



EASY VOICE BIOMETRICS



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EVB Fact Sheet

1. Signal requirements

- Audio file format: WAV (*.wav) – Windows PCM, G.711 (A-law and μ -law compression);
- Maximal audio file size: 300 MB
- Bits per sample: 8, 16 bits
- Record mode: mono/stereo.
- Sampling rate: 8 - 48 kHz.
- Frequency range: 330 - 3400 Hz.
- Signal/noise ratio with frequency range 330 - 3400 Hz: no more than 10 dB.
- Amplitude-frequency characteristic unevenness with frequency range 330 - 3400 Hz: no more than 20 dB.
- Minimal voice signal duration in the audio file should be 3 seconds. The maximum reliability is achieved with 120 sec of voice signal duration.

2. Identification Method

EasyVoiceBiometrics uses a Total Variability method

The following steps are applied for comparison using this method:

- **Speaker's voice model calculation**

On that stage, there are MFCC (Mel Fourier Cepstrum coefficients, cepstral coefficient by Mel scale) speech features calculated – the features, describing spectral representation of speech signal in different moments. Density of identification features distribution is modeled by using of GMM. Using the specifically adapted factor analysis, the features of GMM-model are represented as an I-vector of small-dimension in the space of “total variability”, which includes subspaces of “own channels” and “own voices”, which are used in JFA (Joint Factor Analysis).

Distinctive feature of such GMM-model representation is its high self-descriptiveness and small data size.

- **Making the decision about the identification**

On the stage of I-vectors comparison the SVM-classifier is used, which provides high speed and good quality of identification. By the resulting SVM distance, there are FR/FA errors calculated. There is bagging by the speech signal duration performed (FR/FA



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values depend on the duration of speech signal, by which each compared GMM model is calculated).

3. Equal Error Rate (for GSM channel , depends on the amount of significant biometric voice data, sec)

	3	5	8	13	22	36	58	96
3	11,1	10,1	9,2	8,8	7,5	7,3	6,9	6,8
5		8,9	7,9	7,3	6,1	5,6	5,3	5,1
8			7,1	6,4	4,8	4,5	4,0	3,9
13				4,4	3,4	3,3	3,0	3,0
22					3,2	3,1	2,8	2,8
36						2,7	2,4	2,5
58							2,4	2,4
96								2,3

4. NIST Reporting

Algorithms accuracy estimation is received on NIST SRE 2010 database

5. Application

The EasyVoiceBiometrics product is designed for law enforcement agencies, state and private forensic audio investigators, detectives and lawyers to perform the following tasks:

- Facilitating voice expert identification analysis in the performance of multi-target forensic audio investigation by eliminating imposters and ranging the top-in-the-list speakers according to the biometric traits likelihood probability.
- Express attribution of the investigated speakers' voices by the proximity degree.

The product is designed to assist analysts but not to substitute for them. The court verdict cannot be based on the results of any automatic system regardless of what we compare: voice, face, fingerprint or footprints. Only the forensic expert



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who carried out the investigation using all scientifically available methods and tools can make a conclusion. The assistance is done in two ways:

- For multi-target voice analysis cases to arrange the speakers by match probability. What is multi-target investigation? I receive 10 phone calls records for analysis. After speaker separation I have 20 speakers. And I have 2 suspects and their voice samples. I need to take suspect #1 and compare with all 20 speakers, the same for suspect #2. With EVB I upload 20 speakers in the Library and run comparison #1 vs 20. Then I take the 1-in-the-list speaker (or 2-3 lines in the chart) and use voiceprint or other methods to carry out investigation and make a conclusion. Thus, EVB helps me to save time.
- I have 1 vs 1 comparison. I use EVB as an additional mathematical voice ID method in a row with other methods including voiceprint, pitch and formants analysis, linguistic and auditory analysis. Thus, it helps me to make my analysis more robust, quick and unbiased.