Optimal Arithmetic Coding for Monotone Sources

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Abstract
Following work by Ryabko on the redundancy of the optimal code for the class $\Sigma$ of monotone sources, it is shown how these results apply to arithmetic coding. The optimal probability distribution for coding an unknown monotone source is given. It follows naturally from the expression of the redundancy for the class of monotone sources given by Ryabko. This result is extended to give the optimal probability distribution for coding a partially known monotone source. The new result allows a hybrid coding approach, where one estimates some probabilities by frequency count while relying on the monotone character of the source for the remaining probabilities. It allows to improve the performance of the code compared to the case for an unknown monotone source, while still reducing the complexity compared to a full estimate of the probability distribution.