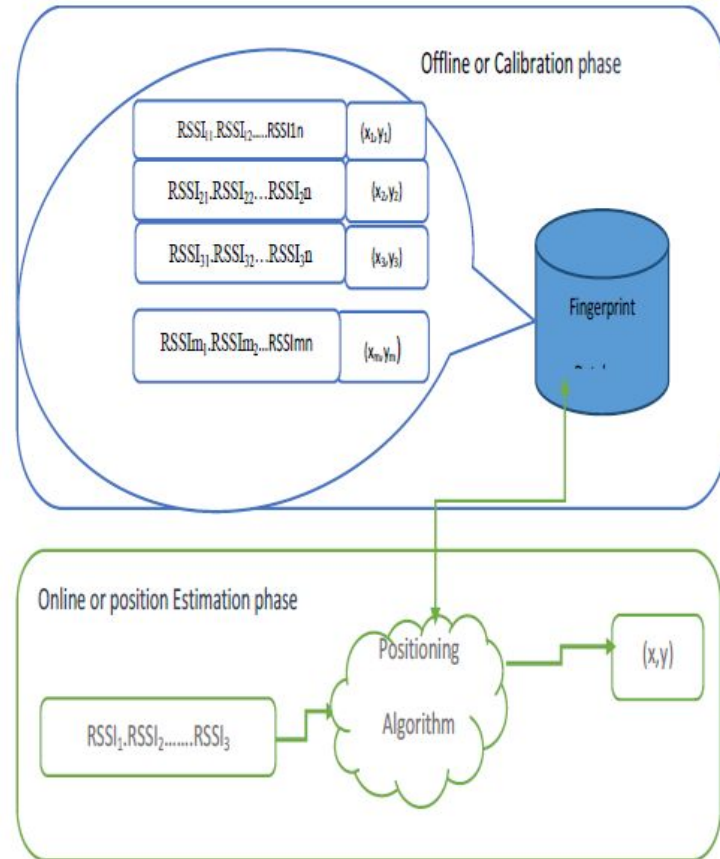
WiFi Positioning Technique

- RSS Solutions (eg. Skyhook)
 - Non-uniform shadowing



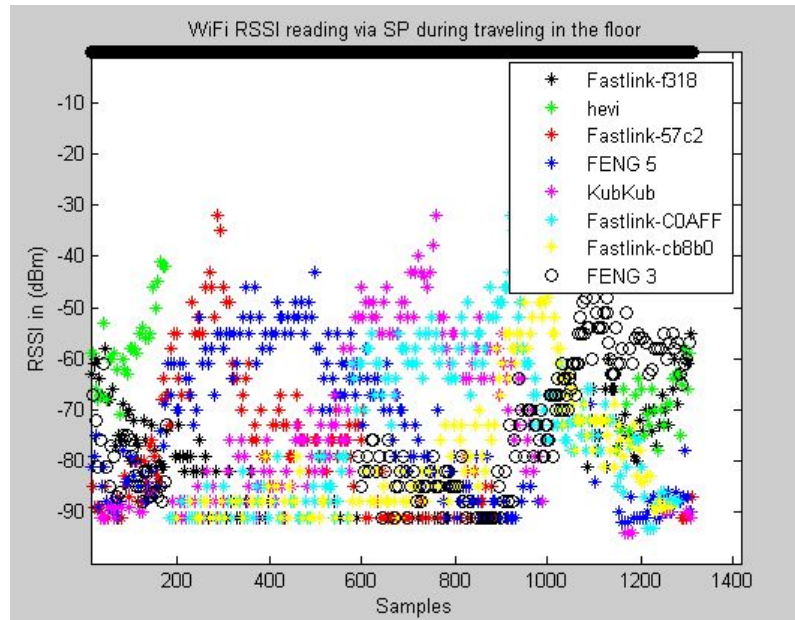
WiFi RSS-Fingerprinting Positioning Technique

- Most of the techniques need to use WAPs' location (like Trilateration, fingerprint doesn't!)
- Fingerprint is a area-dependent!
- Needs offline and online stages!



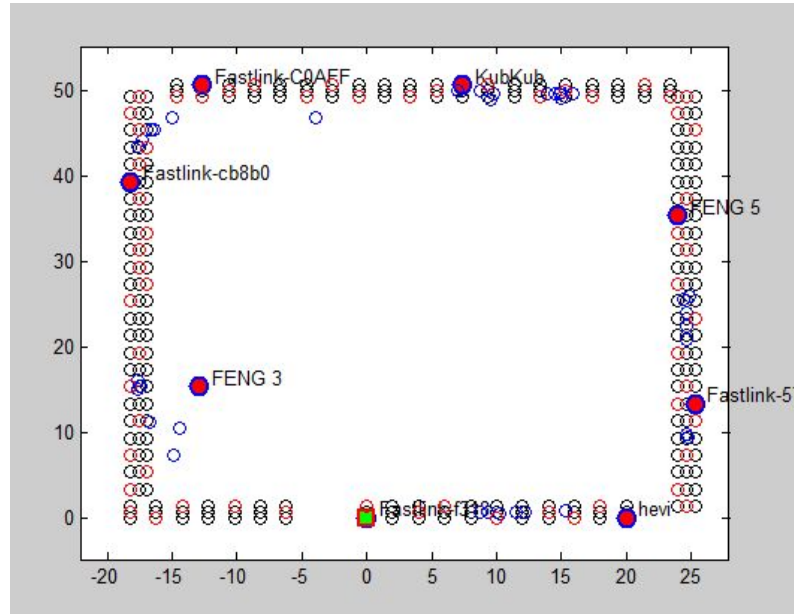
Experiments and Results

- WiFi RSS Received Signal Via Smartphones



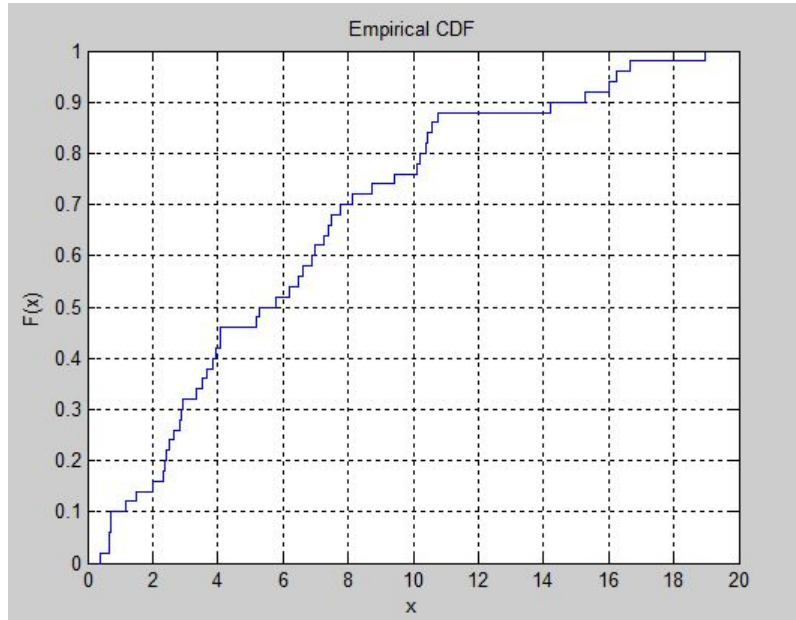
Experiments and Results

- Building-Map fingerprints and estimated positions



Experiments and Results

- Accuracy (average 6 meters) and lower cost than state-of-the-art!



Conclusion

- The solution offers seamless outdoors-indoors SPs positioning with good accuracy (6 meters)
- **Low-cost**, as overcome in the solution which is a new localisation challenges
- The obtained positioning **accuracy within 6.4** meters is based on the **k-NN** technique.
- The new modification of the WiFi-Fingerprinting is to using dynamic **weighting values** of the selecting RSS values,

Future Work

- **More Environmental Factors Consideration**
 - Sources incorporate the **NLOS** issue and calculating **3D SP-position**
- **Enhancing Fingerprinting Algorithm**
 - **Cooperative offline stage**
 - Fusing onboard SPs **DR measurements**
 - Using **Map info** to mitigate the instability issues

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