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Intelligent 5G Cellular Environment

Mareesh Kumar Issar
mareesh.issar@rutgers.edu
Mentor: Shalini Choudhury

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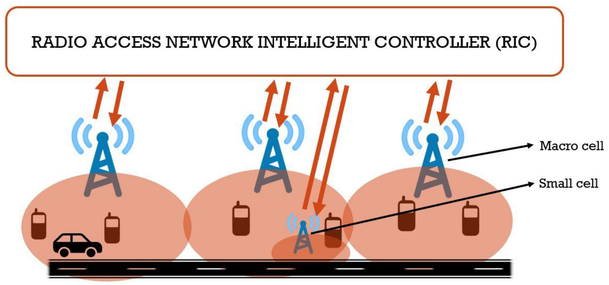
Overview

- Designing intelligent controller for handover management in 5G cellular environment supporting heterogeneous networks.



Handover

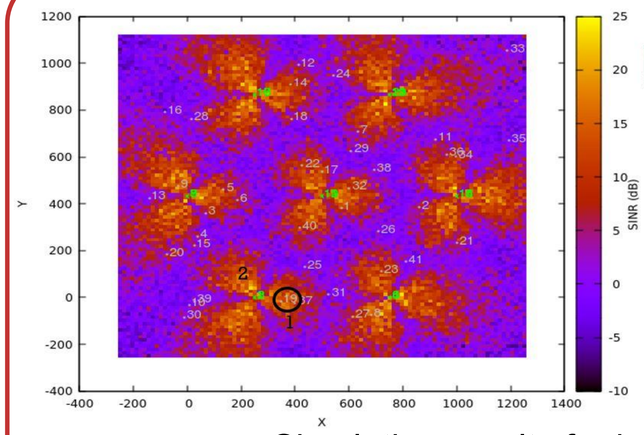
Process of a connected mode user equipment changing its association from one cell tower to other is called a Handover.

Types of handovers:-
- Quality based
- Coverage based
- Load-balancing

Simulation Software

ns-3 is a discrete-event network simulator for Internet systems, targeted primarily for research and educational use.

Results

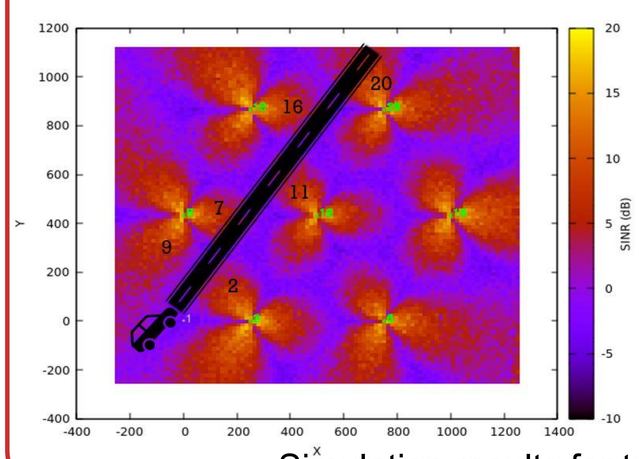


Time	CellID	IMSI	RSRP	SINR
7.395	1	19	-163.121	1.467015
7.396	1	19	-160.791	2.132547
7.397	1	19	-170.757	-8.5337
7.398	1	19	-167.64	-10.3427
7.399	1	19	-167.704	-7.02386
7.401	2	19	-168.756	-4.42811
7.402	2	19	-162.607	0.424731
7.403	2	19	-160.164	4.756901
7.404	2	19	-162.546	4.809995
7.405	2	19	-163.571	0.510174

ATTRIBUTE	VALUE
# eNB (Evolved Node B)	21
# UE (User Equipment)	41
Tx power (eNB)	46 dBm
Site Height	30 m
MAC Scheduler	Proportional Fair Scheduler
DL EARFCN	100
Bandwidth (UL/DL)	5 MHz
Downlink (MHz)	2120 MHz
Uplink (MHz)	1930 MHz
Antenna model	Parabolic
Path loss model	Log normal shadowing

EARFCN- E-UTRA Absolute Radio Frequency Channel Number

Simulation results for handover verification along with associated parameters.



Time	CellID	IMSI
1.359	9	1
1.361	2	1
21.479	2	1
21.481	7	1
34.559	7	1
34.561	11	1
56.279	11	1
56.281	16	1
63.119	16	1
63.121	20	1

ATTRIBUTE	VALUE
UE Mobility model	Random Walk 2D mobility model
UE speed (m/s)	16.6667m/s (60km/hr)
Simulation time	90 sec
Inter-site distance	500 m
Handover algorithm	A2-A4 RSRQ Handover algorithm
Direction	30°- 60° (Uniform distribution)
Starting location	(0,0)
Transport layer protocol	UDP

Simulation results for trajectory verification along with associated parameters.

Future Work

- Implement machine learning models for anticipating user trajectory.
- Design improved handover algorithms.

Acknowledgements

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References

[1] https://www.nsnam.org/docs/models/html/lte-user.html
[2] Karandikar, Abhay, Nadeem Akhtar, and Mahima Mehta. *Mobility Management in LTE Heterogeneous Networks*. Springer Singapore, 2017.
[3] Raca, Darijo, et al. "Beyond throughput: a 4G LTE dataset with channel and context metrics." *Proceedings of the 9th ACM Multimedia Systems Conference*. ACM, 2018.

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