

# Documents

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Novel hybrid asymmetry modulation scheme for fountain codes

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## Abstract

Fountain codes can be used to transmit information over different kinds of channels. The transmitter creates unlimited number of packets, once the receiver correctly receives enough packets, it can recover the original information. This property indicates that all the packets are with almost the same importance in recovering the original uncoded information. In this paper, we shall utilize this property and propose a novel hybrid BPSK/QPSK asymmetry modulation method for fountain codes, which can efficiently improve the system spectrum utilization, especially for relatively low SNR regime. The theoretical analysis on the symbol error rate and various simulation over AWGN channel has been given. It will show that when SNR is relatively low, it is necessary to adopt the hybrid BPSK/QPSK modulation scheme rather than regular QPSK and that there may exist some optimal constellations for hybrid BPSK/QPSK mode for different fountain coding parameter sets or transmission channel situations in practice. This result also provides some insight that when the channel is fading channel, hybrid modulation scheme may provide more performance gains since the system will have high probability falling in low SNR regime. © 2012 IEEE.

## Index Keywords

AWGN channel, BPSK/QPSK, Coding parameters, Fountain codes, High probability, Hybrid modulation, Low SNR, Modulation methods, Modulation schemes, Optimal constellations, Performance Gain, Spectrum utilization, Symbol error rate (SER), Transmission channels, UNCODED; Fading channels, Fountains, Information technology, Modulation; Quadrature phase shift keying

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## Optimal Degree Distribution for LT Codes with Small Message Length

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#### Abstract

Fountain codes, as a kind of rateless codes, can be used to transmit information over different kinds of channels. Among them, Luby Transformation (LT) codes are with relatively low complexity and suitable for real implementation. In this paper, we will investigate the performance by combing LT codes with different kinds of PSK modulation schemes in the presence of Doppler frequency shift. Simulations show that the selection of different PSK modulation schemes has certain impacts on the performance of LT codes for different signal to noise ratio, when transmitting over additive white Gaussian noise channels in high speed mobile environments. © 2012 Springer-Verlag GmbH.

#### Author Keywords

Doppler frequency shift; LT code; PSK modulation

#### Index Keywords

Additive white Gaussian noise channel, AWGN channel, Doppler frequency shift, Fountain codes, High speed mobile, Low complexity, LT codes, MPSK modulation, PSK modulation, Rateless codes; Codes (symbols), Information systems, Velocity measurement; Modulation

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#### Abstract

Fountain code is a kind of rateless code. The mechanism is that the transmitter creates unlimited number of packets, and once the receiver correctly receives enough packets, it can recover the original information. Thus, fountain code can be used to transmit information over different type of channels, especially erasure channels. Luby Transform (LT) code [2] is one type of the practical fountain codes. We proposed a novel hybrid BPSK/QPSK asymmetry modulation method with LT codes, which efficiently improves the system spectrum utilization, especially for relatively low Signal-to-noise ratio (SNR) regime, based on the almost

equal importance of all encoded packets. Also, we will analysis the performance of the said scheme here in Additional White Gaussian Noise (AWGN) channel with Doppler frequency shift. The simulation results indicate that the hybrid scheme has strong robustness against Doppler frequency shift.

#### Author Keywords

Asymmetry modulation; Doppler frequency shift; Hybrid modulation; LT code

#### Index Keywords

AWGN channel, BPSK/QPSK, Doppler frequency shift, Encoded packets, Erasure channels, Fountain codes, Hybrid modulation, Hybrid scheme, Low signal-to-noise ratio, LT code, LT codes, Modulation methods, Rateless codes, Spectrum utilization, White Gaussian Noise; Fountains, Velocity measurement, White noise; Modulation

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Improved ICI Mitigation Scheme over Time-varying Channels for High-Mobility OFDM Systems  
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### Abstract

In wireless communication systems, wireless transmission may suffer from different kinds of interferences including additive noise and fading, resulting in degradation of performance. Fountain codes, as a kind of rateless codes, can be used to transmit information over different kinds of unstable channels. By a special design of encoding and decoding algorithm, Luby Transformation (LT) codes, which are among one of the fountain codes, are with relatively low complexity and suitable for real implementation. In this paper, we try to investigate the performance by combing LT codes with different kinds of PSK modulation schemes in high speed mobile environments. Various simulations will show that the selection of different PSK modulation schemes has certain impacts on the performance of LT codes for different signal to noise ratio over additive white Gaussian noise channels with Doppler frequency shift. In addition, it is shown that combination of LT codes with BPSK modulation is better than other types of MPSK modulation schemes under a certain range of signal to noise ratio.

### Author Keywords

Doppler frequency shift; Fountain code; LT code; PSK modulation

### Index Keywords

Additive white Gaussian noise channel, BPSK modulation, Doppler frequency shift, Encoding and decoding, Fountain code, Fountain codes, High speed mobile, Low complexity, LT code, LT codes, MPSK modulation, Performance evaluation, PSK modulation, Rateless codes, Unstable channels, Wireless communication system, Wireless transmissions; Fountains, Global system for mobile communications, Modulation, Signal to noise ratio, Velocity measurement; Codes (symbols)

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#### Abstract

Fountain codes, as a kind of rateless codes, can be used to transmit information over any unstable channels. In wireless communications, the channels may suffer from different kinds of fading, which results in unpredictable performance in some scenarios. In this paper, we start to investigate the performance of fountain codes over wireless channels by taking its encoding mechanism into account. Here three different random encoding generators are considered. Some simulation results indicated that the selection of random encoding generators has a certain impact on the performance of LT codes for different signal-to-noise ratio over AWGN channels. Keywords: LT code, Fountain code, Pseudo-random Generator, code length. © 2010 IEEE.

#### Index Keywords

AWGN channel, Code length, Encoding mechanism, Fountain codes, LT codes, Pseudorandom generators, Rateless codes, Simulation result, Unstable channels, Wireless channel, Wireless communications; Encoding (symbols), Fountains, Mobile computing, Noise generators, Signal to noise ratio, Wireless telecommunication systems; Fading channels

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