A Novel Channel Estimation Technique for 5G MIMO Communication Systems

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Abstract - Internet of things (IoT) in health care is one of the major areas which ease the usage of many transmitters on board, leading to the usage of Multiple Input Multiple Output (MIMO) systems for better communications. Employing 5G MIMO systems suitable for IoT applications with quality of performance (QoP) is a challenge. This paper defines a channel estimation method based on training symbol for 5G MIMO wireless communication systems for IoT applications is proposed and analyzed. An M-estimator is suggested for optimizing the proposed channel estimator. The proposed technique performance is evaluated based on the comparison of Simulation results with Least Squares (LS) channel estimation with and without Discrete Fourier Transform (DFT). From simulation results, it is seen that the proposed method of channel estimation closely approximates that of true channel estimation.

Index Terms - channel estimation; discrete Fourier transform; influence function; least squares; M-estimator; penalty function.

I. INTRODUCTION

Rapid growing of mobile users and exponential growing demand of higher data rates force many practical challenges on existing cellular networks and their developments to provide a high network capacity with extensive area coverage to meet customer demands of upcoming 5G networks [1]. Major disadvantage of existing networks are low data rate, minimum quality of experience (QoE), low end-to-end performance, less indoor coverage, poor mobility performance etc. Similarly, network operators face difficulties in terms of providing satisfactory services e.g., high spectral efficiency, huge network capacity, large availability of spectrum, low latency, & lower energy consumption. In order for 5G MIMO communication systems to work for both the identified demands, plans for spectral efficiency improvement, scheduling for channel information, coding and adaptive modulation are required. All these techniques need an (CSI) i.e. accurate Channel state transmitter end. An estimation of such CSI is crucial for high data throughput Information available at a In [7], a new channel estimation technique was proposed with enhanced Kalman filter which operates to reduce the noise levels, improves the channel conditions and Quality of Service [QoS] over Wireless Communication environments.

In [8], channel estimation with minimum mean-squared- error (MMSE) criterion for orthogonal frequency division multiplexing (OFDM) systems was investigated. MMSE estimator was studied first which uses the correlation of a frequency response on different instant of time and frequency for a channel. This MMSE channel estimator may be a frequency domain filter with the help of the fast Fourier transform (FFT), and it is followed by a time-domain filters. Further, an estimator which is insensitive to a channel statistics was proposed and analyzed in [8]. A multiuser detector using *M*-estimator [9] was presented in [10]-[11] for non- Gaussian flat- fading channels.

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II. XISTING METHOD

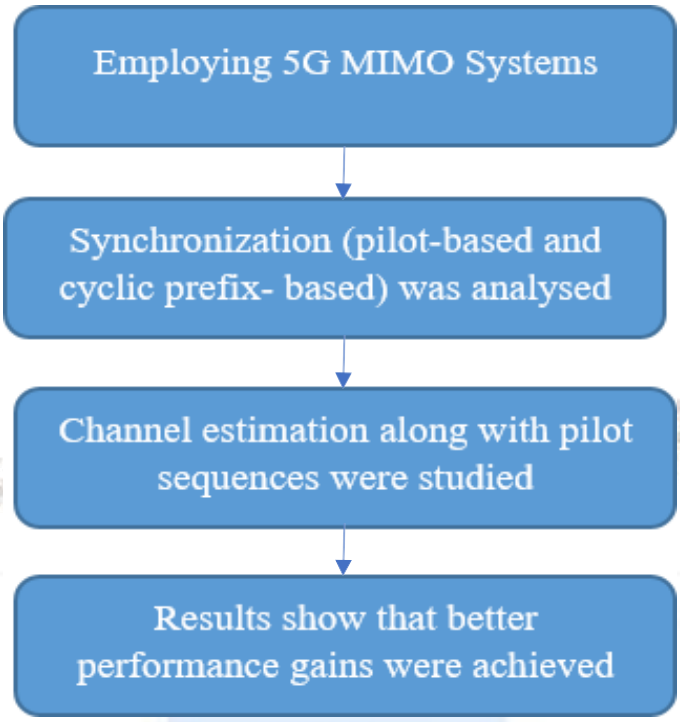


Fig.1 Block Diagram of Existing Method

This method proposed, pilot-assisted techniques for channel estimation (CE) are simulated for UniversalFiltered Multi-Carrier (UFMC) modulation scheme. UFMC aims at replacing orthogonal frequency division multiplexing (OFDM) and improves performance and robustness in the case of time frequency misalignment. These techniques efficiently support Internet of Things (IoT) and massive machine type communications (mMTC), which are identified as challenges for 5G wireless communication systems (WCS). Pilot-aided techniques are adopted and applied to OFDM and UFMC. Simulation results are supplemented to compare the performance of UFMC systems with conventional CP-OFDM systems.

The flow of the proposed method is shown in figure below

III. PROPOSED METHOD

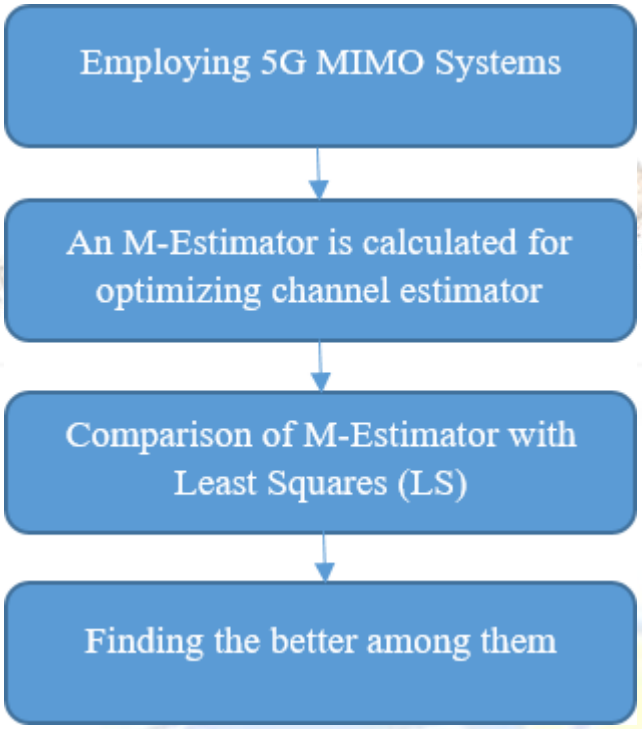
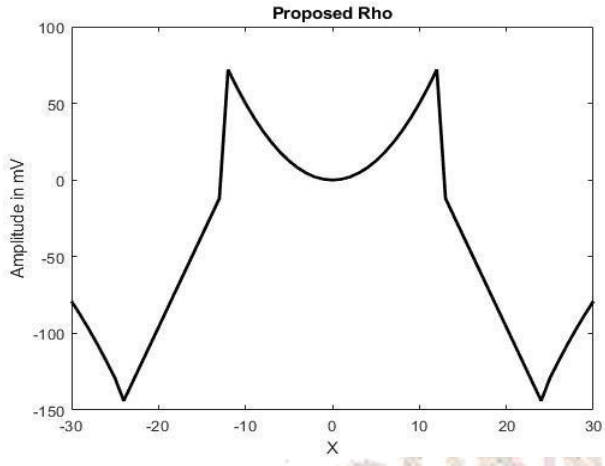
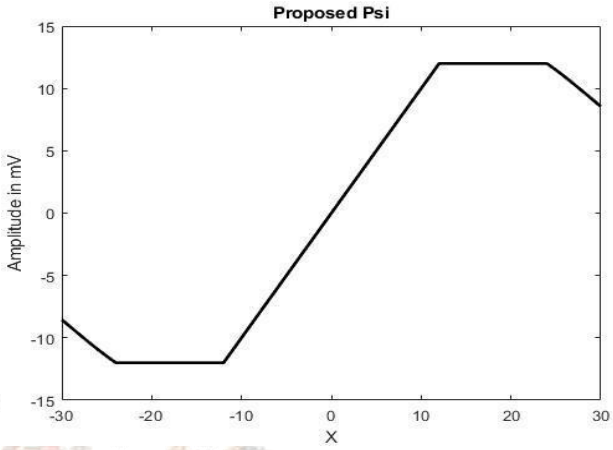
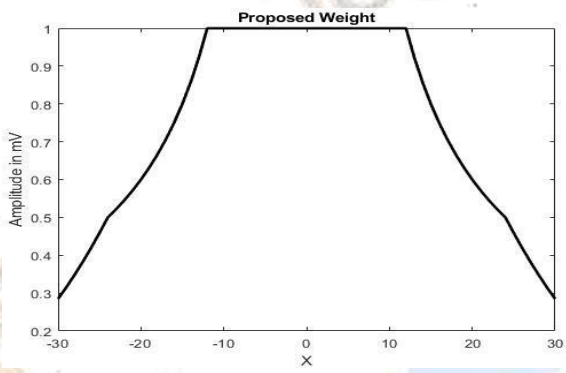


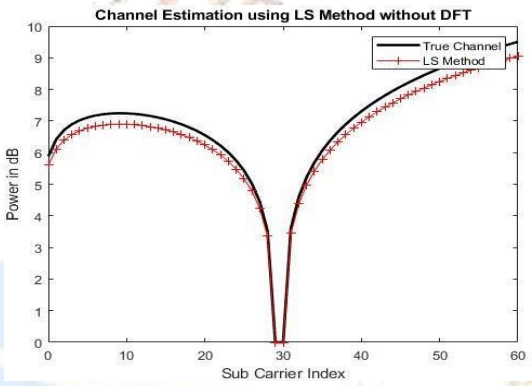
Fig.2 Block Diagram of Proposed Method

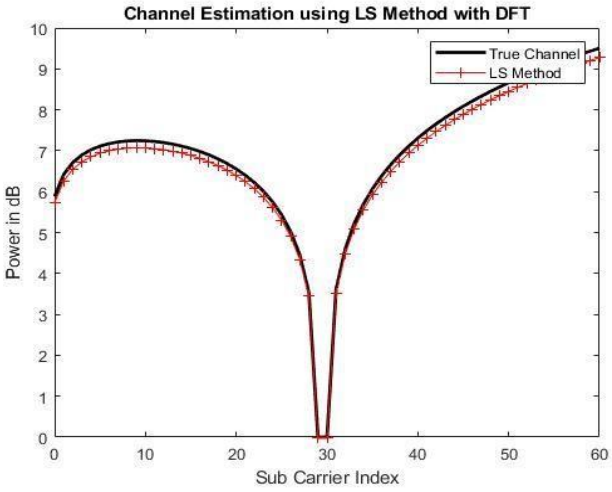
In simulations, channel estimation using LS and Proposed M-estimator (with and without DPT) based techniques are compared and shown in Fig. FFT size is 32 and pilot spacing is 4. For improving the performance of channel estimation technique a DFT-method is been developed by suppressing noise effect outside of the maximum channel delay which is shown in simulations. From the simulation results, an observation In is done on the proposed method for channel estimation (with and without DFT) as closely approximation of true channel in both the cases.

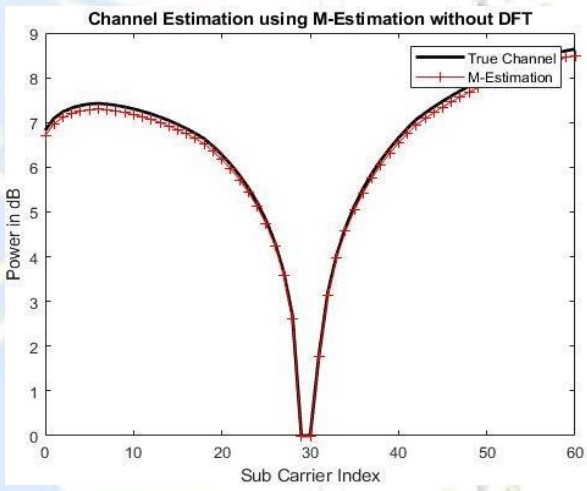

Proposed Rho
Amplitude in mV
X

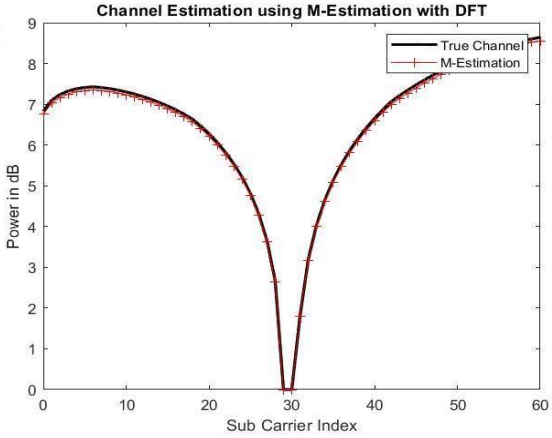

Proposed Psi
Amplitude in mV
X


Proposed Weight
Amplitude in mV
X


Channel Estimation using LS Method without DFT
True Channel
LS Method
Power in dB
Sub Carrier Index


Channel Estimation using LS Method with DFT
True Channel
LS Method
Power in dB
Sub Carrier Index


Channel Estimation using M-Estimation without DFT
True Channel
M-Estimation
Power in dB
Sub Carrier Index


Channel Estimation using M-Estimation with DFT
True Channel
M-Estimation
Power in dB
Sub Carrier Index

IV. CONCLUSION

Robust training symbol based channel estimation for 5G wireless communication systems using *M*-estimation is proposed and studied in this paper. An *M*-estimator is proposed and used for optimizing the channel estimation technique. Simulation results are also provided to support efficacy of the proposed study of channel estimation in 5G wireless communication systems with additive white Gaussian noise. From simulation results, it is concluded that the proposed technique closely approximates true channel estimation for 5G MIMO wireless communication system with and without DFT

IV. REFERENCES

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