MIMO-NOMA Mobility Support

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Overview:

- Traditional wireless communication systems have enhanced data rates, but escalating traffic demands necessitate advanced solutions.
- TDMA(Time Division Multiple Access) and OFDMA(Orthogonal Frequency Division Multiple Access) improved 4G and LTE data rates but led to congestion due to a surge in device numbers.
- Increasing traffic from smartphones and IoT devices requires new solutions.
- Non -Orthogonal Multiple Access (NOMA) emerges as a technology grouping users into clusters based on channel gain differences, promising improved spectral efficiency.
- NOMA, with superposition coding and SIC(Successive Interference Cancellation), enhances spectral efficiency.
- NOMA faces challenges in handling user mobility in cellular networks.
- Three re-clustering methods proposed: Arbitrary, One by One, and KMAA.
- KMAA minimizes re-clustering, improves resource use, and reduces signaling overhead.

Literature review:

	Title	Year	Publisher	Summary
1.	Mobility Support for MIMO-NOMA User Clustering in Next-Generation Wireless Networks	2023	IEEE	Investigates re-clustering methods (arbitrary, one-by-one, KMAA) for NOMA, considering user mobility. KMAA improves efficiency, capacity, and provides gains in throughput and outage probability, particularly in MIMO-NOMA setups.
2.	Towards the Mobility Issues of 5G-NOMA Through User Dissociation and Re-association Control	2020	IEEE	Addresses mobility challenges in 5G-NOMA. Proposes re-clustering methods (arbitrary, one-by-one, simultaneous) for link re-establishment, interference-free clusters, and improved resource utilization. Simultaneous method suitable for dense and highly mobile scenarios.
3.	Joint User Clustering and Beamforming in Non-Orthogonal Multiple Access Networks	2020	IEEE	Focuses on NOMA technology for higher data rates. Introduces a joint user clustering and beamforming scheme to maximize network throughput. Carefully analyzes features affecting system throughput, providing higher utility and improved fairness among users, regardless of channel conditions.

Conclusion:

- Seminar focus: NOMA in dynamic wireless scenarios, specifically addressing user mobility's impact on NOMA clusters.
- Proposed solutions: Implement continuous cluster checks and separate users from ineffective clusters.
- Emphasis on comparing user grouping methods, particularly in busy city areas.
- Addressing challenges in setups with multiple users sharing the same beam.
- Contributions include mobility management, theoretical analysis, tests, and evaluations of grouping methods.
- Main goal: Optimize NOMA for changing wireless conditions.

Chapters

1. Introduction
2. Evolution of Access Techniques(TDMA,OFDMA,CHALLENGES)
3. NOMA
4. Challenges with User Mobility
5. System Model- Dissociation, Re-association
6. Re-association Methods-
    - Initial Clustering and Dissociation Procedure
    - Arbitrary Method
    - One by One Mechanism
    - Kuhn-Munkres Assignment Algorithm (KMAA) Method
7. Conclusion

References:

- Naeem, Muhammad Kamran, et al. "Mobility Support for MIMO-NOMA User Clustering in Next-Generation Wireless Networks." IEEE Transactions on Mobile Computing (2022).
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- Kim, Ha-Ryung, Jiasi Chen, and Jongwon Yoon. "Joint user clustering and beamforming in non-orthogonal multiple access networks." IEEE Access 8 (2020): 111355-111367.

THANK YOU