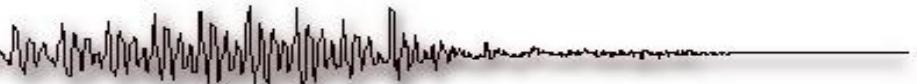# MELPe Vocoder - Software Suite for TI's c54xx, c55xx, and OMAP's DSP.

Real-Time Implementation of the MELPe U.S. and NATO standard vocoder (MIL-STD-3005, NATO STANAG 4591)

Compandent's MELPe suite is a hand optimized real-time implementation of the 2400/1200/600 bps MELPe vocoder, U.S. and NATO standard vocoder (MIL-STD-3005, STANAG 4591), running on Texas Instruments' TMS320c54xx , TMS320c55xx, and OMAP's DSP. The suite is versatile, easy and convenient to operate and integrate. Compandent MELPe suite provides complete state-of-the art low-rate voice communications.

Background

MELPe- Enhance Mixed-Excitation Linear Predictive (MELP) vocoder, known as military standard MIL-STD-3005 and NATO STANAG 4591, is a dual-rate low rate coder that operates at 2400, 1200 and 600 bps. Its quality surpasses that of the old MELP vocoder. The Compandent's MELPe vocoder suite includes also compressed bit-stream transcoding between the two rates, and optional Noise Pre-Processor (NPP).

Operation

Compandent Inc. has participated in the research, development and implementation of the Enhanced Mixed-Excitation Linear Predictive (MELPe) vocoder. Compandent provides support as well as software and hardware related to the MELPe vocoder. Compandent is the only company that both participated in the MELPe R&D, and also provides related products, services, and support.

Compandent has been supporting and improving the MELPe real-time implementation. Compandent has ported MELPe to various DSPs by Texas Instruments such as TMS320c54xx, TMS320c55xx, and OMAP.

Tables

Table 1 and 2 illustrate Compandent's MELPe MIPS and memory requirements, respectively.

Available features:

The MELPe software suite includes the following features:

- Hand optimized Assembly real-time implementation of all algorithm components
- C-callable high-level functions
- Multi-channel per DSP
- Optional components available (customer can select desired combination):
  - MELPe at 2400 bps - high rate encoder and/or decoder
  - MELPe at 1200 bps - mid rate encoder and/or decoder
  - MELPe at 600 bps - low rate encoder and/or decoder
  - compressed bit-stream transcoding between the two rates
  - noise pre-processor - for reducing background noise
  - postfilter - for quality enhancement of the reproduced speech
- Example of main C program that initializes and runs the MELPe vocoder functions
- "Packetized-Network-Ready" - to maintain high quality even in severe FER conditions
- Operation mode can be switched on the fly (no need to reload the program to the DSP)
- Easy and fast Test Vectors running and verification setup
- Comprehensive and detailed documentation that allows for smooth and easy integration
- Compandent support and service
- Very low-cost ($395) complete DSP development board and tools (CCS) on which Compandent's MELPe may run.
- Comprehensive and spectacular Real-Time demo, using DIP-switch control and LEDs indicators
- User friendly for simple integration.

Process\Rate	2400 bps	1200 bps	600 bps
NPP+ Encoder	44	50	47
Encoder	21	30	24
Decoder	15	14	15
Transcoder	15	15	15

Table. 1: Compandent's *MELPe* MIPS
(NPP=Noise-Preprocessor)

Algorithm \ Memory	Data (Vars.)	Data (Table)	Program
2400/1200/600 Full Duplex + NPP	15.7K	80.2K	31.7K
2400/1200 Full Duplex +NPP	14.4K	41.9K	24.8K
2400 bps Full Duplex + NPP	12.6K	8.9K	14.5K
2400 bps Full Duplex	4.4K	8.6K	5.7K
2400/1200 Decoders	7.0K	40.5K	9.6K
2400 bps Decoder	3.0K	7.7K	6.2K

Table. 2: Compandent's *MELPe memory requirements in 16-bit words (NPP=Noise-Preprocessor)*

Please note: Compandent owns **intellectual property** (IP) in the official (standard's) MELPe implementation, and any of its derivatives. Any party intending to develop commercial products based on MELPe should contact Compandent as well as other IP holders regarding licensing.