NASA TECH BRIEF
Manned Spacecraft Center

Third Order Digital-To-Analog Converter

A digital-to-analog converter system, utilizing third order interpolation between sample points, improves the accuracy of the reconstructed analog signal without increasing sample rates.

The converter system consists of a sample and hold digital-to-analog converter, a clock circuit, a sample delay circuit, an initial condition circuit, and an interpolator circuit. The sample and hold digital-to-analog converter changes the pulse code modulated telemetry signal to a pulse amplitude modulated signal. The output of the converter feeds the sample delay circuit, which stores the four most recent data points. The data points are inputs for the initial condition circuitry, which calculates the coefficients of a third order polynominal equation. An additional circuit interpolates between two data points. As the initial condition circuit receives a new data point, it drops the oldest point and computes new coefficients for the interpolator. The interpolator output is a smooth (piecewise) continuous signal.

An analog computer simulation of the third order digital-to-analog converter showed, that for normalized sampling frequencies above five samples per cycle, a converter which uses third order interpolation provides the same results as a conventional sample and hold digital-to-analog converter with twice the normalized sample rate. Incorporating a third order interpolator into a digital-to-analog converter will provide better accuracy or will permit lower sampling rates to be used with a commensurate saving in system bandwidth.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Reference: TSP72-10030

Patent status:

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