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**A SURVEY ON DELAY BOUNDED, SELF INTERFERENCE MITIGATION FRAMEWORK FOR FULL DUPLEX 5G MOBILE WIRELESS NETWORKS (USING EFFECTIVE CAPACITY THEORY)**

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**Abstract:**

Full Duplex 5G mobile wireless networks have received important research attention and efforts from both industry and academia. 5G mobile wireless networks for full duplex are expected to provide different delay bounded Quality of Service (QoS) guarantees and self-interference mitigation framework for wide range of services and application and users with very different requirements and provide opportunities in enhancement of performance and energy saving for mobile, battery powered devices and provide strategies of different video content delivery. In this project we propose a delay bounded, self-interference mitigation framework to overcome the new challenges in 5G mobile wireless networks. We also propose a new scheduling algorithm that predict viewer behavior, computes and mobiles an energy optimal download strategy for a given mobile client. This scheduling algorithm also includes a mechanism to extend the explicit control of traffic overhead of mobile video that the users will never watch that content and we propose the task scheduling for power allocation scheme to decrease energy loss ,timing and increase throughput of 5G mobile wireless networks for full duplex. In this scheme, instead of developing interface from one device we will develop with many devices.

**Keywords:** 5G, Task Scheduling , Energy Minimization , Energy Efficiency , Mobile Communication ,Video Streaming ,Delay Bound ,Effective Capacity Theory , Self Interference Mitigation framework.

**1. Introduction:**

Energy consumption of 5G mobile wireless Communication for full duplex networks has become a primary concern in video streaming in design and operations. Mobile wireless networks have been designed with the aim of improving

performance of networks such as the data-rate, throughput, latency, delay bound, efficiency, bandwidth etc. In networks energy efficiency is depend on economic, environmental etc. In the design of the 5G mobile wireless networks will necessarily have to consider energy efficiency and self-interference mitigation as its important operations. 5G systems will provide ubiquitous connectivity and it will serve the number of devices, as well as innovative and rate-demanding. 5G mobile wireless networks for full duplex have received research efforts from both industry and academia. The 5G wireless networks are provide different delay-bounded Quality of Service (QoS) guarantees and self-interference mitigation framework to reduce the interference while data transfers between Numbers of devices over a network for a wide range of services, applications, and users with very different requirements. Fourth-generation wireless networks are becoming a more widely used and implemented in the mobile wireless industrial and Fifth-generation wireless networks are rapidly emerging in research fields. In that their aim to ensure that wireless application that can provide a better speed network, provide better functionalities and wireless application can be serve any time and any place.

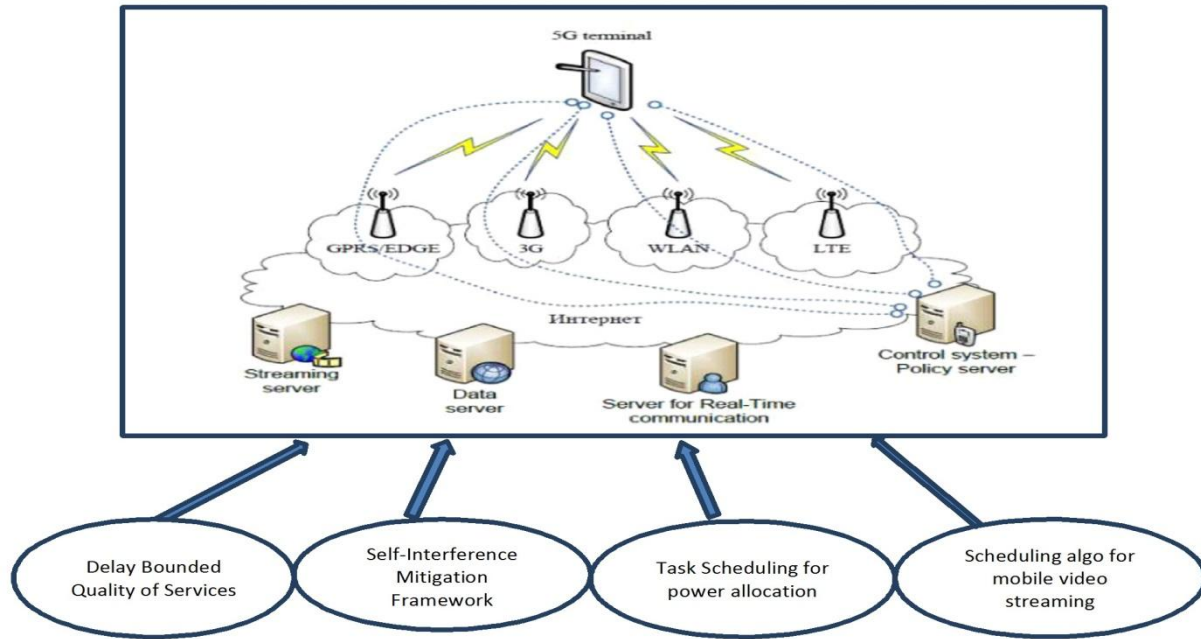
In this paper we propose self-interference mitigation framework for 5G mobile wireless network for full duplex .This framework will ensure that reduce interference between wireless devices while communicating over a wireless network. Management of Interference in wireless mobile networks is a key and important issue, such as those found in dense urban areas.

Also we propose a task scheduling to schedule the task to reduce power consumption and to increase the speed of downlink and uplink information over a network. We propose an algorithm for video streaming with using two buffers for sending and receiving data on network with less power consumption. Mobile devices such as tablet-PCs and Smart-phones, are widely used as amain computing platforms because of their portability and compactness. But there is main issue with these devices are shorter battery life and also a power issues in the development of 5G mobile device technology. Mobile video streaming is the most used mobile services. It takes more power and battery to watch and download the video streaming on mobile phones as compare with the desktop. The energy consumed by wireless networks during video streaming is significant. In fact, it can add up to more than half of the total energy consumed by a smartphone when streaming videos.

Energy of devices waste in downloading information that the users will never watch because of abandoning the session .This energy is called tail energy.

### 1.1.Delay Bounded Quality of Services

Delay bounded is total delay experienced by the data transmission over a network can be guaranteed not to exceed some predetermined value. 5G wireless network expected to provide high data rate with very low delay bound. We propose the fundamentals of delay-bounded QoS provisioning for 5G mobile wireless networks for full duplex, which will be based on the effective capacity theory.



**Fig 1.Proposed system for delay bounded, self- interference mitigation framework for full duplex 5g mobile wireless networks.**

#### 1.1. Self-Interference Mitigation for 5g Mobile Wireless Network

When deploying 5G mobile wireless networks, self-interference can become an issue if not given proper attention. In this paper we discuss the concept of self-interference and develop a self -interference mitigation framework to overcome the problem of interference during transmission. In wireless network if base station is sending message to Terminal 1 at that time terminal 2 and terminal 3 and feel interference.

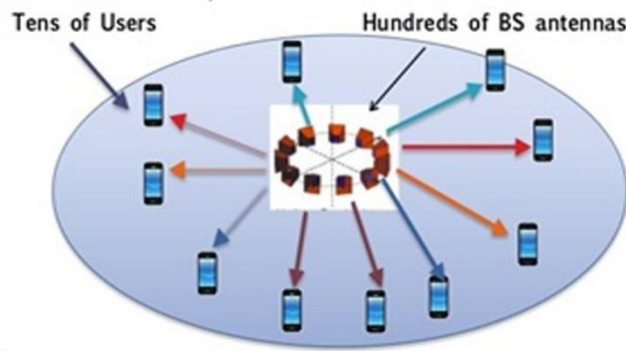
#### 1.2.Massive MIMO

Massive MIMO (also known as large-scale antenna systems, hyper mimo, full-dimension mimo, very large mimo ) makes a clean break with current practice through the use of a very large number of service antennas (e.g., hundreds or thousands) that are operated fully coherently and adaptively. Extra antennas help by focusing the transmission and

reception of signal energy into ever-smaller regions of space.Massive MIMO can be applied also in frequency division duplex (FDD) operation. But it was originally envisioned for time division duplex (TDD) operation.

The key focuses of massive MIMO are: 1) Outdoor Scenario 2) Indoor Scenario. In the idea of massive MIMO is to increase the number of deployed antennas. In massive MIMO concept, antennas arrays with a few antennas fed by expensive hardware are replaced by hundreds of small antennas fed by low-cost amplifiers.

- a. **Indoor Scenario** – Indoor technology is now deployed for residential and commercial use.
- b. **Outdoor scenario** – Outdoor technology is specifically designed to provide an effective solution for outdoor wireless networking application.



**Fig 2. Massive MIMO.**

**2. Literature Survey:**

I have done literature survey for 25 papers. I have shown propose methods of papers and also disadvantage and advantages and applications etc in the TABLE A which is giving description about content which important for my project.

**2.1.Table**

S. NO.	Title of Paper	Name of Authors	Journal Name	Pa-ge No.	Proposed Method	Advanta ges	Disadv an- tages	Applica- tion Domain	Remarks
1.	A Performance Evaluation Framework	David Öhmann , Albrecht J. Fehske,	IEEE	938-950	Evaluation framework for cellular	Increase performa nce and	Not suitable for	Data Networks	Future work may use for different adaptations

	for Interference-Coupled Cellular Data Networks	Henrik Klages, Gerhard P. Fettweis			Networks	data rate	distributed antenna systems		of model proposed to more specific (future) network architectures including distributed antenna systems
2.	A Survey of Energy Efficient Techniques for 5G Networks and Challenges Ahead	Stefano Buzzi, Chih-Lin I, Thierry E. Klein, H. Vincent Poor, Chenyang Yang, Alessio Zappone	IEEE	697-705	Proposed Energy Efficient Techniques for 5G Wireless Networks	Energy efficiency has gained in the last decade its own role as a performance measure and design constraint for communication networks	Business challenges still remain to be addressed before the ambitious 1000-times energy efficiency improvement goal can be reached	5G Networks	These technologies can also be used for energy efficiency and QoS guarantee.
3.	Quality of service	Xi Zhang,	IEEE	2043-	The optimal power	V-MIMO	Speed	Commun-	The effective capacity of

	(QoS)-Aware Power Allocations for Maximizing Effective Capacity Over Virtual-MIMO Wireless Networks	Wenchi Cheng, Hailin Zhang		2057	allocation schemes with statistical QoSprovisionin gs over noncollaborativ e/ collaborativeV-MIMO wireless networks	power allocation schemes can achieve larger effective capacity than the effective capacity without consideri ng QoS requirem ents	of network will effect	ications	Virtual-MIMO wireless networks can be further increased, It can be implemented among the grouped users.
4.	A Real-Time Adaptive Algorithm for Video Streaming over Multiple Wireless Access Networks	Lin Cai, Siyuan Xiang, Min Xing	IEEE	795-805	Proposed a real-time adaptive best-action search algorithm for video streaming over multiple wireless access networks	higher video quality, lower latency, and better smoothn ess	Bandwi dth could be better.	Wireless Networks	To better allocate the loads betw- een several links with finer granu- larity should be investigated. Second, to better pre- dict the future bandwidth
5.	An Energy-Balanced and	Chien Fu Cheng,	IEEE	4184-4193	ETSR algorithms	ETSR algorith	-	Grid-Based	It resolves all the problems

	Timely Self-Relocation Algorithm for Grid-Based Mobile WSNs	and ChihWei Huang			(Energy-Balanced and Timely SR algorithm for grid-based mobile wsns)	ms can solve the self-relocation SR problem with the strict response time requirement and reduce the potential occurrence of SR problems		Mobile Wireless Sensor Networks	which isoccurr in SR. This algorithm also can increases the overall network lifetime
6.	Architectures for MIMO-OFDM Systems in Frequency Selective Mobile Fading Channels	Hen-GeulYeh	IEEE	1189-1193	STCC and WHSTCC schemes for enhancing the BER performance of OFDM systems and applications to MU-MIMO systems in mobile fading channels	Error floor of the STCC and WHSTCC scheme is significantly lower than the ST scheme	Generates a diversity transmission gain but also reduces PAPR.	Circuits and Systems	These scheme may serve as the needed baseband function for reconfigurable 5G in a time-variant and dynamic Environment.

						Robustness			
7.	Cross-Layer Modeling for Quality of Service Guarantees over Wireless Links	Jia Tang ,and Xi Zhang	IEEE	4504-4512	Proposed Cross-layer approach to investigate the impact of physical-layer infrastructure on data-link-layer quality -of-service performance over wireless links in mobile networks	Normalized effective capacity, Less delay bound	Feedback delay increases then effective capacity decreases	Wireless Communications	This approach offers to develop highly-efficient admission-control, packet scheduling, and adaptive resource-allocation schemes for real-time multimedia traffics over mobile wireless n/w
8.	Dynamic - Control of Receiver Buffers in Mobile Video Streaming Systems	Joseph Peters, FaridMolazemTabrizi, and Mohamed Hefeeda	IEEE	995-1008	Propose algorithm for efficiently transmit multiple Variable-Bit-Rate (VBR) video streams from a base station to mobile receivers in wide-area	Controls the buffer levels , Save Devices energy , and no two bursts overlapping in	complexity	Mobile Computing	algorithm allows the base station to transmit more video data on time to mobile receivers and enables dynamic control of the wireless



					wireless networks	time			channel
9.	Dynamic Scheduling for Energy Minimization in Delay Sensitive Stream Mining	Mihaela van der Schaar ,Nikos Deligiannis ,ShaoleiRen, Yiannis Andreopoulos, Mohammad A. Islam.	IEEE	5439-5448	Proposed Novel framework for energy minimization in dynamic scheduling (DSE) that leverages this emerging hardware heterogeneity	DSE reduces the average energy consumption	model inaccuracy	Signal Processing	DSE can reduce the average energy consumption by up to 50% given the same delay requirement
10.	Energy-Aware and Bandwidth-Efficient Hybrid Video Streaming Over Mobile Networks	SalehAlmowena, Md. Mahfuzur Rahman, Cheng-Hsin Hsu, Ahmad AbdAllah Hassan, and Mohamed Hefeeda	IEEE	102-115	Concurrently utilize unicast and multicast for minimizing the energy consumption of mobile devices and minimizing the load on cellular networks	Lower energy consumption, video quality increase	If number of users increase then buffer time also increases	Multimedia	Dynamic configuration of SFNs can also be considered to further increase the number of served multimedia streams within cellular networks
11.	Energy-Efficient	Giacomo Bacci	IEEE	1668-1683	Proposed Framework to	energy efficiency	complexity of	Signal Processing	An optimization Frame-

	Power Control: A Look at 5G Wireless Technologies	,Luca Sanguineti ,AlessioZ appon, Eduard Jorswieck , and Mérouane Debbah			develop decentralized and centralized power control algorithms for Energy Efficiency optimization in wireless networks	y maximiz ati-on	each iteratio n	g	work is provide solution of energy-efficient optimization problems in interference-limited networks
12.	Energy-Minimized Multipath Video Transport to Mobile Devices in Heterogeneous Wireless Networks	Bo Cheng, Ming Wang, Jiyan Wu, Chau Yuen, and Junliang Chen	IEEE	1160-1178	Provide an energy video aware multipath transport protocol (EVIS)	Provide video communication over multiple communication paths. Optimize energy efficiency	Loss protection to achieve minimal energy consumption while achieving target video quality	Communi cations	Improvement in energy conservation, end-to-end delay, and goodput ,video peak signal-to-noise ratio (PSNR)
13.	Interference Allocation Scheduler For Green Multi-media Delivery	Khirallah, DejanSiyi Wang, WeisiGuo , ChadiVuk obratovi'c	IEEE	2059-2070	A novel and effective scheduling policy that allocates resource blocks, such	Improve the performance of cells that have a high	The number of FL user pairings is low	Vehicular Technology	Scheduling may have a profound impact on both energy efficiency and QoE of

		, and John Thompson			that interference power is shifted toward capacity-saturated users, while improving the throughput of unsaturated users	discrepancy in its signal-to-noise ratio (SNR) distribution			multimedia service delivery
14.	Joint Access Point Selection and Power Allocation for Uplink Wire-less Networks	Mingyi Hong, Alfredo Garcia, Jorge Barrera, and Stephen G. Wilson	IEEE	3334-3347	The joint AP selection and power allocation problem in a multichannel wireless network	Increased throughput, Provide solutions for efficiency improvement	Little throughput loss	Signal Processing	The non-cooperative game with mixed-integer strategy space analyzed in this paper can be applied to many other problems as well. It is beneficial to characterize quantitatively the efficiency of the JEP
15.	Distortion-Aware	Jiyan Wu, Bo	IEEE	688-701	Distortion-aware	Enhanced	Cost minimi	Mobile Computin	CMT-DA outperforms

	Concurrent Multipath Transfer for Mobile Video Streaming in Heterogeneous Wireless Networks	Cheng, Chau Yuen, Yanlei Shang, and Junliang Chen			concurrent multipath transfer (CMT-DA) solution includes three phases: 1) per-path status estimation and congestion control; 2) quality-optimal video flow rate allocation; 3) delay and loss controlled data retransmission	transmission reliability and data throughput	zation problem of utilizing CMT for mobile video delivery	g	the reference schemes in terms of video peak signal-to-noise ratio (PSNR), goodput, and inter-packet delay
16.	Quality-of-Service Driven Power and Rate Adaptation over Wireless Links	Jia Tang, and Xi Zhang	IEEE	3058-3068	Quality-of-service (QoS) driven power and rate adaptation scheme over wireless links in mobile wireless networks	Increase efficiency, power control, Data rate	Cost minimization problem, Throughput loss	Wireless Communications	The adaptation policy proposed for Markov channel models can also be applied to the more general channel models
17.	Resource Allocation for Cost	Xiaoming Chen, Zhaoyang	IEEE	1229-1236	Design a resource allocation	Control noises, Increase	complexity	Wireless Communications	Develop system model and

	Minimization in Limited Feedback MU-MIMO Systems With Delay Guarantee	Zhang, and Chau Yuen			framework for the delay-sensitive multiuser multiple-input multipleoutput (MU-MIMO) broadcast system with limited feedback	d performance of system , minimizing the total resource cost			scheduling algorithm to optimize the energy efficiency
18.	Robust Scheduling and Resource Allocation in the Downlink of Spatially Correlated MIMO-OFDMA Wireless Systems With Imperfect CSIT	GuillemF emenias, FelipRiera-Palou, and John S. Thompson	IEEE	614-629	resource allocation and scheduling in the context of (downlink) spatially correlated MIMO-OFDMA networks where the available CSIT information has limited accuracy	Discrete and continuous rate allocation Reduce traffic	Delay Bound Multicell scenarios	Vehicular Technology	The generalization of the current framework to allow peruser multistream transmission The incorporation of multiuser MIMO mechanisms
19.	Scheduling and Resource Allocation in Downlink Multiuser MIMO-	GuillemF emenias , and FelipRiera-Palou	IEEE	2019-2034	Analytical scheduling and resource allocation design for MU-MIMO-	Multiuser, Space and Frequency	Speed ,Complexity	Communications	Future work will concentrate on the extension of the

	OFDMA Systems				OFDMA networks based on BD considering the steps of subcarrier and power allocation scheduling policy, rate allocation and user/stream selection				framework to multicell scenarios where intercell interference is taken into account in the design
20.	Silence is Gold: Strategic Interference Mitigation Using Tokens in Heterogeneous Small Cell Networks	Cong Shen, JieXu, Mihaela van der Schaar	IEEE	1097-1111	Novel distributed token exchange framework, which can be used in heterogeneous small cell networks to successfully mitigate interference among the self-interested users	Improves the overall network QoS, Improves network performance	Security and Reliability	Communications	Ensuring the security and reliability of token exchanges represents a crucial aspect of the proposed design and represents an important topic for further investigation

### 3. Challenges and Issues

Full duplex radio suffer from serve self-interference as well as extra cross-directional coupling between simultaneous uplink and downlink operation which further degrades the overall network performance. Speed, data rate and reliability. These are related to each other. If speed increases data rate and reliability of channel decreases .Ensuring the security and

reliability of token exchanges represents a crucial aspect of the proposed design and represents an important topic for further investigation. To implement better capacity theory of fading channel to Increase capacity of channel. To manage the multiple users is a difficult challenge in 5G wireless network without transmission loss and with less delay bound. We have to focus on Errors in the side information used for mitigation and additional noise.

#### **4. Conclusion**

In this project we propose a delay bounded, self -interference mitigation framework to overcome the new challenges in full duplex 5G mobile wireless networks. We will also propose a new scheduling algorithm that predict viewer behavior, computes and mobiles an energy optimal download strategy for a given mobile client. This scheduling algorithm also includes a mechanism to extend the explicit control of traffic overhead of mobile video that the users will never watch that content and we will propose the task scheduling for power allocation scheme to decrease energy loss ,timing and increase throughput of full duplex 5G mobile wireless networks.The most important challenges and issues in this paper that is how we are going to implement self-interference mitigation framework for 5G network and improve frequency of channel.

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