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Lossless Compression of High-volume Numerical Data from Simulations

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Abstract

Applications in scientific computing operate with high-volume numerical data and the occupied space should be reduced. Traditional compression algorithms cannot provide sufficient compression ratio for such kinds of data. We propose a lossless algorithm of delta-compression (a variant of predictive coding) that packs the higher-order differences between adjacent data elements. The algorithm takes into account varying domain (typically, time) steps. The algorithm is simple, it has high performance and delivers a high compression ratio for smoothly changing data. Both lossless and lossy variants of the algorithm can be used. The algorithm has been successfully applied to the output from a simulation application that uses a solver of ordinary differential equations.

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