A-posteriori Probability Decoding of Variable-Length Codes Using a Three-Dimensional Trellis Representation

Jörg Kliewer and Ragnar Thobaben

Institute for Circuit and System Theory, Christian-Albrechts-University, Kaiserstr. 2, D-24143 Kiel, Germany, {jkl, rat}@tf.uni-kiel.de

ABSTRACT

In this contribution we present an improved indexbased a-posteriori probability (APP) decoding approach for variable-length encoded packetized data, where implicit residual source correlation is exploited for error protection. The proposed algorithm is based on a novel generalized two-dimensional state representation which leads to a three-dimensional trellis with unique state transitions. APP decoding on this trellis is realized by employing a two-dimensional version of the classical BCJR algorithm. This new method has the advantage that due to the unique state representation all available a-priori information can be fully exploited, which especially holds for the transition probabilities of the Markov model associated with the variable-length encoded source indices. Simulation results for an additional error protection by channel codes and iterative joint source-channel decoding show that the proposed approach leads to an increased errorcorrection performance compared to previously published results where a one-dimensional state representation is used.