NASA TECH BRIEF

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Improved First Order Interpolator

The conventional data compression method described in the literature (L.W. Gardenhire, "Redundancy Reduction, the Key to Adaptive Telemetry," National Telemetry Conference, 1964; J. A. Bryan and J. W. Stumpe, "The Data Management Analyzer, A Laboratory Tool for Data Compression Analysis," International Space Electronics Symposium, 1965) requires the calculation of three slopes (a data slope, S, and upper and lower boundary slopes, U, L) for each data sample or point. The maximum rate at which samples can be accepted for processing using the conventional algorithm is limited by the relatively long times required for the calculations which entail three divisions, or multiplications, if a table lookup is used, for each data point. Although the multiplication time can be reduced by a special multiplier, its use would also increase the hardware weight and cost.

An improved method, without the use of additional hardware, has been devised to enable a first order interpolator to operate at higher speeds. The data-slope between the original data point and each successive data point is calculated as in the conventional algorithm. The upper and lower boundary slopes (U and L) are then calculated by adding and subtracting a constant from the data slope. This constant is obtained from a table lookup unit (which may be in the same memory as the other constants). The same number of additions or subtractions is needed in either the conventional or improved method, but the latter requires only one multiplication rather than three multiplications as in the conventional method.

Note:

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