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1 Introduction

This document describes how to use the Sigma300 AEC Plug-In for SigmaStudio.

1.1 Scope

The document is intended to assist software developers integrating the Sigma300 AEC Plug-in for SigmaStudio into a SigmaStudio schematic application. A basic understanding of SigmaStudio is recommended. Also, a basic understanding of acoustic echo cancellation is recommended.

1.2 Integration

Previous versions of this Plug-in must be removed from SigmaStudio before adding a new version.

To remove an old version of this Plug-in, launch SigmaStudio and select Add-Ins Browser from the Tools menu. Within the Add-Ins Browser window, highlight AECNB.dll if it exists, and click Delete Item to remove. Save the settings by selecting Save from the File menu.

To register this Plug-in into the SigmaStudio development environment, select the Add-Ins Browser from the Tools menu. Within the Add-Ins Browser window, select Add DLL from the File menu. Browse to the location of AECNB.dll and add the DLL. Save the settings by selecting Save from the File menu.

Upon successful registration, the Plug-in can be found in the Schematic tab in the Tree ToolBox window as shown below.
1.3 Organisation of this Guide

Section 1: This section contains the introduction.
Section 2: Lists the specifications of the Plug-In.
Section 3: Describes the example schematics.

1.4 Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADI</td>
<td>Analog Devices Inc.</td>
</tr>
<tr>
<td>AEC</td>
<td>Acoustic Echo Cancellation</td>
</tr>
<tr>
<td>DLL</td>
<td>Dynamic Link Library</td>
</tr>
<tr>
<td>DM</td>
<td>Data Memory</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>HPF</td>
<td>High pass filter</td>
</tr>
<tr>
<td>PM</td>
<td>Program Memory</td>
</tr>
</tbody>
</table>

Table 1: Acronyms

1.5 References

Refer to SigmaStudio and SigmaDSP documentation available on the Analog Devices website.

1.6 Additional Information

1.6.1 Other Information

For more information on the latest ADI processors, silicon errata, code examples, development tools, system services and devices drivers, technical support and any other additional information, please visit our website at www.analog.com/processors.
2 Specifications

2.1 Version Information

The AEC Plug-in for SigmaStudio is developed and tested under SigmaStudio version 3.14 and will work with later versions.

2.2 Target Platform

Sigma300 and Sigma350 series family of processors.

2.3 Overview

The figure below shows the AEC Plug-in. Several GUI controls are provided to allow the user to configure the Plug-in in SigmaStudio.

![AEC GUI](image)

Figure 2: AEC GUI

2.4 I/O pins

2.4.1 Inputs

The Plug-in inputs are shown in Figure 1 and described in the following table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FarIn</td>
<td>Input signal from far end</td>
</tr>
<tr>
<td>MicIn</td>
<td>Input signal from near end microphone</td>
</tr>
</tbody>
</table>

Table 2: Inputs
2.4.2 Outputs

The Plug-in outputs are shown in Figure 1 and described in the following table.

<table>
<thead>
<tr>
<th>FarOut</th>
<th>Output signal to far end</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1ROut</td>
<td>Output signal from adaptive filter, used by Sigma300 NLP plug-in</td>
</tr>
</tbody>
</table>

Table 3: Outputs

2.5 GUI Controls

The Plug-in provides the following GUI controls to set the compile-time and run-time parameters of the module.

<table>
<thead>
<tr>
<th>GUI control</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taps</td>
<td>Number of taps of adaptive filter</td>
<td>320-640 Note: compile time parameter</td>
</tr>
<tr>
<td>AEC on/off switch</td>
<td>On: AEC enabled, Off: AEC bypassed</td>
<td></td>
</tr>
<tr>
<td>HPF on/off switch</td>
<td>On: HPF enabled, Off: HPF bypassed</td>
<td></td>
</tr>
<tr>
<td>HPF cut-off frequency</td>
<td>Cut-off frequency of the HPF on the Mic input</td>
<td>20-300 Hz</td>
</tr>
</tbody>
</table>

Table 4: GUI controls

2.6 Resource Usage

2.6.1 Memory

The plug-in requires 3K words of data memory.

2.6.2 MIPS

The plug-in uses 12 MIPS at 8 kHz sample rate.
3 Example Usage

The AEC plug-in typically operates at 8 kHz sample rate. For a system with 48 kHz I/O this requires decimation and interpolation. Also, two example implementations are provided: standard and wideband. Standard uses one AEC plug-in at 8 kHz sample rate as shown in Figure 2. Wideband uses two AEC plug-ins at 8 kHz sample rate, with an effective sample rate of 16 kHz as shown in Figure 3. To implement a complete AEC solution, both example implementations include RES plug-in for residual echo suppression and NR plug-in for noise reduction. These can be removed or bypassed if necessary. Note in the figures RES is shown as NLP.

Figure 2: Standard AEC
3.1 Example Projects

Refer to the provided example projects Sigma300_AECNR_Standard_GUI.dspproj and Sigma300_AECNR_Wideband_GUI.dspproj.