



Processor

Motorola DSP56300 range.

Background

The algorithm implemented is the ETSI Enhanced Full-Rate (EFR) GSM recommendation, digital mobile telephone system. The encoder compresses linear-PCM (Pulse Code Modulated), speech input data, at a sample rate of 8kHz, to 12 200 bps. The encoder input originates from either a Mobile Station or a converted Public Switched Telephone Network (PSTN). The decoder input arrives via a channel coding function as defined by GSM 05.03. This adds additional flags and bad frame indicators. The speech decoder converts the data back to 160 speech samples of 16-bit uniform format.

The EFR-GSM algorithm implements silence compression techniques to reduce the transmitted bit rate during the silent intervals of speech. Systems allowing discontinuous transmission (DTX) are based on Voice Activity Detection (VAD) algorithms and Comfort Noise Generator (CNG) algorithms that allows the insertion of Silence Insertion Descriptor (SID) frames during the silence intervals. This also provides the additional advantage of using lower processing loads and DSP bandwidth resource during silence frames

Features and Performance

- Passes all ETSI EFR-GSM test vectors
- Less than 21K data memory required for 5 channels of EFR-GSM
- EFR is also available integrated with AMR-GSM and IS641A

FR GSM	Program Memory		X Data Memory		Y Data Memory		Processing Load (MHz)
	Code (Kwords)	Tables (Kwords)	Variables (Kwords)	Tables (Kwords)	Variables (Kwords)	Tables (Kwords)	
Encoder	6.5	4.19	$2.05+n*1.11$	0.51	$0.57+n*0.76$	4.47	$n* 16.33$
Decoder	2.67	4.24	$0.49+n*0.58$	0.4	$0.57+n*0.15$	3.84	$n* 1.72$
Encoder + Decoder	8.64	5.02	$2.05+n*1.69$	0.55	$0.57+n*0.91$	4.47	$n*18.05$

Table 1 : DSP Requirements for EFR-GSM

Note: Processing loads quote worst-case scenarios and n represents the number of channels.
Program memory table values are initialisation values. 1 word equals 24 bits. Kwords equals 1024 words.

Technical Notes

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

Interface Details

For convenience the individual software functions are supplied as a single library module. The library contains all the object code that is required to link in to a user's top-level application code.

Availability

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

Also available for DSP56300™ are a full range of vocoders including AMR-GSM, HR-GSM, FR-GSM as well as other communication algorithms.

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