



ETSI EFR-GSM Speech Coder

SIGNALS+SOFTWARE



Processor

Texas Instruments TMS320C6000 DSP range.

Background

The algorithms implemented are the ETSI Enhanced Full-Rate (EFR) GSM audio processing functions, including transcoding, discontinuous transmission and error concealment. The encoder compresses linear speech input data, at a sample rate of 8kHz, to a data rate of 12 200 bps.

The EFR-GSM algorithm uses silence compression or discontinuous transmission to reduce the transmitted bit rate during the silent intervals of speech. Voice Activity Detection (VAD) and Comfort Noise Generation (CNG) algorithms are used to enable the transmission of Silence Descriptor (SID) frames during the periods of silence. This provides the additional advantage of using lower processing loads and DSP bandwidth resource during silence intervals.

Features and Performance

- TI eXpressDSP™ Compliant software available
- 12 channels of EFR-GSM on 200MHz device
- Less than 98Kbytes data memory required for 12 channels of EFR-GSM (including buffers and stack)
- Integrated solution with AMR-GSM and IS-641-A functionality will be available
- Passes all test vectors

EFR-GSM	Program Memory		Data Memory			Interrupt Latency (Cycles)	Typical call Period (ms)	Processing Load (MHz)
	Code (Kbytes)	Tables (Kbytes)	Static Memory		Stack Memory (Kbytes)			
			Heap (Kbytes)	Tables (Kbytes)				
Encoder	61.00	0.052	n * 3.36	10.89	6.07	74260	20	n * 14.00
Decoder	30.58	0.052	n * 1.56	9.73	0.98	17360	20	n * 1.92
Encoder + Decoder	84.75	0.052	n * 4.92	11.21	6.07	74260	20	n * 15.92

Table 1 : DSP Requirements for EFR-GSM

Note: Processing loads quote worst-case scenarios with n representing the number of channels. Program memory table values are initialisation values. Kbytes equals 1024 bytes.

Technical Notes

The software is written using only fixed-point instructions and is compatible with both the TMS320C6000 fixed-point family and the TMS320C6700 floating-point family. It is supplied in both big-endian and little-endian variants.

The EFR-GSM encoding scheme uses Algebraic Code Excited Linear Prediction Coder (ACELP). An excitation signal at the input of a short term linear predictor synthesis filter is constructed by adding two excitation vectors from adaptive and fixed codebooks.

Interface Details

The eXpressDSP™ EFR-GSM software uses an interface defined by **SIGNALS+SOFTWARE** that is similar to the other vocoder interfaces specified by Texas Instruments in the eXpressDSP™ developer's kit.

The software is also available in a non-eXpressDSP version with a basic multi-channel interface. The DSP requirements for this version are similar to those given in Table 1.

Availability

The code is available now, for a one-off payment and/or royalties depending on the commercial application.

Software for the TMS320C6000 is available for a range of GSM vocoders including AMR-GSM, FR-GSM, and for other communication algorithms.

SIGNALS+SOFTWARE

SIGNALS+SOFTWARE was founded in 1992 as a developer of high quality Digital Signal Processing application software for the communications industry. Supplying to a whole range of customers, including large blue chip corporations, **SIGNALS+SOFTWARE** has quickly established itself as the world leader in DSP software design and production.

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