

1. Introduction

iSceneDetect™ is a feature new to Sound Design Technologies' pre-configured SA3286 product. This feature allows the hearing aid wearer to have an instrument that will work in any environment with a single memory selection. When enabled in a hearing aid, iSceneDetect will continuously classify the environment and adapt the hearing aid's algorithms according to the environment and pre-established settings without the need of user intervention. The iSceneDetect settings are used to improve the audibility, comfort, and overall listening experience according to a user's needs or preferences.

2. iSceneDetect Operation

iSceneDetect uses sophisticated algorithms to analyze the incoming audio signals and perform environmental classification. The listening environment is classified into one of the six following categories: Quiet, Speech-in-Quiet, Noise, Speech-in-Noise, Music, and Wind.

Based on the detected environment and pre-established settings, iSceneDetect will adjust the settings of the following algorithms: the Feedback Canceller, Noise Reduction, WDRC (Wide Dynamic Range Compression), and the Adaptive Directional Microphone.

Figure 1 summarizes the environment classes and the algorithms that are controlled by iSceneDetect.

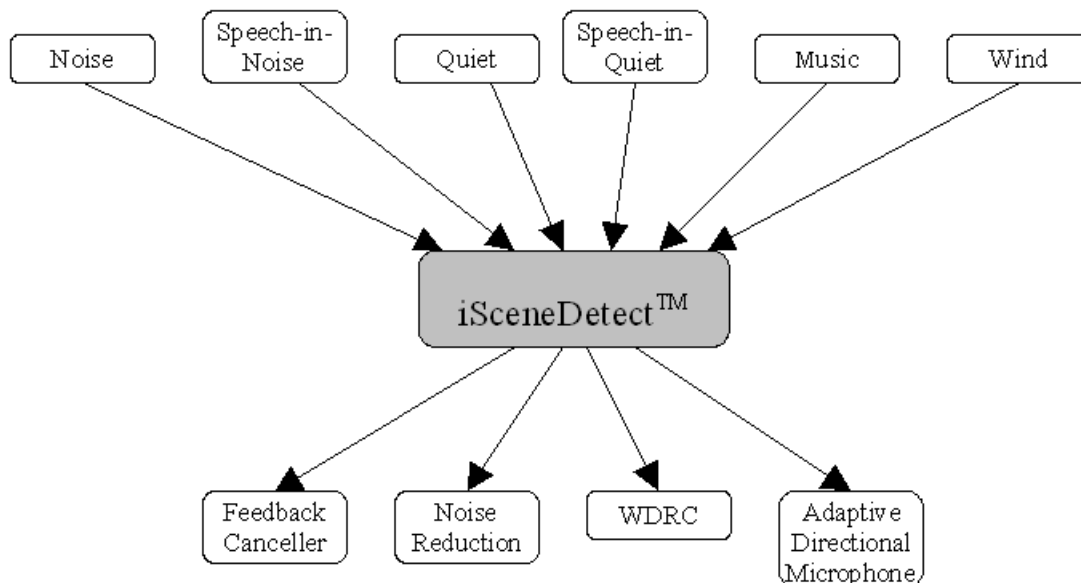


Figure 1: Scope of iSceneDetect Algorithm

3. iSceneDetect Algorithm Control

iSceneDetect adjusts the Feedback Canceller, Noise Reduction, WDRC, and Adaptive Directional Microphone, depending on the hearing aid’s environment. In order to prevent abrupt and possibly very frequent hearing aid behaviour transitions, iSceneDetect makes adjustments to the various algorithm settings in a gradual fashion over time. The duration of the transition interval is controlled by the *EC_TransSpeed* parameter (refer to section [Configuring iSceneDetect in IDS on page 4](#) for more details).

Table 1 provides a summary of how iSceneDetect controls the hearing aid’s algorithms for the various environment classes.

Table 1: iSceneDetect Control of Algorithms in Different Environments

Environment	Algorithm Settings			
	Noise Reduction	Feedback Canceller	Directional Microphone	Wide Dynamic Range Compression
Quiet, or Speech-in-Quiet	Adaptive (NR Min)	FBC normal	Adaptive	Multi-band level detection
Noise, or Speech- in-Noise	Adaptive (NR Max)	FBC normal	Adaptive	Multi-band level detection
Music	Forced to NR Min	FBC slow	Omni	Wideband level detection
Wind	Forced to NR Max	FBC normal	Omni	Multi-band level detection

3.1 Noise Reduction Adjustments

The Noise Reduction level setting is controlled by iSceneDetect and is constrained to lie within the range specified by the iSceneDetect Min NR and Max NR parameters. These parameters can be controlled from IDS (see section [Configuring iSceneDetect in IDS on page 4](#)).

For environments classified as Quiet, Speech-in-Quiet, Noise, or Speech-in-Noise, iSceneDetect sets the noise reduction level to a value proportional to its noise estimate. As a consequence, the amount of noise reduction applied will tend to be less in Quiet or Speech-in-Quiet environments (closer to Min NR) and greater in Noise or Speech-in-Noise environments (closer to Max NR). Figure 2 shows the relationship between the estimated noise level and the Noise Reduction level setting applied by iSceneDetect.

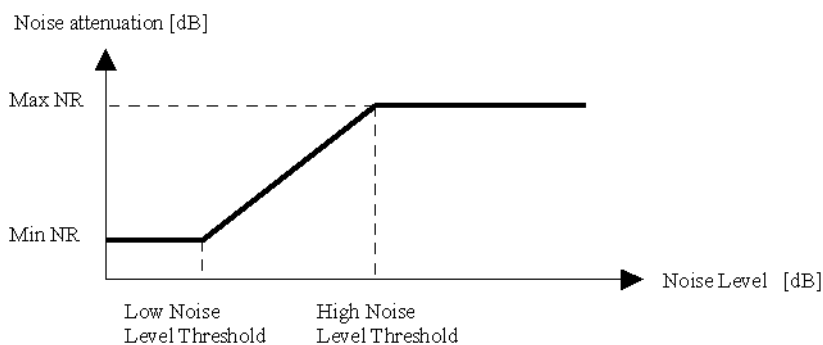


Figure 2: Noise Reduction level setting in Quiet, Speech-in-Quiet, Noise, and Speech-in-Noise Environments

The Noise Reduction level setting is controlled differently for environments classified as Wind and Music environments. In a Wind environment, the Noise Reduction level setting is simply forced to its maximum value (Max NR) to ensure maximum noise reduction in this highly dynamic environment. In a Music environment, the Noise Reduction level setting is forced to its minimum value (Min NR) to minimize music distortion.

3.2 Feedback Canceller Adjustments

The Feedback Canceller operates nominally in all environments except for the Music environment. In this case, the Feedback Canceller adaptation speed is slowed down to preserve sound fidelity.

3.3 Adaptive Directional Microphone Control

Adaptation of the Adaptive Directional Microphone (ADM) is enabled in all environments except for the Music and Wind environments. In these cases, the ADM is forced into an omni-directional state. The use of a steady omni-directional microphone pattern is optimum for preserving sound fidelity when listening to music. As for a windy environment, a directional microphone poses the risk of amplifying the wind noise. Therefore, it is preferable to avoid microphone directionality in the presence of wind by once again forcing the ADM into a steady omni-directional state

In Quiet, Speech-in-Quiet, Noise, and Speech-in-Noise environments, the Adaptive Directional Microphone is allowed to adapt as if the Auto ADM Front End mode was selected. This usually means that the Adaptive Directional Microphone will adapt and transition into the omni-directional state when operating in Quiet or Speech-in-Quiet environments, although this isn't strictly enforced by iSceneDetect. In Noise or Speech-in-Noise environments, the Adaptive Directional Microphone will tend to adapt to a directional state, although, again, this isn't strictly enforced.

3.3.1 WDRC

The WDRC operates nominally (using multi-band level detectors) in all environments except for the Music environment. When a Music environment is detected, iSceneDetect directs the WDRC to use a combination of the multi-band level detectors and the wideband level detector. The combination weighting is dictated by the WB Weight parameter. This parameter can take on a value anywhere from 0% (all multi-band detection) to 100% (all wide-band detection) – see section [Configuring iSceneDetect in IDS](#). By emphasizing wideband detection, the hearing aid behaves more like a single channel device which is considered preferable for listening to music.

4. Configuring iSceneDetect in IDS

The parameter controls for iSceneDetect in IDS are in effect only for those memories where iSceneDetect is the selected Front End Mode (FEMode selection on the *Front End* tab). The iSceneDetect parameters are all located on the *Front End* tab and are shown in [Figure 3](#).

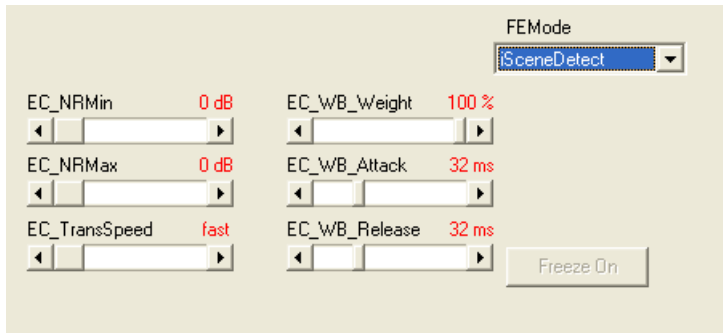


Figure 3: iSceneDetect Parameter Controls in IDS

EC_NRMin: This parameter controls the minimum level of noise reduction allowed by the iSceneDetect algorithm. This value can be anywhere from 0dB to 12dB but EC_NRMin must always be less or equal than EC_NRMax.

Note: The *Noise Reduction* parameter control on the *Adv. Features* tab is ignored whenever iSceneDetect is selected as the FE Mode for a particular memory.

EC_NRMax: This parameter controls the maximum level of noise reduction allowed by the iSceneDetect algorithm. This value can be anywhere from 0dB to 12dB but EC_NRMin must always be less or equal than EC_NRMax.

Note: The *Noise Reduction* parameter control on the *Adv. Features* tab is ignored whenever iSceneDetect is selected as the FE Mode for a particular memory.

EC_TransSpeed: This parameter controls the speed with which iSceneDetect transitions the various algorithm settings under its control, such as the Noise Reduction level, the Adaptive Directional Microphone state, and the WDRC multi-band/wideband level detectors' combination weights. The transition speed parameter can take on the value: fast, med-fast, medium, med-slow, and slow. The approximate transition times for these settings are as follows:

- Fast: 20 seconds
- Med-fast: 25 seconds
- Medium: 30 seconds
- Med-slow: 35 seconds
- Slow: 40 seconds

EC_WB_Weight: This parameter controls the WDRC multi-band/wideband level detectors' combination weights when the environment is classified as Music. In other environments, only the multi-channel level detectors are used. This parameter can take on a value anywhere from 0% (all multi-band detection) to 100% (all wide-band detection). By emphasizing wideband detection, the hearing aid behaves more like a single channel device. There is evidence to suggest that this may improve music quality.

EC_WB_Attack: This parameter controls the attack time of the wideband level detector. The wideband attack and release times serve the same purpose as the individual channel attack and release times; to control the aggressiveness or smoothness of the compressor algorithm.

EB_WB_Release: This parameter controls the release time of the wideband level detector. The wideband attack and release times serve the same purpose as the individual channel attack and release times; to control the aggressiveness or smoothness of the compressor algorithm.

5. Revision History

Version	ECR	Date	Change Description
Rev 0	149159	December 2008	New document.

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