

TWELP™ 600 bps Vocoder



[TWELP vocoders](#), [TWELP 600 bps](#), [TWELP 1200 bps](#), [TWELP 2400 bps](#), [TWELP Robust 3600 bps](#)

January 15, 2014 - DSP Innovations Inc. (DSPINI) announces proprietary 600 bps vocoder, based on the newest speech coding technology TWELP™, for HF Radio, DMR/dPMR and other markets.

TWELP™ technology features. The vocoder is based on newest technology of speech coding called "Tri-Wave Excited Linear Prediction"™ (TWELP) that was developed by experts of DSPINI. The technology provides the best speech quality among competitors today. Please visit: <http://twelp.pro> for details.

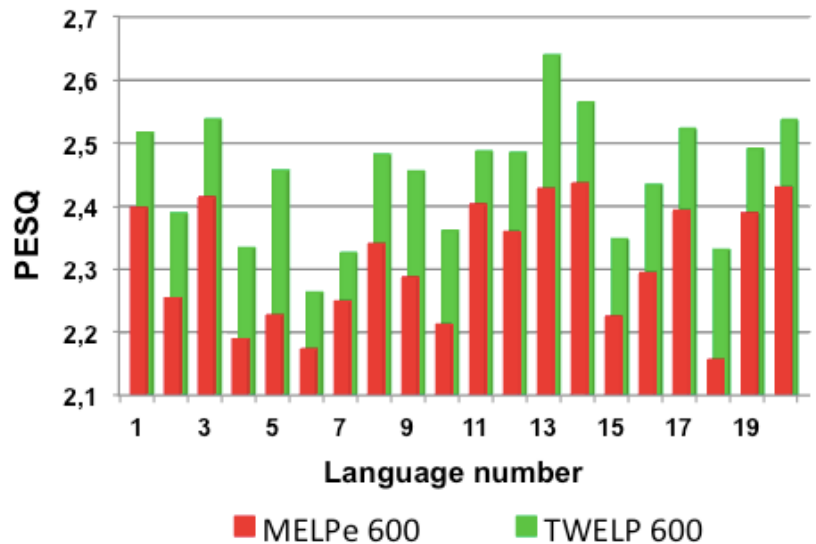
Superiority in speech quality. Here is the comparison with MELPe vocoder. TWELP 600 bps vocoder and MELPe 600 bps vocoder were tested, using ITU-T P.50 speech base for 20 different languages. ITU-T P.862 utility was used for estimation of the speech quality in PESQ terms:

Data for the chart: speech quality (in PESQ)

	MELPe	TWELP
1 American	2,397	2,517
2 Arabic	2,254	2,389
3 British	2,414	2,538
4 Chinese	2,189	2,334
5 Danish	2,227	2,457
6 Dutch	2,173	2,263
7 Finnish	2,249	2,326
8 French	2,34	2,482
9 German	2,287	2,455
10 Greek	2,212	2,361
11 Hindi	2,403	2,487
12 Hungarian	2,359	2,485
13 Italian	2,428	2,64
14 Japanese	2,436	2,565
15 Norwegian	2,225	2,348
16 Polish	2,294	2,434
17 Portuguese	2,393	2,523
18 Russian	2,156	2,331
19 Spanish	2,389	2,491
20 Swedish	2,43	2,537
Average:	2,31275	2,44815
TWELP advantage over MELPe:		+0,1354

Speech Quality Comparison

TWELP 600 vs MELPe 600



A diagram demonstrates significant superiority of TWELP over MELPe in speech quality.

A few independent experts tested by listening TWELP 600 vocoder in comparison with MELPe 600 vocoder, using method of preferences. Absolute majority of experts preferred TWELP to MELPe, having noted much more intelligibility as well as more natural human-sounding of voice in the TWELP vocoder.

Superiority in quality of the non-speech signals. In contrast to other LBR vocoders (MELPe, AMBE+2, etc.), TWELP vocoders provide high quality of non-speech signals, including police, ambulance, fire sirens, etc. This feature in conjunction with high quality natural human-sounding of voice makes TWELP vocoders well suitable for replacement of analog radio by digital radio and also for other applications where high quality transmitting of non-speech signals is relevant along with high quality transmitting of speech signals.

High robustness to acoustic noise. In contrast to other LBR vocoders, TWELP vocoders are well robust to acoustic noise thanks to robust reliable method of pitch estimation and other features of TWELP technology.

High Robustness to the channel errors. "Robust" versions of the TWELP vocoders include FEC that are integrated with vocoder on base of "joint source-channel coding" approach that provides high speech quality simultaneously in noisy channel as well as in noiseless channel. FEC can operate with "soft decisions" as well

as with "hard decisions" from a modem. Mode of "soft decisions" provides much better robustness in comparison with mode of "hard decisions".

Additional functionalities. The following additional functionalities are developed by DSPINI and integrated into TWELP vocoders:

- Automatic Gain Control (AGC),
- Noise Cancellation for Speech Enhancement (NCSE)
- Voice Activity Detector (VAD),
- Tone Detection/Generation (Single tones and Dual tones). The tones are transmitted through vocoder.

Technical characteristics and resource requirements:

Technical characteristics

Bit Rate (bps)	Algorithm	Frame size (ms)	Algorithmic delay (including frame size) (ms)	Sampling rate (kHz)	Signal format	Bit stream format
600	TWELP	80	100	8	Linear 16-bit PCM	48

Additional functionalities

Name	Functionality	Technical characteristics	
		Name	Value
AGC	Automatic Gain Control	Control range:	0 ... +20 dB
NCSE	Noise Canceller - Speech Enhancer	SNR increasing	> 6 dB
		Speech quality improvement	> 0.1 PESQ
Tone Detector	Single/Dual tones detection	In accordance with international standards	
Tone Generator	Single/Dual tones generation	Special generator, kept continuity of signal (phase and amplitude of signal of previous frame)	
VAD	Voice Activity Detection	Reliable detection speech in background noise	
CNG	Comfort Noise Generation	Type of noise	"white"
		Level	- 60 dB

Resources for TI's C64 DSP platform

Module	MIPS* peak	Memory (KBytes)			
		Program	Data		
			Constants	Channel	Heap
Voice Encoder	36				
NCSE	3.7				

AGC	0.1	338	155	11.8	8.0	1.0
Voice Decoder	5.6					
Voice Encoder + Voice Decoder	41.6					
Total	45.4					

Resources (estimated) for TI's C55 DSP platform

Module	MIPS* peak	Memory (KBytes)				
		Program	Data			
			Constants	Channel	Heap	Stack
Voice Encoder	50	21	155	11.8	8.0	1.0
NCSE	6.9					
AGC	0.2					
Voice Decoder	10.0					
Voice Encoder + Voice Decoder	60					
Total	67.1					

* DSPINI continues optimization of the TWELP algorithm and code in order to minimize computational complexity of the vocoder.

Guarantee and support. DSPINI guarantees a quality and accordance of all technical characteristics of the product to requirement of current specifications. Testing and other method of quality control are used for guarantee support.

Any platform. DSPINI can port this vocoder software into any other DSP, RISC or general- purposes platform inshort time: 2-3 months.

Licensing terms. To use the vocoder, customer should obtain a license from DSPINI only.

Low price is another advantage of this vocoder. Please contact us to check it out.

Prospects. DSPINI are developing a set of new vocoders with range from 600 bps up to 9600 bps, based on TWELP technology. Please visit the <http://twelp.pro> web-site to get more information.

Related software. This vocoder may be effectively used in a bundle with other DSPINI's products:

- Linear and acoustic echo cancellers,
- Multichannel noise cancellers (including two-microphone adaptive array),
- Wired or radiomodems for any types of channels and bitrates,
- Other products.

More DSPINI's products on <http://www.dspini.com>

Please contact to evaluate and purchase:

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