

UNIVERSITY OF THE WITWATERSRAND

Abstract

Engineering and the Built Environment
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Analysis of Bounded Distance Decoding of Reed Solomon Codes

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Bounded distance decoding of Reed Solomon (RS) codes involves finding a unique codeword if there is at least one codeword within the given distance. A corrupted message having errors that is less than or equal to half the minimum distance corresponds to a unique codeword, and therefore will decode errors correctly using the minimum distance decoder. However, increasing the decoding radius to be slightly higher than half of the minimum distance may result in multiple codewords within the Hamming sphere. The list decoding and syndrome extension methods provide a maximum error correcting capability whereby the radius of the Hamming ball can be extended for low rate RS codes. In this research, we study the probability of having unique codewords for $(7, k)$ RS codes when the decoding radius is increased from the error correcting capability t to $t + 1$. Simulation results show a significant effect of the code rates on the probability of having unique codewords. It also shows that the probability of having unique codeword for low rate codes is close to one.