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Scalable and Energy Efficient Communication using Multirate Sampling for 5G

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Abstract: **As we all are aware that 5G technology has lot many challenges like Scalability, energy efficiency, data rate etc. These entire factors if improved leads 5G technology to the next level. In this paper we are trying to implement the system to overcome the issues of 5G like scalability, power consumption and data rate by decimating the sample which needs to be transmitted and then interpolating the same at receiver end followed by data prediction algorithm which will generate more or less the same original signal. In order to achieve above we have to develop three algorithms. Decimator algorithm is to decimate only redundant data and not the unique value. Interpolator and prediction algorithm is to recover the signal similar to the original signal. Minimize the probability error to zero which will prove that the interpolated signal is same as the original signal. If we achieve this then power consumption would also be reduced as it will save transmitting and receiving antenna power which is the highest among all the interconnected systems.**

Keywords: **Decimation algorithm, Interpolation algorithm, Prediction algorithm.**

1. INTRODUCTION

With the emergence of big data as an important information technology in support of virtualised services, it becomes promising to design 5G wireless networks by exploiting recent advances relevant to network function virtualization and benefiting from advanced virtualization techniques of cloud computing to build efficient and scalable networking infrastructures[1]. Researchers have been designing new architectures for elastically composing and op-erating a virtual end-to-end network platform on de-mand on top of fragmented physical infrastructures provided by federated cloud [1].

As we know that 5G technology is providing large broadcasting of data in gigabit which supports almost thousands connections. As a demand of data grows continuously to transfer high data require large band width. To use high-bandwidth solution is to use lower wavelength waves, which require line of sight propagation, which is challenged to compare with lower frequency propagation[1]. A high-altitude platform can be airplane or balloon designed to for matter will need to create these components, incorporating the applicable criteria.

A high-altitude platform can be airplane or bal-loon designed to operate at very high-altitude and is able to stay there for long time HAPs give a coverage radius of 30Km so we can establish single HAP instead of several terrestrial base stations in suburban and rural areas[1].

We have also suggesting BDMA as a radio interface for 5G, which is not depended on fre-quency/time resources. In BDMA technique base station allocates separate beam to each mobile sta-tion for that it divides the antenna beam according to the location of mobile stations. This multiple access technique significantly increases the capacity of the system. Initially, base station and mobile station don't know each other positions so mobile station finds its position and moving speed transmit it omni directionally thereof to the base station. In BDMA, base station allocate separate beam for each mobile station through phase array antenna .A phase array is an array of antenna in which the relative phases of the respective signals feeding the antenna are varied in such a way that the effective radiation pattern of the array is reinforced in a desired direction and suppressed in undesired direction[2].

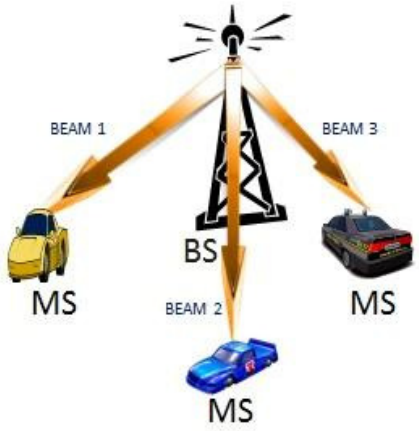

Fig. 1: BDMA System

Because of a steady increase the communication speed and number of user requirements of a radio spectrum also increase. This leads to more effi-cient use of the spectrum which gives cost-effective results [3]. Cognitive radio technologies share

the same spectrum efficiently by finding unused spec-trum and adapting the transmission scheme to the requirements of the technologies currently sharing the spectrum [4, 5].

2. METHODOLOGY

Traffic on wireless networks has been doubling annually and around 2020, data consumption will be thirty times more. Current 4G technology will not be capable of carry this rapid increase of data consumption[6]. In reality, 5G does not exist yet but the future network next to 4G we say as 5G. So far, we heard about only LTE advanced, which give peak download speed of 1Gbps and upload speed of 512Mbps, but you cannot drain its full capacity with your mobile device[7].

TABLE I: Different Methodologies For 5G chal-lenges

Sr No	Methodology	Parameters of 5G			Proposed Methodology
		Data Rate	Energy Effi-ciency	Scalability	
[12]	Vector Compression Algorithm, EVM(error measurement), LTE-A,C-RAN	Yes	-	-	Decimation Algorithm, Interpolation Algorithm, Prediction Algorithm, Filters
[13]	SFBC(Space Frequency block code), VBLAST	Yes	-	-	
[14]	OFDMA, Adaptive Modulation	Yes	-	-	
[15]	Network Simulator And Emulator	Yes	-	-	
[16]	LSI	-	Yes	-	
[17]	Solar Energy-Economic And Ecological Sources	-	Yes	-	
[18]	Heterogeneous Network	-	Yes	-	
[19]	OFDMA And SC-FDMA, IFDMA	-	Yes	-	
[20]	Mobile Computing And Cloud Service	-	-	Yes	
[21]	Combination of Optimal semi Static scheme And FFR	-	-	Yes	

It is expected that4G standard will be concluded within two years. 5G network will not be only more speed but also capable of carry more data [8]. In Recent past Compression technique is used for reduce data rate. C-RAN for Larger data transmis-sion in optical fiber. Algorithm remove redundancy in spectral domain then apply block scaling and which is combined with non-uniform quantize and minimize quantization error. Reduce amount of data which is transfer from BBU to RUU in LTE system [12].

Researches in[13] have developed Space free blocks code for improving BER in low SNR whereas VBLAST increases data rate in high SNR. The impact of spatial correlation on performance of SFBC and VBLAST scheme on MIMO-OFDM-

LTE. Researchers have developed system which contains WiMax for high speed access service and OFDMA supports adaptive modulation multiple diversity which also increase the performance and data rate of the transmission [14].

Existing system in recent past which contain Net-work simulator and emulator for simulate proposed scheme.PFRS can have PSN values in network condition with lower bit error rates (BER)[15]. Re-searchers developed LSI for improve reliability and functionality as well as speed. Ultra high speed tech-nology (WPAN, WLAN) used for improving energy efficiency[16]. Solar energy is used as an economic and ecological source in recent year which supports mobile base station. Its efficiency is depending on geographical location and changing whether condi-tion. Calibrate solar improving availability of base station by controlling consumption and energy [17].

Researches in [18] developed Heterogeneous net-work for improving energy efficiency of cellular system. It is designed for LTE femtocell. Result parameters are average energy consumption of fem-tocell, average femtocell energy efficiency. In recent past SC-FDMA and OFDMA used in LTE system. OFDMA used in down link wireless communication system for its high spectral efficiency. SC-FDMA is used in uplink wireless communication system for its high power efficiency[19].

Researchers developed Smart phone application that served as real time data acquisition system from sensors or device attached to patient body[20]. Researchers in [21] developed Existing resource al-location on scheme have difficulty to satisfy this re-quirement. For future work combined optimal semi-static scheme and FFR for improving performance.

3. PROPOSED SYSTEM MODEL

In this paper we are proposing a design to over-come the above mentioned issues while implement-ing the 5G technology. The block diagram of the proposed system is designed to:-

- Improve Scalability Enhance the data rate
- Reduce power consumption

We have designed a proposed system for 5G technology. In that system all the above mentioned parameters are covered. This system will improve the scalability, energy efficiency and speed of data rate by using Digital Signal Processing.

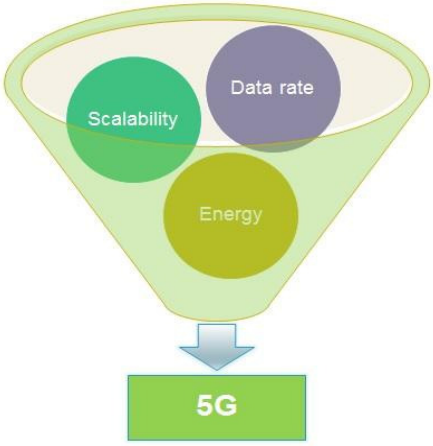

Fig. 2: Design criteria for Beyond 4G systems

In below system, message signal contain audio or video data. Anti-aliasing filter used for avoid alias-ing effect. Decimation Algorithm used for remove redundant data of signal. Amplify signal for long distance transmission. Insertion done through In-terpolation Algorithm. Recover signal through pre-diction algorithm applying anti-imaging filter then obtain output signal which is closed to original signal.

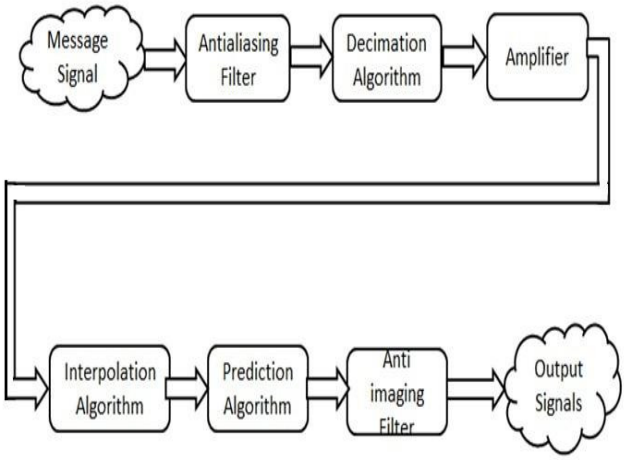

Fig. 3: Proposed system scenario

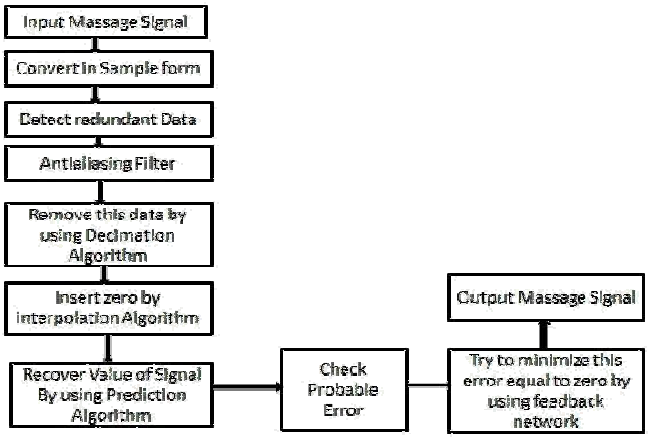

Fig. 4: Algorithm of proposed system

4. ALGORITHM FOR PROPOSED WORK

Input Message is baseband signal which contains audio or video data. Then signal convert in sample form by using sampling algorithm. We can detect redundant data through different technique. Signal passed through anti-aliasing filter for avoid aliasing effect, then remove redundant data of signal by using Decimation Algorithm and Recover signal through interpolation algorithm and prediction algorithm. After recovering signal check probable error and try to minimize this error equal to zero by using feedback network. At end of receiver obtain output signal which is closed to original signal.

5. CONCLUSION AND FUTURE SCOPE

In this paper, we have shown the comparative study applied by using different methodology for improvising parameter of 5G in table 1. In 5G, multirate sampling technique is better technique for improving data rate, energy efficiency and scalabil-ity for communication. In this proposed system, dec-imator algorithm is decimating the redundant data; interpolator and prediction algorithm is recovering

the signal which is close to original signal. Authors of this paper are working on this proposed system and experiments are being carried out for 5G.

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