



OO/UC3M/34- ALGORITHMS FOR MIMO-OFDM WIRELESS COMMUNICATIONS

Communications Group of University Carlos III of Madrid has designed and implemented algorithms for the improvement of the performance of MIMO-OFDM systems. This technology is capable of providing high data rate wireless communications. The developed algorithms allow, on one side, the correction of the imperfections introduced by radio-frequency equipment and, on the other side, adaptation of the transmission to the channel characteristics.

Description and special features

MIMO-OFDM technology (Multiple Input Multiple Output –Orthogonal Frequency Division Multiplexing) combines the diversity and capacity of MIMO with the immunity to multipath of OFDM, resulting the ideal candidate for the provision of high speed wireless communications in harsh environments.

Communications Group has developed and implemented algorithms that optimize the use of this technology: on one hand, by correcting undesired effects introduced by radio-frequency systems, such as phase noise; on the other hand, adapting the transmitted signal to the channel, leading to a much higher spectral efficiency.

Phase noise, due to the non-ideality of oscillators, exists in every transmitting or receiving equipment, It is particularly damaging for OFDM systems due to the fact that it produces a loss of orthogonality between the subcarriers, one of the key features for the right functioning of this technology. The developed algorithms allow estimating and correcting this phase noise, thus avoiding its dangerous effects on the received signal.

Adaptive modulation is a technique that allows taking advantage of the capabilities of a transmission channel, choosing the modulation that permits the transmission of the highest amount of information, according to the channel state. In turn, knowledge of the channel in the transmitter is mandatory, and that is not always possible. For that reason, we have developed algorithms to adapt the MIMO-OFDM signal to the channel when the latter is not perfectly and instantaneously known, but only its statistics, and also procedures to convey the channel state information from the receiver (where it is usually estimated) to the transmitter.

The prototype that has been implemented allows us to verify the behavior of these algorithms in realistic situations.

Innovative aspects

The main difference between our algorithms and other existing ones is the degree of required channel knowledge. Many algorithms assume that the channel has been previously and ideally estimated. This is not possible in real systems, so our algorithms either correct jointly channel and phase noise effects or adapt the signal to the channel without its perfect previous knowledge.

Competitive advantages

This technology provides high speed wireless transmission so that it causes a cost reduction and/or improvement of the performance offered by mobile communications operators.

Technology Keywords

Mobile Communications; Signal Processing; MIMO, OFDM, phase noise, adaptive modulation

Contact Person: María Dolores García-Plaza

Phone: + 34 916249016

E-mail: comercializacion@pcf.uc3m.es