ABSTRACT

Unequal Error Protection using Convolutional Codes

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The rapid increase in the volume of data with varied reliability requirement, for example digitally encoded speech, has created a need for coding schemes that can provide different levels of protection. Traditional schemes use either a combination of codes with different error correction capabilities, or a single error-control code that can meet the highest reliability requirement of the system. The ideal solution for less complexity and more flexibility is to use a single error-control code to provide unequal error protection (UEP). Of the two major categories of error-control codes, in the last decade, coding emphasis has been in the area of convolutional rather than block codes. This is due in part to the fact that convolutional codes outperform block codes when similar implementation complexity of the encoding, and decoding operations is involved. Hence, in this thesis, UEP on a binary source using convolutional codes is investigated, and two UEP coding schemes involving convolutional codes will be presented.

Both schemes will demonstrate the inherent UEP nature of punctured convolutional codes. The first of these schemes is based on utilising the inherent

UEP capability within the columns of the puncturing matrix, without a reduction in information throughput. The second scheme reduces the effective code rate of a punctured convolutional code created from an original rate 1/n code. It is shown that the performance of a simple rate 1/2, constraint length K=3 code, when transformed to an effective rate 1/3 code, provides an increased coding gain.