

Novel Successive Beamforming Schemes for Multiple Antenna Systems

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BACKGROUND

A new trend in wireless communications is to use multiple transmit and receive antennas such as those found in MIMO wireless systems, to attain higher data rate, better signal quality, and superior system flexibility. Transmit beamforming has been widely adopted for wireless systems with multiple transmit antennas. For a block fading channel, the Grassmannian beamformer has been shown to provide the best performance for given amount of feedback. However, the original Grassmannian beamformer does not take the time domain correlation of the channel fading into consideration.

TECHNOLOGY DESCRIPTION

University researchers have developed a first order auto-regressive (AR1) dynamic fading model, separated into two new classes of beamforming algorithms that exploit the inter-frame correlations in the channel fading. First, an algorithm based on a standard predictive vector quantization (PVQ) approach, with the resulting PVQ beamformer accomplishing superior power delivery at the receiver. However, the error performance of the PVQ beamformer is not satisfactory at high SNRs, and it also has a high implementation complexity. To resolve these issues, researchers then developed a novel successive beamforming (SBF) algorithm. The new SBF scheme uses the knowledge of the previous fading blocks to aid the beamforming codebook design of the current fading block. The optimal codebook is constructed based on the successive partition of the surface of a spherical cap. The new SBF scheme accomplishes superior performance at both low and high SNRs. Furthermore, it also enjoys easy implementation. Through numerical simulations, researchers have demonstrated that the proposed PVQ beamformer and successive beamformer outperform several other previously proposed beamformers at various fading scenarios.

APPLICATIONS

This invention can be used for the existing and next generation wireless communication systems. It can be adopted for any wireless system with multiple transmit antennas. For example, it can be used for 3G wireless systems, or the residential WiFi or WiMax systems. Another major area of application is communication systems in the defense industry.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,150,433	04/03/2012	2006-073

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OTHER INFORMATION

CATEGORIZED AS

- » Communications
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