



Prioritized Data Mapping to Recover High Usefulness Data for Improved Wireless Communications

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WARF: P100120US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a wireless communication system with the ability to map data bits to symbol bit positions according to error rates of those bit positions and data content.

Overview

Sophisticated wireless transceivers transmit digital data encoded into a physical signal such as a radio wave. The encoding process changes multiple bits making up a data unit into symbols that describe the physical parameters of the transmitted signal. Many different symbols together make up a “symbol constellation.” At the receiver, the symbols are decoded into the multibit data units by matching the physical parameters of the received signals to the discrete states of symbols in the constellation.

Communication systems are prone to errors when one or more of these symbols are decoded incorrectly at the receiver, leading to loss of information and performance. When data is being transmitted in a noisy environment, it may be impossible to distinguish among the parameters of many symbols in a large constellation. Methods to improve the decoding process include adjusting the transmitter to operate with a smaller constellation and reducing the effective rate of data transmission to provide redundant data transmission. Unfortunately, these methods must discard any symbol that cannot be correctly decoded, resulting in data corruption. A method to recover useful information from symbols decoded incorrectly is needed to improve performance in wireless communication systems.

The Invention

UW-Madison researchers have developed a wireless communication system with a physical transmitter that transmits symbols mapped to multiple bits under an encoding system that allows data in an incorrectly received symbol to be salvaged. This encoding system exploits predictable expectations in error rates of different bit positions of symbols to promote transmission of high usefulness data. By placing the high usefulness data preferentially in bit positions that have fewer errors, the likelihood that high usefulness data can be recovered even after symbol errors occur is increased. The system recovers data by harvesting a portion of the bits of erroneous symbols rather than discarding the bits.

The entire system consists of a transmitter, a prioritizer, an encoder and an interleaver. The wireless transmitter transmits the symbols. The prioritizer divides received multibit data units into categories of relatively high and low usefulness, and creates mixed multibit data units made up of high and low usefulness bits. The encoder maps the mixed multibit data units to symbols and provides the symbols to the transmitter for transmission. The interleaver and encoder work together to map high usefulness bits to positions within the symbols having lower data error rates.

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Applications

- Sophisticated wireless transceivers such as cell phones and computers



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- Delivery of high quality media in wireless environments such as video streams
- Unicast and multicast communication systems for media delivery

Key Benefits

- Transmits high usefulness data in data unit positions less prone to errors by intermixing data units before transmission
- Increases the probability of correctly decoding high-priority data bits, often without retransmission
- Improves quality of wireless communications

Stage of Development

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Additional Information

For More Information About the Inventors

- [Suman Banerjee](#)

Tech Fields

- [Information Technology : Networking & telecommunications](#)

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842

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