

**The modern  
Speech Technologies  
- The time of innovations**

# The general directions of researches

- **Speech Enhancement;**
- **Voice Biometrics;**
- **Speech Effects.**

# Speech Enhancement

- **GritTec's Noise Cancellation**
  - noise suppression with single microphone.
- **GritTec's Dual Microphone Array**
  - noise suppression with dual microphone array.

## GritTec's Noise Cancellation

It's the technology of noise suppression with single microphone. It's recommended to use in case of an amount of hindrances is unknown beforehand or it is impossible in the evident type to select "point" source of hindrances (absent-minded hindrance). Filter noise cancellation is automatically adapted under all types of surrounding hindrances and selects a refined of speech signal.

### Features

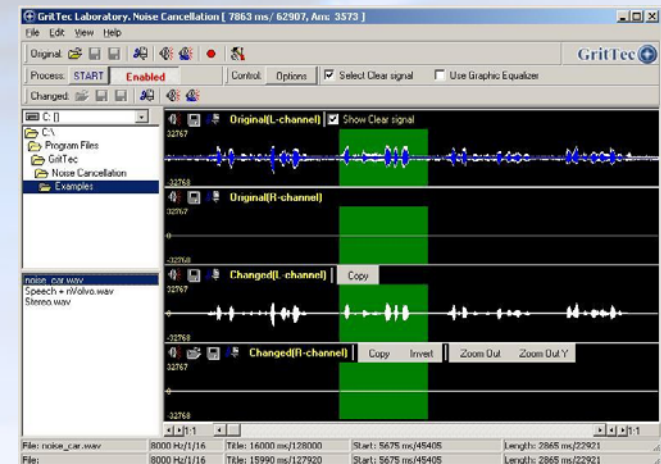
- Supports sampling rate from 6kHz up to 48kHz;
- High quality of speech enhancement;
- Low level of speech distortion;
- Operation with low level SNR signals;
- Separation as cleaned speech, so and a background noises;
- Three adaptation modes to background noises;
- Controlled level of noise suppression in speech, including a broadband color noises up to -60 dB;
- Possibility of using a graphic equalizer for removing the stationary hindrances;
- Easy integration with target applications.

### Effectively for

- suppression of offices, street noises;
- suppression of mechanical noises such as noises of cars;
- suppression of channel distortion and noises in VOIP, POTS.

### Applications

- Hands Free systems;
- Call centers;
- VOIP telephony.



## GritTec's Dual Microphone Array

It's the technology of dual microphone of noise suppression on the base of dual microphone array. It's used for the suppression of external hindrances and surrounding noises in chosen direction of the speech source. Suppression of external hindrances is descended by mean of the acoustical beam-forming, defining configuration of microphones and using methods of adaptive filtrations. It's recommended to use for suppression of background speech, music and mechanical noises.

### Features

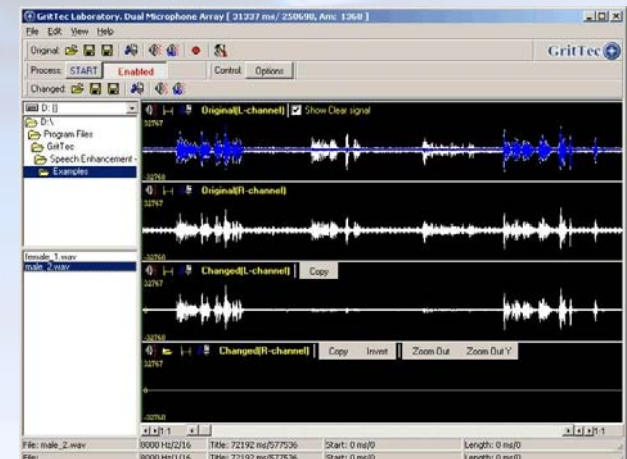
- Support 2 microphones configurations;
- Supports sampling rate from 8кГц up to 32кГц;
- Fast adaptation to changing of external noises;
- High quality of speech enhancement;
- Controlled level of Sidelobe canceller, up to -60 dB;
- Distance between microphones not less 0.025 meters;
- Distance to the speaker source not less 0.2 meters (up to 5.0 meters);
- Choice of a direction of a speech source: Direct (hand control);
- Easy integration with target applications.

### Effectively for

- suppression of offices, street noises;
- suppression of mechanical noises such as noises of cars;
- suppression of background speech and music.

### Applications

- Hands Free systems;
- Call centers;
- Audio – video conferences.



# Voice Biometrics

- **GritTec's Speaker-ID**
  - text independent voice identification;
  - text independent voice verification.
- **GritTec's Voice Transcription**
  - phonetic transcription of speech signal records.

## GritTec's Speaker-ID

It's intended for automatic identification or verification of a speech signal of unknown speaker by paired comparing with speech signal example of target speaker. Designed algorithm of voice identification is based on duel comparison of spectra features of unknown voice with the spectra features of target voice. The spectra features are calculated with provision of dynamic determinations of channel distortions and external hindrances and noises.

### Features

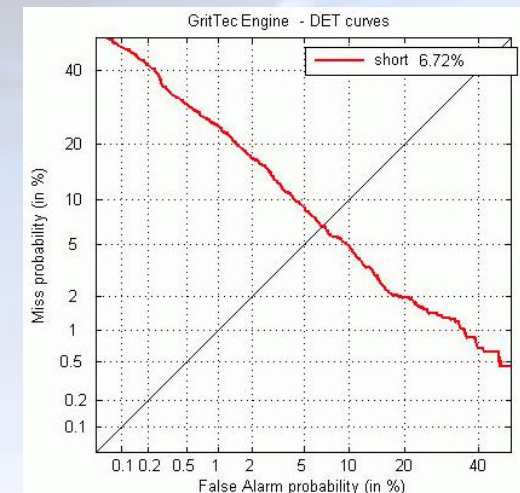
- Operation with low SNR level;
- Fast adaptation to channel distortions and external noises;
- Minimum duration of a speech signal with a voice example used for correct reception of voice parameters for the target speaker – not less 30 seconds;
- Minimum duration of a speech signal with a voice example used for voice identification or voice verification - not less 7 seconds;
- Identification accuracy not less than 95% if the both of speech signals were recorded in the same channel;
- Identification accuracy not less than 90% if the both of speech signals were recorded in different channels.

### Effectively for

- Automatic voice identification or verification by phonogram of telephone negotiations;
- Applications where it's necessary to identify a person using his voice.

### Applications

- Call centers;
- Systems with high level of security.



# GritTec's Voice Transcription

It's used for making phonetic transcription of a speech signal with unknown voice. Module of phoneme recognition is developed on the base triphone Hidden Markov Models (HMMs) models and model of phonemes duration.

## Features

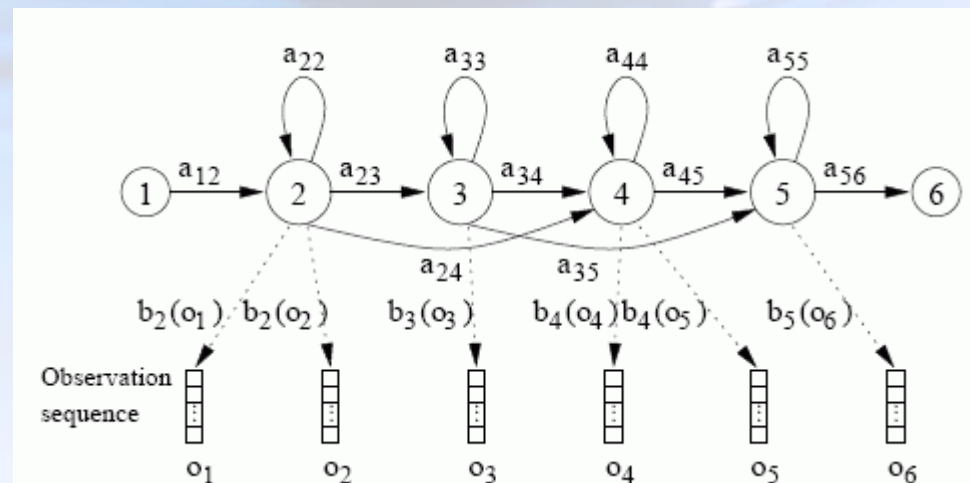
- Operation with low SNR level;
- Fast adaptation to changing of channel distortions and external noises;
- Speaker independent system;
- Accuracy of phone recognition ~ 75% for TIMIT database;
- Easy integration with target applications.

## Effectively for

- realization of phonetic transcription;
- language identification.

## Applications

- Call centers;
- Security systems.



# Speech Effects

- **GritTec's Pitch Shift**
  - changing of a sounding timbre;
- **GritTec's Time Stretching**
  - changing of a sounding tempo;
- **GritTec's Sample Rate Converter**
  - sampling rate converter.

## GritTec's Pitch Shift

It's intended for changing of a sound timbre in a audio and speech signals. Effectively can be used for changing initial music or voice into another voice.

### Features

- High sound quality;
- Operation with sampling rate signal from 8kHz up to 48kHz;
- Signal delay: 0 ms.;
- Guarantees fixed speaker position of sounding for stereo signals;
- Pitch stretching factor: 50%, ..., 200% (normal: 100%);
- Dynamic changing of pitch stretching factor;
- Length of packet length maybe set from 20 ms. up to 40 ms.;
- Dynamic changing of packet data length;
- Easy integration with target applications.

### Effectively for

- voice changer – «VOICE ANONYMOUS»;
- changing of a sounding timbre in speech and audio.

### Applications

- The program on witness protection;
- Call systems;
- IVR systems;
- Audio – video conferences.



## GritTec's Time Stretching

It's used for changing of a sound tempo in a speech and audio signals. Effectively can be used for time scale modification (changing the speed or duration of sounding).of an speech-audio signals without affecting its pitch.

### Features

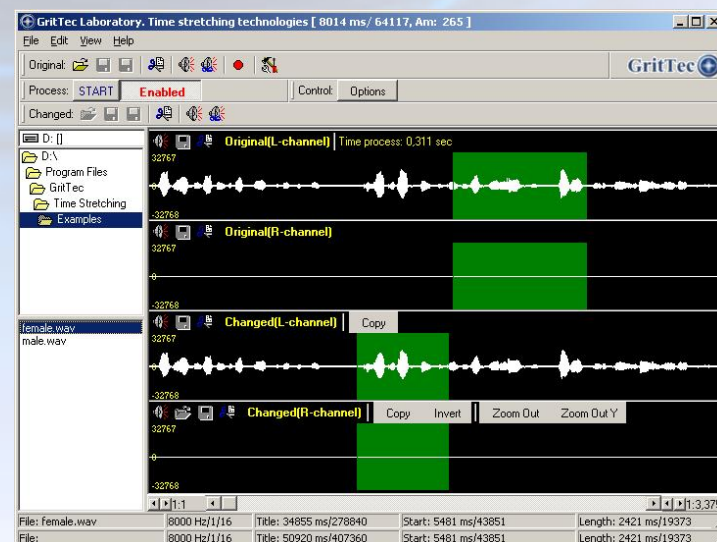
- High sound quality;
- Operation with sampling rate signals from 8kHz up to 48kHz;
- High robustness;
- Guarantees fixed speaker position of sounding for stereo signals;
- Time stretching factor: 50%, ..., 200% (normal speed: 100%);
- Dynamic changing of time stretching factor;
- Length of packet length maybe set from 20 ms. up to 40 ms.;
- Dynamic changing of packet data length;
- Easy integration with target applications.

### Effectively for

- changing of a sound tempo in speech and audio;
- synchronization of audio stream;
- reduce the rate of bit transmission (jitter control) in devices of IP telephony

### Applications

- Call systems;
- IVR systems;
- Audio – video conferences.



# GritTec's Sample Rate Converter

It's used for changing sampling rate in speech and audio signals. Principle of functioning algorithm is based on methods of interpolation. Principle of functioning algorithm is based on interpolation methods.

## Features

- High quality of sound conversion;
- Supports sampling rates: 6kHz, 8kHz, 11.025kHz, 16kHz, 22.05kHz, 32kHz, 44.1kHz, 48kHz and 96kHz;
- Supports of stereo channels signals;
- Full compatible with most audio-speech codecs;
- Easy integration with target applications.

## Effectively for

- sampling rate conversion.

## Applications

- Аудио systems and devices;
- Professional audio applications, such as audio-media players, streaming digital radio.

# Contacts

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