High-Throughput Communication System

Tech ID: 27292 / UC Case 2016-393-0

SUMMARY

UCLA researchers have developed a set of source and operation codes for high-throughput (100 Gbps) communication system to approach channel capacity. This technique is unique in that it does not use reverse transmission confirming or denying message reception is provided which saves decoder computational power and improves efficiency especially at/near capacity.

BACKGROUND

There is a growing demand for data drives and better performance over difficult (noisy) channels. Throughput (digital bandwidth consumption) is the rate of production, or the rate at which something can be processed (the rate of successful message delivery over a communication channel). Maximum theoretical throughput is closely related to the channel capacity of the system, specifically the maximum possible quantity of data that can be transmitted under ideal circumstances. Systems constrained to hard decoding use more resources and have limited capabilities at/near capacity. This invention is a new method for short block communication without feedback that allows for improved performance and efficiency of high-throughput communication.

INNOVATION

- Set of source and operation codes using short-block length convolutional codes
- Ideal block-length to maximize throughput, while maintaining an acceptable error rate and signal to noise ratio.
- Intended for high throughput applications (100+ Gbps communication)
- Incremental redundancy without feedback is modeled after Gaussian approximation and used in place of ACK or NACK messages (signals for successful or unsuccessful data reception).
- Low-density parity-check (LDPC) code (linear error correcting code) is used as the method of transmitting a message over a noisy transmission channel
- Represents an alternative to current hard-decoding. This tech allows higher duty cycles, closer to capacity while meeting frame rate error requirements for communication.

APPLICATIONS

High throughput communication applications (100+ Gbps)

ADVANTAGES

- Short-block length convolutional codes
- No reverse transmission confirming or denying message reception is provided
- Saves decoder computational power and efficiency
- Allows higher duty cycles, closer to capacity while meeting frame rate error requirements for communication

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,374,759	08/06/2019	2016-393
United States Of America	Issued Patent	9,998,260	06/12/2018	2016-393

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

High-Throughput Communication System, Short-block length, convolutional codes, error control coding, low-density parity-check codes, source coding with side information, incremental redundancy, fountain codes, communication system

CATEGORIZED AS

- **Communications**
  - Networking

RELATED CASES

2016-393-0

▶ Lou, Chung-Yu, Babak Daneshrad, and Richard D. Wesel. "Convolutional-code-specific crc code design." IEEE Transactions on Communications 63.10 (2015): 3459-3470.

▶ Williamson, Adam R., Tsung-Yi Chen, and Richard D. Wesel. "Variable-length convolutional coding for short blocklengths with decision feedback." IEEE Transactions on Communications 63.7 (2015): 2389-2403.

▶ Chen, Tsung-Yi, et al. "Protograph-based raptor-like LDPC codes." IEEE Transactions on Communications 63.5 (2015): 1522-1532.

▶ Williamson, Adam R., Matthew J. Marshall, and Richard D. Wesel. "Reliability-output decoding of tail-biting convolutional codes." IEEE Transactions on Communications 62.6 (2014): 1768-1778.

▶ Williamson, Adam R., Tsung-Yi Chen, and Richard D. Wesel. "Reliability-based error detection for feedback communication with low latency." Information Theory Proceedings (ISIT), 2013 IEEE International Symposium on. IEEE, 2013.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Lower-Complexity Layered Belief Propagation Decoding Ldpc Codes

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