

# Coherent versus Non-Coherent Coded Cooperative Wireless Systems

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Tutorial

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**Abstract:**

An attractive technique of providing multiple independently faded replicas of the transmitted signal for the sake of achieving a beneficial diversity gain is to employ relaying, distributed space-time coding or some other cooperation-aided procedure, which is the subject of this overview. We may also interpret the benefits of decode-and-forward based relaying as receiving and then flawlessly regenerating and re-transmitting the original transmitted signal from a relay closer to the destination - provided of course that the relay succeeded in error-freely detecting the original transmitted signal.

This tutorial reviews the current state-of-the-art in cooperative communications and proposes a number of novel relaying and cooperation techniques. An important related issue is the availability or the absence of accurate channel information, which leads to the concept of coherent versus non-coherent detection both at the relays and at the destination.

Naturally, when using hard-decisions in the transmission chain, we discard valuable soft-information, which results in an eroded performance, albeit also reduces the complexity imposed. Hence the hard- versus soft-decoding performance trade-offs will also be explored in the course, along with the benefits of interleaved random space-time coding invoked for multi-source cooperation.

**Bio:**

Lajos Hanzo received his first-class Master degree in electronics in 1976, his PhD in 1983 and his Doctor of Sciences (DSc) degree in 2004. He is a Fellow of the Royal Academy of Engineering (FREng). He co-authored 20 IEEE Press - John Wiley books totalling in excess of 10 000 pages on mobile radio communications, published 1200+ research entries at IEEE Xplore, organized and chaired major IEEE conferences, and has been awarded a number of distinctions. Lajos is also an IEEE Distinguished Lecturer and a Fellow of both the IET and IEEE. He is the Editor-in-Chief of the IEEE Press. He has in excess of 12,000 Scholar Index citations. For further information on research in progress and associated publications please refer to <http://www-mobile.ecs.soton.ac.uk>;

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