SPEED ESTIMATION ALGORITHMS IN UPLINK FREQUENCY FOR MOBILE OFDM SYSTEMS

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ABSTRACT

The pace of User Equipment (UE) is remarkable in enhancing the performance of Orthogonal Frequency Division Multiplexing (OFDM) systems. Evaluating the haste can avail in assigning resources to users, reducing call drop rate in handoff, choosing the optimal radiation pattern, etc. In the subsisting system, the microcell is utilized. Most of the antecedent methods estimate speed on the UE side. However, it is obligatory for base station (BS) to ken UE speed when carries out such operations as adaptively choosing the optimal radiation pattern. Many algorithms have been proposed such as zero crossing rates (ZCR) algorithm and level crossing rates (LCR) algorithm where UE haste is estimated in uplink frequency domain on the base station (BS) side. Our incipiently proposed method can estimate UE speed on the BS side directly. In integration, UE speed is estimated in frequency domain instead of time domain in the proposed method, which has lower computational intricacy.

Key words: Optimal Radiation, Uplink Frequency, Speed Estimation

1. INTRODUCTION:

For High-speed railway mobile communications, if OFDM systems adopt the proposed simplified Doppler diversity, the time of signal processing can be reduced. The effect of interference from Doppler spread on OFDM is very small. Doppler spread levels the orthogonality between the sub-carriers resulting in inter-carrier interference (ICI). For this occurrence Doppler diversity can successfully reduce the side effect of the Doppler spread. The signal is converted from serial to parallel converter[2]. The receiver with smallest Doppler diversity, shifts the received signal by different frequency shifts and then combining FFT demodulation from all the branches with weighted coefficients. When the number of branches increase, the amount of linear calculation of the receiver will decreases. In High-speed mobile communications, the short-time consumed algorithm can track the change of channel. So the simplified Doppler diversity is more useful.

The Expediteous velocity adaptive handoff algorithms for microcellular systems able to provide consistent and excellent performance are presented and characterized 3 various velocity estimators are introduced and compared with reverence to their sensitivity to Rice factors and adaptive Gaussian noise and performance in a adaptive handoff algorithm[5]. For LOS handoffs, the mobile consistently, maintains an LOS with both the accommodating and alternate base stations. On the other hand, NLOS handoffs arise and accommodating base station and gains an LOS component from an alternate base station. This is called the corner effect.
Fast temporal-predicated handoff algorithms can moderately solve this quandary, where short temporal averaging windows are used to detect sudden drops in signal strength. The precision of local mean estimation in microcells depends on the Rice factor, the angle of the secular component, and the averaging length. For sample averaging sample spacing’s less than .5X should be utilized.[2]. All 3 velocity estimators are comparatively callous to the Rice factor under isotropic scattering. The LCR and COV velocity estimators are highly sensitive to non isotropic scattering, whereas the ZCR estimator is plausibly robust. Microcells cannot provide good signal level to the whole coverage area.

The timing synchronization algorithm for distributed MIMOOFDM system is proposed in this paper. An opportune MIMO preamble termed MCDSP is transmitted to avail the receiver to differentiate the non simultaneously reaching signals on each TA and evade the pseudo-peak caused by utilizing CDSP. At the receiver, after the cross correlation operation, ACSW is utilized to split the multi-path clusters of each TA and preamble sub-block. Then MPBS is employed to combat the interference[6]. Our simulation results demonstrate the proposed methods enhance the synchronization performance remarkably. The main drawback is utilizing of hardware components is more and its costs are more extravagant.

2. EXISTING SYSTEM:

2.1. Hybrid Estimator:

A hybrid Doppler spread estimation algorithm is proposed. It is based on auto correlation functions of the channel estimate, and composed of 2 steps. The first is to determine whether the Doppler spread is small or large[3]. The second step is to estimate the exact value of the maximum Doppler spread using either a curvature method (for small Doppler spread) or a first zero detection method (for large Doppler spread). The reason behind using a two step approach depends on the fact that the curvature estimator is accurate only at low speeds but cannot achieve enough accuracy at high speeds, and the first zero detection estimator is more suitable for high speeds than low speeds.

2.2. Curvature Estimator (Small Doppler Spread):

It requires the knowledge of autocorrelation functions Ry and the second derivative of autocorrelation functions at lag zero. Here Ry [0] can be estimated directly from the channel estimate, and Ry [1] [0] can be obtained by the polynomial fitting of Ry.

The Doppler spread can be calculated as

\[ f(\nu) = \frac{1}{2\pi} \sqrt{-2Ry''[0]} \]

2.3. First Zero Detection Estimator (large Doppler spread):

This estimator detects the 1\textsuperscript{st} zero crossing point of the autocorrelation functions, and relates this point with the Bessel function to estimate the maximum Doppler spread.

2.4. Frequency Domain Maximum Likelihood Estimator:

The basic idea is to use an estimated spectrum to approximate the shape of theoretical Jakes spectrum. Furthermore, the Whittle approximation is applied in the likelihood function to estimate the maximum Doppler spread. The result depends upon two factors. The First one is the shape of the estimated Doppler spectrum. The other factor is the resolution of frequency estimation, i.e, the interval between two hypothesis values of Doppler spread. It has highest computational complexity.
2.5. LCR Estimation with DANS Technique in Frequency Domain:

The proposed DANS (Doppler adaptive noise suppression) technique in frequency domain eliminates the upshot of additive noise remarkable. Especially, the proposed method shows the strongest performance over low SNR and non-isotropic scattering environments. In this paper, we analyzed the statistical properties of the received signals which contain unknown transmitted data, unknown frequency selective Rician fading coefficients, and additive white Gaussian noise. Predicated on the received signal’s statistics, we proposed a mobile speed estimation algorithm[3]. The incipient algorithm employed modified auto-covariance to first relegate “slow”, “medium” and “fast” mobiles, then estimate the maximum Doppler frequency and calculate the mobile haste. Extensive simulations have shown that our incipient algorithm Rician fading, frequency selective channel with rigorous multipath spread, and low signal-to-noise ratio scenario, etc. This method is computationally efficient, and it only needs simple arithmetic operations such as multiplications, integrations and subtractions. provides very reliable estimation results for broadband wireless communications over sundry fading channel conditions, which include Rician fading, frequency selective channel with astringent multipath spread, and low signal-to-noise ratio scenario, etc[2],[6]. This method is computationally efficient, and it only needs simple arithmetic operations such as multiplications, integrations and subtractions.

3. PROPOSED SYSTEM:

3.1. Level Crossing Rate:

LCR is defined as the average number of positive-going Crossings per second a signal makes of a pre-determined level. This method require the estimation of the channel response as input, thus the following assumption is applied. The pilot symbols in uplink DPCCH are used for the channel evaluation in the receiver. However, it is difficult to use the continuous pilot symbols with more than one slot length in the Doppler spread estimation since the pilot bits are not continuously, and only 3 to 8 pilot bits exist in each slot. Therefore the average received pilot symbols over one slot is used as one sample of channel response estimation, denoted by

Where Y_p are the pilot bits in each slot and N_p is the number of pilot symbols in one slot. Then the sampling period T_s for the channel impulse response estimation is equal to the slot length, T_s = 2.3 ms = 6.7×10^{-4} s. Moreover, assuming the obtained channel estimation is a block of N samples, i.e. y[0], y[1], and so on y[N −1]. And the value of maximum Doppler spread is assumed to be stable for these N samples.

3.2. Zero Crossing Rate:

ZCR is elucidate as the mean number of zero crossings, a signal makes per second. In the context of discrete-time signals, a ZCR is verbalized to occur if successive samples have different algebraic signs. The rate at which zero crossings happen is a easy measure of the frequency component of a signal. ZCR is a quantification of number of times in a given time interval/frame that the amplitude of the verbalization signals passes through a value of zero[4]. Verbalization signals are broadband signals and interpretation of average ZCR is ergo much less precise. However, uneven estimates of spectral properties can be obtained utilizing a representation predicated on the short time average zero-crossing rate.
The model for verbalization engenderment suggests that the energy of voiced verbalization is concentrated below about 3 kHz because of the spectrum fall of introduced by the glottal wave, whereas for unvoiced verbalization, most of the energy is found at higher frequencies. Since high frequencies implicatively insinuate high zero crossing rates, and low frequencies implicatively insinuate low zero-crossing rates, there is a vigorous correlation between zero-crossing rate and energy distribution with frequency. A plausible generalization is that if the zero-crossing rate is high, the verbalization signal is unvoiced, while if the zero-crossing rate is low, the verbalization signal is voiced.

4. SIMULATION RESULTS:

The Simulation results of our algorithms are presented table 1 describes the parameter of the simulation. We only utilize the signal received by the first receiver antenna and transmitted by the first transmitter antenna. We set N=50,000.

<table>
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<th>Parameters</th>
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<td>NLOS</td>
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<td>Carrier Frequency</td>
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<td>SNR</td>
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<td>SCME</td>
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Table: Simulation Layout Parameters

4.1. Method 1:

Simulation results of mean estimated speed of Method1 we shown in fig1. The dotted lines designate the results that the noise is not subtracted while calculating coefficients. It can be optically discerned that there is a quiet astronomically immense error in the estimated speed especially in the UE haste is low. In additament the estimation speed is precise when SNR is 20db because the influence of the noise debilitates with the incrementation of SNR. By subtracting the variance of noise as shown by solid lines, we can observe a considerable gain in the precision of speed estimation especially when the utilize equipment is low. The performance of Method1 is not copacetic.
4.2. Method 2:

The estimated speed is quite precise in the range of 0-350kmph. In different SNR’s in integration, estimation speed is fundamentally the same in different SNR’s. The Method 2 can eliminate the influence of noise efficaciously.

4.3. Method 3:

From Fig 3 we can see the relative errors of previous two methods. It can be observe that Method 2 is ostensibly higher than Method 1. The error for Method 1 is quite immensely colossal when the UE haste (speed) is high. For Method 2, the relative can be controlled fewer than 5% in the range of 0-350kmph in different SNR’s. The results prove that our incipiently proposed Method 2 can estimate UE speed accurately and it is less prone against noise.
V. CONCLUSION:

This project commonly deals with the UE speed evaluation in uplink frequency for LTE systems. Speed estimation algorithms Auto correlation Function, Zero Crossing Rate, Level Crossing Rate is proposed. UE speed is guessed on the base side by using the demodulation reference signal in the Uplink frequency domain. Simulation results have proved that the influence of noise is eliminated effectively and the estimated speed is measured in the range 0-350 kmph in different SNR's.

VI. REFERENCES:


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