Summary

The dsPIC30F Noise Suppression (NS) Library provides a function to suppress the effect of noise interfering with a speech signal. This function is useful for microphone-based applications, which have a potential for incoming speech getting corrupted by ambient noise captured by the microphone. It is especially suitable for systems in which an acoustically isolated noise reference is not available, such as:

- Hands-free Cell Phone Kits
- Speakerphones
- Intercoms
- Teleconferencing Systems
- Headsets
- As a front-end to a Speech Recognition system
- Any microphone-based application that needs to eliminate undesired noise

Description

The Noise Suppression Library is written entirely in assembly language and is highly optimized to make extensive use of the dsPIC3OF DSP instruction set and advanced addressing modes. The algorithm avoids data overflow. The Noise Suppression Library provides a "NoiseSuppressionInit" function for initializing the various data structures required by the algorithm and a "NoiseSuppression" function to remove noise from a 10ms block of sampled 16-bit speech data. The user can easily call both functions through a well-documented Application Programmer's Interface (API).

The "NoiseSuppression" function is primarily a Frequency Domain algorithm. A Fast Fourier Transform (FFT) is performed on each 10ms block of data to analyze the frequency components of the signal. Thereafter, a Voice Activity Detection (VAD) algorithm is used to determine if the signal segment is speech or noise. The NS algorithm maintains a profile of the noise, and updates it every time a noise segment is detected by the VAD. Every frequency band of the input signal is then scaled according to the proportion of noise contained in that frequency band, thereby causing a significant degree of noise suppression in the resultant signal. The algorithm, thus, adapts to changes in the nature and level of noise, and does not require a separate noise reference input.

Features

Key feature of the Noise Suppression Library include:

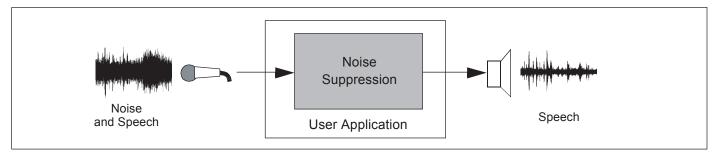
- Only 2 user functions ("NoiseSuppressionInit" and "NoiseSuppression"), both of which can be called from either a C or assembly application program
- Full compliance with the Microchip dsPIC30F C30 Compiler, Assembler and Linker
- Simple user interface just one library file and one header file
- Highly optimized assembly code, utilizing DSP instructions and advanced addressing modes
- Audio Bandwidth: 0-4 kHz at 8 kHz sampling rate
- 10-20 dB noise reduction, depending on type of noise
- Several speech recordings corrupted by Babble, Car Cabin, White and Narrowband Noise included for library evaluation
- dsPIC30F Noise Suppression Library User's Guide is provided to help the user understand and use the library
- Demo application source code is provided with the library
- Accessory Kit available for purchase includes: an audio cable, headset, oscillators, microphone, speaker, DB9 M/F RS-232 cable, DB9M-DB9M Null Modem Adapter and can be used for library evaluation
- Contact Microchip sales for FREE evaluation samples

Resource Requirements

Computational Requirements: 3.3 MIPS Program Flash Memory: 5 KB RAM: 1 KB

Devices Supported

dsPIC30F6014 dsPIC30F6012 dsPIC30F5013 dsPIC30F5011 dsPIC30F4013





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Host System Requirements (For programming and debugging using MPLAB IDE)

- PC-compatible system with an Intel Pentium[®] class or higher processor, or equivalent
- A minimum of 16 MB RAM
- A minimum of 40 MB available hard drive space
- Microsoft Windows[®] 98, Windows 2000 or Windows XP

Part Numbers and Ordering Information:

dsPIC30F Noise Suppression Library		
Part Number	Description	Availability
SW300040-5K	dsPIC30F Noise Suppression Library Software License (Up to 5K units)	Q2/2004
SW300040-25K	dsPIC30F Noise Suppression Library Software License (5K+ to 25K units)	Q2/2004
SW300040-100K	dsPIC30F Noise Suppression Library Software License (25K+ to 100K units)	Q2/2004
AC300030	Accessory Kit (includes: audio cable, headset, oscillators, microphone,	Q2/2004
	speaker, DB9 M/F RS-232 cable, DB9M-DB9M Null Modem Adapter)	- /

Note: Quantities are per project, payable as a one-time license fee based on estimated lifetime volume for products resulting from the project. Please consult the factory for quantities above 100K.

dsPIC™ Development Tools from Microchip		
MPLAB° IDE	Free	
MPLAB [®] Visual Device Initializer (included in MPLAB [®] IDE)		
MPLAB [®] C30 C Compiler	SW006012	
MPLAB [*] ICD 2 In-Circuit Debugger/Programmer	DV164005, DV164007	
MPLAB [®] ICE 4000	ICE4000	
MPLAB [®] PM3 Universal Device Programmer	DV007004	
dsPIC30F Math Library (included in download of MPLAB [*] C30 C Compiler)	Free	
dsPIC30F DSP Library	Free	
dsPIC30F Peripheral Library	Free	
dsPICworks™ Data Analysis and DSP Software	Free	
dsPIC [®] Digital Filter Design	SW300001	
dsPIC30F Soft-Modem Library	SW300002/3/4/5	
dsPIC [*] Speech Recognition Library	SW300010/11/12	
dsPIC [®] Symmetric Key Embedded Encryption Library	SW300050	
dsPIC [®] Asymmetric Key Embedded Encryption Library	SW300055	
dsPIC30F Acoustic Echo Cancellation Library	SW300060	
dsPIC30F Noise Suppression Library	SW300040	
CMX-RTX™ for dsPIC30F	SW300031	
CMX-Tiny+™ for dsPIC30F	SW300032	
CMX-Scheduler [™] for dsPIC [®] Devices	Free at www.cmx.com	
dsPICDEM [™] Starter Demonstration Board	DM300016	
dsPICDEM [™] 28-pin Starter Demonstration Board	DM300017	
dsPICDEM™ 1.1 General Purpose Development Board	DM300014	
dsPICDEM™ MC1 Motor Control Development System	DM300020	
dsPICDEM.net [™] 1 Connectivity Development Boards	DM300004-1	
dsPICDEM.net [™] 2 Connectivity Development Boards	DM300004-2	

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