

Acoustic EC Software Library

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Profiling has been done in order to evaluate the resource consumption in terms of MIPS, RAM and FLASH figures may change depending on specific use case optimizations. The following figure shows the profiling results for acoustic echo cancellation using a STM32F446 MCU based on an ARM M4 core with floating point unit running at 168 MHz (210 DMIPS available) and the IAR embedded workbench tool chain, version 7.70. Optimization has been set on High, speed.

Options	Tail Length	CPU (MIPS)	FLASH (Bytes)	RAM (Bytes)
AEC	128	34.1	32460	24412
AEC + Denoiser		73.9		43236
AEC + Denoiser + AGC		75.2		43236
AEC	512	47.5	32460	35164
AEC + Denoiser		87.4		53988
AEC + Denoiser + AGC		88.8		53988

Memory footprint depends on the length of the filter tail. Data has been collected using a filter tail length equal to 128 and 512.

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Modules

Here is a list of all modules:

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▼ MIDDLEWARES	
▼ ACOUSTIC_EC	
▼ AcousticEC Exported Constants	
Acoustic_EC_errors	Echo cancellation errors
Acoustic_EC_preprocessor	Echo cancellation preprocessor
AcousticEC Exported Types	
AcousticBF Exported Functions	

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<h2>MIDDLEWARES</h2>			

Modules

ACOUSTIC_EC

Detailed Description

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ACOUSTIC_EC		MIDDLEWARES	

Modules

[**AcousticEC Exported Constants**](#)

[**AcousticEC Exported Types**](#)

[**AcousticBF Exported Functions**](#)

Detailed Description

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Modules

AcousticEC Exported Constants

[MIDDLEWARES](#) » [ACOUSTIC_EC](#)

Modules

Acoustic_EC_errors

Echo cancellation errors.

Acoustic_EC_preprocessor

Echo cancellation preprocessor.

Detailed Description

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Acoustic EC Software Library

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Acoustic_EC_errors

[MIDDLEWARES](#) » [ACOUSTIC_EC](#) »

[AcousticEC Exported Constants](#)

Echo cancellation errors. [More...](#)

Macros

```
#define ACOUSTIC_EC_TAIL_LENGTH_ERROR ((uint32_t)0x00000000)

#define ACOUSTIC_EC_AEC_LEVEL_ERROR ((uint32_t)0x00000000)

#define ACOUSTIC_EC_PTR_CHANNELS_ERROR ((uint32_t)0x00000000)

#define ACOUSTIC_EC_PREPROCESS_ERROR ((uint32_t)0x00000000)

#define ACOUSTIC_LOCK_ERROR ((uint32_t)0x10000000)
```

Detailed Description

Echo cancellation errors.

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Acoustic EC Software Library

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Acoustic_EC_preprocessor

[MIDDLEWARES](#) » [ACOUSTIC_EC](#) »

[AcousticEC Exported Constants](#)

Echo cancellation preprocessor. [More...](#)

Macros

```
#define ACOUSTIC_EC_PREPROCESS_ENABLE ((uint32_t)0x00010000)
```

```
#define ACOUSTIC_EC_PREPROCESS_DISABLE ((uint32_t)0x00000000)
```

Detailed Description

Echo cancellation preprocessor.

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AcousticEC Exported Types

[MIDDLEWARES](#) » [ACOUSTIC_EC](#)

Data Structures

struct **AcousticEC_Handler_t**

Library handler. It keeps track of the static parameters and it handles the internal state of the algorithm. [More...](#)

struct **AcousticEC_Config_t**

Library dynamic configuration handler. It contains dynamic parameters. [More...](#)

Detailed Description

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Acoustic EC Software Library

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Data Fields			
<h2>AcousticEC_Handler_t</h2> <h3>Struct Reference</h3> <p>MIDDLEWARES » ACOUSTIC_EC » AcousticEC Exported Types</p>			

Library handler. It keeps track of the static parameters and it handles the internal state of the algorithm. [More...](#)

```
#include <acoustic_ec.h>
```

Data Fields

uint16_t **tail_length**

uint32_t **preprocess_init**

uint16_t **ptr_primary_channels**

uint16_t **ptr_reference_channels**

uint16_t **ptr_output_channels**

uint32_t **internal_memory_size**

uint32_t * **pInternalMemory**

Detailed Description

Library handler. It keeps track of the static parameters and it handles the internal state of the algorithm.

Field Documentation

uint32_t internal_memory_size

Keeps track of the amount of memory required for the current setup. It's filled by the libSpeexAEC_getMemorySize() function and must be used to allocate the right amount of RAM

uint32_t* plinternalMemory

Pointer to the memory allocated by the user

uint32_t preprocess_init

Specifies the option for the preprocessor uinitialization. This parameter can be a value of [Acoustic_EC_preprocessor](#).

uint16_t ptr_output_channels

Specifies the number of channel in the Output Stream. Default Value is 1.

uint16_t ptr_primary_channels

Specifies the number of channel in the Primary Stream. Default Value is 1.

uint16_t ptr_reference_channels

Specifies the number of channel in the Reference Stream. Default Value is 1.

uint16_t tail_length

Specifies the length of the filter tail. Default Value is 512.

The documentation for this struct was generated from the following file:

- D:/Documents.Repositories/DMIC/Private/Fw/OSX_Libraries/EchoC

Acoustic EC Software Library

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Data Fields			
<h2>AcousticEC_Config_t</h2> <h3>Struct Reference</h3>			
<p>MIDDLEWARES » ACOUSTIC_EC »</p> <p>AcousticEC Exported Types</p>			

Library dynamic configuration handler. It contains dynamic parameters.
[More...](#)

```
#include <acoustic_ec.h>
```

Data Fields

uint32_t **preprocess_state**

uint32_t **AGC_value**

uint32_t **residual_echo_remove**

int32_t **noise_suppress_default**

int32_t **echo_suppress_default**

int32_t **echo_suppress_active**

Detailed Description

Library dynamic configuration handler. It contains dynamic parameters.

Field Documentation

uint32_t AGC_value

Specifies the threshold for the AGC, if activated

int32_t echo_suppress_active

Specifies the echo suppress active parameter of the preprocessor

int32_t echo_suppress_default

Specifies the echo suppress default parameter of the preprocessor

int32_t noise_suppress_default

Specifies the noise suppress default parameter of the preprocessor

uint32_t preprocess_state

Enable or disable pre-process function

uint32_t residual_echo_remove

Activate residual echo removal

The documentation for this struct was generated from the following file:

- D:/Documents.Repositories/DMIC/Private/Fw/OSX_Libraries/EchoC
-

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Acoustic EC Software Library

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AcousticBF Exported Functions

[MIDDLEWARES](#) » [ACOUSTIC_EC](#)

Functions

- uint32_t **AcousticEC_getMemorySize** (**AcousticEC_Handler_t** *pHandler)
Fills the "internal_memory_size" of the pHandler parameter passed as argument with a value representing the right amount of memory needed by the library, depending on the specific static parameters adopted. [More...](#)
- uint32_t **AcousticEC_Init** (**AcousticEC_Handler_t** *pHandler)
Library initialization. [More...](#)
- uint32_t **AcousticEC_Data_Input** (void *ptrPrimary, void *ptrReference, void *ptrBufferOut, **AcousticEC_Handler_t** *pHandler)
Library data input and output function. [More...](#)
- uint32_t **AcousticEC_Process** (**AcousticEC_Handler_t** *pHandler)
Library run function, performs audio analysis when all required data has been collected. [More...](#)
- uint32_t **AcousticEC_setConfig** (**AcousticEC_Handler_t** *pHandler, **AcousticEC_Config_t** *pConfig)
Library setup function, it sets the values for dynamic parameters. It can be called at runtime to change dynamic parameters. [More...](#)
- uint32_t **AcousticEC_getConfig** (**AcousticEC_Handler_t** *pHandler, **AcousticEC_Config_t** *pConfig)
Fills the pConfig structure with the actual dynamic parameters as they are used inside the library. [More...](#)
- uint32_t **AcousticEC_GetLibVersion** (char *version)
To be used to retrieve version information. [More...](#)

Detailed Description

Function Documentation

```
uint32_t  
AcousticEC_Data_Input ( void *  
                      void *  
                      void *  
                      AcousticEC_Handler_t * pHandler  
                      )
```

Library data input and output function.

Parameters

- ptrPrimary** pointer to an array that contains PCM samples (16 bit signed int) of the primary signal (1 ms = 16 samples at 16 KHZ).
- ptrReference** pointer to an array that contains PCM samples (16 bit signed int) of the reference (echo) signal (1 ms = 16 samples at 16 KHZ).
- ptrBufferOut** pointer to an array that will contain output PCM samples (1 ms for processed channel = 16 samples at 16 KHZ).
- pHandler** pointer to the handler of the current SpeexAEC instance running.

Return values

- 1 if data collection is finished and libSpeexAEC_Process must be called, 0 otherwise.

Note

Input/output function reads and write samples skipping the

required number of values depending on the ptr_Mx_channels configuration

```
uint32_t  
AcousticEC_getConfig ( AcousticEC_Handler_t * pHandler,  
                      AcousticEC_Config_t * pConfig  
)
```

Fills the pConfig structure with the actual dynamic parameters as they are used inside the library.

Parameters

pHandler **AcousticEC_Handler_t** filled with desired parameters.

pConfig pointer to the dynamic parameters handler that will be filled with the current library configuration.

Return values

0 if everything is ok, 1 otherwise.

```
uint32_t AcousticEC_GetLibVersion ( char * version )
```

To be used to retrieve version information.

Parameters

none

Return values

Version Number.

```
uint32_t  
AcousticEC_getMemorySize ( AcousticEC_Handler_t * pHandler )
```

Fills the "internal_memory_size" of the pHandler parameter passed as argument with a value representing the right amount of memory

needed by the library, depending on the specific static parameters adopted.

Parameters

pHandler [AcousticEC_Handler_t](#) filled with desired parameters.

Return values

0 if everything is fine.

uint32_t AcousticEC_Init ([AcousticEC_Handler_t](#) * pHandler)

Library initialization.

Parameters

pHandler [AcousticEC_Handler_t](#) filled with desired parameters.

Return values

0 if everything is fine. different from 0 if erroneous parameters have been passed to the Init function and the default value has been used. The specific error can be recognized by checking the relative bit in the returned word.

**uint32_t
AcousticEC_Process ([AcousticEC_Handler_t](#) * pHandler)**

Library run function, performs audio analysis when all required data has been collected.

Parameters

pHandler pointer to the handler of the current SpeexAEC instance running

Return values

0 if everything is ok, 1 otherwise.

```
uint32_t  
AcousticEC_setConfig ( AcousticEC_Handler_t * pHandler,  
                      AcousticEC_Config_t * pConfig  
)
```

Library setup function, it sets the values for dynamic parameters. It can be called at runtime to change dynamic parameters.

Parameters

pHandler `AcousticEC_Handler_t` filled with desired parameters.

pConfig pointer to the dynamic parameters handler that will be filled with the current library configuration.

Return values

0 if everything is ok, 1 otherwise.

Acoustic EC Software Library

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Data Structures

Here are the data structures with brief descriptions:

 AcousticEC_Config_t	Library dynamic configuration handler. It contains dynamic parameters
 AcousticEC_Handler_t	Library handler. It keeps track of the static parameters and it handles the internal state of the algorithm

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Acoustic EC Software Library

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Data Structure Index

A

[**AcousticEC_Handler_t**](#)

[**AcousticEC_Config_t**](#)

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Acoustic EC Software Library

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All	Variables		

Here is a list of all documented struct and union fields with links to the struct/union documentation for each field:

- AGC_value : [AcousticEC_Config_t](#)
- echo_suppress_active : [AcousticEC_Config_t](#)
- echo_suppress_default : [AcousticEC_Config_t](#)
- internal_memory_size : [AcousticEC_Handler_t](#)
- noise_suppress_default : [AcousticEC_Config_t](#)
- plntrnalMemory : [AcousticEC_Handler_t](#)
- preprocess_init : [AcousticEC_Handler_t](#)
- preprocess_state : [AcousticEC_Config_t](#)
- ptr_output_channels : [AcousticEC_Handler_t](#)
- ptr_primary_channels : [AcousticEC_Handler_t](#)
- ptr_reference_channels : [AcousticEC_Handler_t](#)
- residual_echo_remove : [AcousticEC_Config_t](#)
- tail_length : [AcousticEC_Handler_t](#)

Acoustic EC Software Library

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All	Variables		

- AGC_value : [AcousticEC_Config_t](#)
- echo_suppress_active : [AcousticEC_Config_t](#)
- echo_suppress_default : [AcousticEC_Config_t](#)
- internal_memory_size : [AcousticEC_Handler_t](#)
- noise_suppress_default : [AcousticEC_Config_t](#)
- plInternalMemory : [AcousticEC_Handler_t](#)
- preprocess_init : [AcousticEC_Handler_t](#)
- preprocess_state : [AcousticEC_Config_t](#)
- ptr_output_channels : [AcousticEC_Handler_t](#)
- ptr_primary_channels : [AcousticEC_Handler_t](#)
- ptr_reference_channels : [AcousticEC_Handler_t](#)
- residual_echo_remove : [AcousticEC_Config_t](#)
- tail_length : [AcousticEC_Handler_t](#)

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File List

Here is a list of all documented files with brief descriptions:

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▼ EchoCancellation	
▼ trunk	
▼ export	
acoustic_ec.h	

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EchoCancellation	>		
<h2>EchoCancellation Directory Reference</h2>			

Directories

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Acoustic EC Software Library

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EchoCancellation	trunk		
<h2>trunk Directory Reference</h2>			

Directories

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Acoustic EC Software Library

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EchoCancellation	trunk	export	
export Directory Reference			

Files

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EchoCancellation > trunk > export >

acoustic_ec.h

```
1
55 /* Define to prevent recursive inclusion ---
   * -----
   */
56 #ifndef __ACOUSTIC_EC_H
57 #define __ACOUSTIC_EC_H
58
59 /* Includes -----
   * -----
   */
60 #include "stdint.h"
61 /* Exported constants -----
   * -----
   */
62 /* Exported macro -----
   * -----
   */
63 /* Exported define -----
   * -----
   */
64 /* Exported functions -----
   * -----
   */
65 /* Exported types -----
   * -----
   */
66
83 #define ACOUSTIC_EC_TAIL_LENGTH_ERROR
     ((uint32_t)0x00000001)
84 #define ACOUSTIC_EC_AEC_LEVEL_ERROR
     ((uint32_t)0x00000002)
85 #define ACOUSTIC_EC_PTR_CHANNELS_ERROR
```

```
    ((uint32_t)0x00000004)
86 #define ACOUSTIC_EC_PREPROCESS_ERROR
    ((uint32_t)0x00000010)
87
88 #ifndef ACOUSTIC_LOCK_ERROR
89 #define ACOUSTIC_LOCK_ERROR
    ((uint32_t)0x10000000)
90 #endif
91
99 #define ACOUSTIC_EC_PREPROCESS_ENABLE
    ((uint32_t)0x00000001)
100 #define ACOUSTIC_EC_PREPROCESS_DISABLE
    ((uint32_t)0x00000000)
101
117 typedef struct
118 {
119     uint16_t tail_length;
120     uint32_t preprocess_init;
121     uint16_t ptr_primary_channels;
122     uint16_t ptr_reference_channels;
123     uint16_t ptr_output_channels;
124     uint32_t internal_memory_size;
127     uint32_t * pInternalMemory;
129 }
130 AcousticEC_Handler_t;
131
135 typedef struct
136 {
137     uint32_t preprocess_state;
138     uint32_t AGC_value;
139     uint32_t residual_echo_remove;
140     int32_t noise_suppress_default;
141     int32_t echo_suppress_default;
142     int32_t echo_suppress_active;
143 }
144 AcousticEC_Config_t;
145
```

```
160 uint32_t
161     AcousticEC_getMemorySize(AcousticEC_Handler_t
162     * pHandler);
163
164 uint32_t
165     AcousticEC_Init(AcousticEC_Handler_t *
166     pHandler);
167
168 uint32_t AcousticEC_Data_Input(void
169     *ptrPrimary, void *ptrReference, void
170     *ptrBufferOut, AcousticEC_Handler_t *
171     pHandler);
172
173 uint32_t
174     AcousticEC_Process(AcousticEC_Handler_t *
175     pHandler);
176
177 uint32_t
178     AcousticEC_setConfig(AcousticEC_Handler_t *
179     pHandler, AcousticEC_Config_t * pConfig);
180
181 uint32_t
182     AcousticEC_getConfig(AcousticEC_Handler_t *
183     pHandler, AcousticEC_Config_t * pConfig);
184
185 uint32_t AcousticEC_GetLibVersion(char
186     *version);
187
188
189
190 #endif /*__ACOUSTIC_EC_H*/
191
192 /***** (C) COPYRIGHT 2015
193 STMicroelectronics *****END OF FILE****/
```

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Related Pages

Here is a list of all related documentation pages:

[profiling](#)

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