

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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DESIGNING OPTIMUM SOLUTIONS FOR LOSSLESS DATA COMPRESSION IN SPACE

Abstract

The standard solutions currently available for lossless data compression have difficulties in fulfilling the tight requirements of modern space missions. High compression ratios are often needed and the available processing power is usually small. Adaptive algorithms requiring large amounts of data for their optimum operation cannot be used in most cases, due not only to their high processing requirements but also to the limited reliability of the communications channel. We describe a method for pushing the information theory to its limit while guaranteeing a reliable downlink, achieving high compression ratios at a low processing cost. This is done using a two-stage compressor, namely, an adequate pre-processing stage followed by a new noise-resilient entropy coder. While the pre-processor should be tailored for each case, we have developed a new universal entropy coder, PEC, which offers a robust operation in front of noisy data. This coder has comparable or even better performances than those offered by the current CCSDS standard, and it also guarantees a better performance in case of data degradation. Finally, we present the results of this technique applied to the case of the Gaia mission.