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Tone Detection Technical Specifications

Answering Machine Detection tone

These tones are created by an answering machine at the end of a recorded message to inform the user to start leaving a message. This is usually a single frequency pure tone of any audible frequency with any length since there is no standardized technical specification for an AMD tone and it is left to the answering machine manufacturer. While uncommon, some answering machines may also have custom tones as their AMD tone such as musical tones or multi-frequency tones. We currently do not support detection of such multi-frequency tones. The LumenVox Answering Machine Detector has an advanced proprietary algorithm that detects single frequency pure tones and allows for some distortion in the frequency as well as clicks and other artifacts in the middle of the beep that are common in normal landline and cellphone usage. It also actively rejects multi-frequency tones to prevent false positives from in-band DTMF tone, Busy tone, Ring tone etc. This high performance algorithm has a 98.7% accuracy based on our real-world test set. Table 1 includes the specifications of our AMD beep detector.

DESCRIPTION	VALUE	NOTES
Accuracy	98.7%	
Frequency Range	70 Hz – 4 kHz	Single frequency tones detected only. Multi-frequency tones are actively rejected to prevent false positives for in-band DTMF tone, Busy tone, Ring tone etc
Length of Beep	70 milliseconds to 1.5 seconds	
Frequency distortion	± 10 Hz	This allows for a faulty tone generator that changes the single frequency tone slightly during the beep
Artifact length handled	20% beep length	This allows for handling of multiple artifacts such as clicks or jitter that take up to 20% of the beep length.
RMS Energy	> 387	Minimum energy to be considered a beep
Silence after beep	50 milliseconds	The detector waits for 50 milliseconds of silence after the end of the tone before checking if the tone was an AMD tone
Average time between end of beep and beep detection message	96 milliseconds	This time includes the 50 milliseconds of silence that the algorithm waits for before testing for a beep. The rest of the time is due to data present in incomplete frame buffers that get processed only when sufficient data is received to fill up the frame

Table 1 : LumenVox AMD beep detection technical specification

Fax tones

To detect a Fax machine, we detect the CED tone which is a 2100Hz tone of length 2.6 to 4 seconds in duration. The fax detection shows 100% accuracy in our real-world test set. Table 2 includes the specifications of our fax machine detector.

DESCRIPTION	VALUE	NOTES
Accuracy	> 99%	
Frequency Range	2100 Hz ± 30 Hz	
Length of Beep	> 1 second	
Frequency distortion	± 10 Hz	
Artifact length handled	20% beep length	This allows for handling of multiple artifacts such as clicks or jitter that take up to 20% of the beep length.
RMS Energy	> 387	Minimum energy to be considered a Fax tone
Silence after beep	50 milliseconds	The detector waits for 50 milliseconds of silence after the end of the tone before checking if the tone was a Fax tone
Average time between end of beep and beep detection message	96 milliseconds	This time includes the 50 milliseconds of silence that the algorithm waits for before testing for a tone. The rest of the time is due to data present in incomplete frame buffers that get processed only when sufficient data is received to fill up the frame.

Table 2 : LumenVox Fax tone detection technical specification

SIT (Special Information Tone)

To detect SIT tones we detect a sequence of 3 consecutive tones with frequencies and minimum lengths as specified in in ITU-T E.180/Q.35 which are also specified in Table 3. We also have some additional proprietary tolerance levels to the ones specified in the standard since our real world tests showed a significant number of systems that had SIT tones outside the ITU specifications. The SIT tone detection shows 100% accuracy in our real-world test set. Table 3 shows the specifications of our SIT tone detector.

DESCRIPTION	VALUE	NOTES
Accuracy	> 99%	
SIT Tone 1 Frequency	950 ± 50 Hz	
SIT Tone 1 Length	330 ± 70 milliseconds	
SIT Tone 2 Frequency	1400 ± 50 Hz	
SIT Tone 2 Length	330 ± 70 milliseconds	
SIT Tone 3 Frequency	1800 ± 50 Hz	
SIT Tone 3 Length	330 ± 70 milliseconds	
Artifact length handled	20% beep length	This allows for handling of multiple artifacts such as clicks or jitter that take up to 20% of the beep length.
RMS Energy	> 387	Minimum energy to be considered a SIT tone
Silence after beep	50 milliseconds	The detector waits for 50 milliseconds of silence after the end of the tone before checking if the tone was a SIT tone
Average time between end of beep and beep detection message	96 milliseconds	This time includes the 50 milliseconds of silence that the algorithm waits for before testing for a tone. The rest of the time is due to data present in incomplete frame buffers that get processed only when sufficient data is received to fill up the frame.

Table 3 : LumenVox SIT detection technical specification