VoiCode® - Unique Technological Assets in Audio Coding

1. VoiCode® Stereo: A Professional Audio, Film & Television Studio Software Tool

Our initial product, a VST software plug-in, has been designed for professional audio, film and television studios, and we are launching this first product in the most sensitive market segment concerning sound quality: audio, television and film postproduction studios equipped with digital audio workstations (DAWs), a fast growing niche market within the broadcast and media technology industry.

Merging Technologies, which is considered to be a leader in quality software solutions for postproduction studios all over the world, is our partner for this unique product, which goes far beyond customer expectations in the field of recording, editing or remastering.

Reactions on the product itself have been enthusiastic ranging from „a scientific tool“ (the interpretation of a U.S. university professor) to „after VoiCode it's ‚breathing' very, very powerful“ (the reaction of a recording engineer). Regarding sound restoration an American producer wrote: „Once people get over this, I think engineers that restore older recordings will start to champion it.“

Major applications for our first software product: 1. Nearly any modern mono release of historic recordings made before 1958 is employing pseudostereophonic postproduction techniques, however, with the major defect of instable plural sound sources. 2. The American film industry is favouring remakes of classical films based on a mono soundtrack (which never could be edited on a professional

level before). 3. Even contemporary documentary films are largely based on monophonic material. 4. The plug-in may be used for mixing multiple sound sources without the well-known prior art defect of colouration. 5. Modern stereo or Surround audio, film or television productions (which may cost several hundred thousands of Swiss francs depending on the cast) may show major technical defects – these productions can be entirely recovered by means of the present plug-in!

The product has been officially announced at NAB Show 2010 in Las Vegas in April 2010 and launched at IBC Amsterdam in September 2010.

2. VoiCode® MEMS: Making MEMS Sound Three-dimensional

As the VoiCode® algorithm is slim (according to an estimation done by our research and development partner EPF Lausanne, the entire algorithm covers about 1% of the entire surface of an average consumer electronics microcontroller!) its professional implementation may be transferred to the mass market without any quality restrictions. You literally have a full virtual professional Stereo, Surround or 3D recording studio at hand, which fits into a digital camera, a mobile phone, a handycam or players.

MEMS microphones, a fast growing segment within consumer electronics OEM products, are nowadays built into any consumer device which boasts with its miniature dimensions replacing conventional ECM (Electret Condenser Microphone). These MEMS microphones are indifferent to electromagnetic fields (a major problem in miniature electronics), and they show excellent results concerning sound quality. However, as their directivity is limited to an omnidirectional polar pattern they may not be used in order to render a professional Surround or 3D sound representation.

Our system is the first of its kind to offer a full Surround or 3D virtualization with Mono MEMS microphone signals on a professional level!

3. VoiCode® Satellite: A Sound Solution For Bandwidth Reduction And Rain Fade Recovery

Several audio codecs are playing an important role in satellite transmission, especially with HDTV and DARS. Satellite television represented three-quarters of total satellite services revenues in 2008, increasing by 17% to 64.9 billion USD, and satellite radio experienced likewise a strong growth to 2.45 billion USD with an impressive growth rate of 29% from 2006 to 2007. However, satellite transmission is about two times more expensive than terrestrial transmission and is subject to so-called „rain fade“ (meteorologically induced quality restrictions which may likewise be compensated by means of our technologies).

The essential costs are related to the bandwidth of the transponders that literally explodes for broadcasters providing High Definition (HD) programs or future Ultra High Definition (UHDTV) 3D audio based programs, and which can with regard to spatial bit rates be reduced up to 200 times by means of swissaudec's proprietary technologies. We therefore may achieve a 100% competitiveness of future satellite radio with terrestrial transmission, and significant further data reduction with satellite HD television or future UHDTV!

Japanese television program NHK has already performed genuine Ultra High Definition transmission with Hamasaki 22.2 audio over the last years - 24 audio channels as a total! -, which seems to be an anticipation of what is to be genuine 3D audio in the near future.

4. VoiCode 3D: Bringing a Highly Immersive Sound Experience to the Consumer World

Spatial bitrate reduction by means of swissaudec's proprietary VoiCode® technologies reaches its climax with 3D audio, where, for instance with Hamasaki 22.2 (a 3D audio format promoted by Japanese national television NHK) permanently necessary spatial bitrates with prior art may be reduced to an occasional data pulse with absolute bitrates lowered up to another 99.5%!

Audio bandwidth may thus be severely augmented for the sake of genuine 3D transmission and rendering on low bandwidth devices such as Smartphones or tablets.

The system is compliant with any waveform preserving and non-waveform preserving audio codec and therefore may enjoy major adoption in the consumer electronics world.

5. VoiCode® Hybrid: Radio Receiver Chip Layouts

swissaudec's unique patented tools not only provide a genuine virtualization of Stereo, Surround or 3D formats with any given broadcasting signal, they furthermore offer the reconstruction of deficient audio content under bad reception conditions in real-time – and furthermore are apt for their cheap integration on any radio receiver IC.

VoiCode® Hybrid adds unique assets to hybrid Internet radio, DAB, FM and PC streaming chips - and likewise to VoiCode® Automotive's extended features (see below)!

6. VoiCode® Automotive: Safer Driving

Mono speech signals represent a significant aspect in everyday life - whether related to telephony, particularly car handsfree sets, navigations systems, infotainment applications etc. When processing

these signals by means of swissaudec's proprietary technologies – due to a psychoacoustic effect related to the virtualization of genuine spatiality – the intelligibility is significantly enhanced – particularly in a noisy environment. For instance, consonants like „b", „p", „g", „k", „d", „t" or „f", „s" can be easily distinguished when being processed by our system.

An important application is the implementation of our system with car handsfree sets that are subject to legislation in most countries of the world.

Mobile phone use while driving is common but controversial. Being distracted while operating a motor vehicle has been shown to increase the risk of accident. Because of this, many jurisdictions prohibit the use of mobile phones while driving. For instance, Japan bans both hand-held and hands free use of a mobile phone whilst many other countries – including the U.K., France and many U.S. states – ban hand-held phone use only, allowing hands free use.

As with swissaudec's Stereo, Surround or 3D virtualization the driver is no more distracted by his attempt to catch the information given by his interlocutor, we increase the safety as well as the comfort of the driver and his passengers.

VoiCode® Automotive, apart from VoiCode® Hybrid, may be combined with features of VoiCode® Satellite for reconstructing deficient broadcasting signals - based on the same technological background as the reconstruction of satellite broadcasting signals in case of „rain fade". Conventional car FM stereo signals furthermore suffer from the fact of continuously changing receiving conditions. As soon as the sub-channel L – R is poor the radio receiver automatically switches to the main channel L + R - leading to an incoherent sound image which may be described as „stereo pumping" - which can be avoided with extended VoiCode® Automotive filters!

Another emerging field in automotive industry are 3D audio formats - as loudspeaker placement represents no real obstacle within the vehicle – which may be virtualized by swissaudec's unique patented tools with any given broadcasting signal or audio content, and particularly with mono input signals.

7. VoiCode® Measurement: Retrieving Additional Electroacoustic Measurement Data by Means of Inverse Problem Theory

Inverse problems were described first by Russian-Armenian physicist Viktor Ambartsumian in 1929, then solving, for instance, complex linear integral equations by a simple numerical solution.[1]

Generally speaking, lossy data of lower order may be recovered to finally represent a data set of higher order by means of specific matrix inversions.

Inverse problems solutions are today of major scientific interest and are nowadays widely spread in numerous disciplines such as physics, measurement techniques, or image and video coding. Interestingly enough they never have been applied to sound signals, not only for the sake of further bandwidth reduction, low latency coding and lowest possible complexity but also with acoustic measurement techniques, which represent a highly specialized branch within the audio industry.

Also related measurement technologies in other industrial sectors, which currently use, for instance, mechanical systems, can likewise be equipped with swissaudec's technologies thereby speeding up measurement processing several times. Such a substitution has already

[1] "In the simplest case of monochromatic and isotropic elementary scattering acts the method enables to replace the search for a family of solutions of a complicated linear integral equation by a numerical solution of a single and very simple nonlinear functional equation." (V. Ambartsumian: A Life in Astrophysics. - New York: Allerton Press 1998.)

been proposed to us at an early stage of our technologies - as mechanical measurement systems literally cost millions to the end customer. These systems may be substituted by inverse problem based acoustic measurement systems based on VoiCode® Measurement!

8. VoiCode® MedTech: Retrieving Additional Data in Professional 3D Ultrasound

3D ultrasound is vastly used in medical diagnostics, particularly in cardiology and prenatal diagnosis. On the other hand the worldwide hand-carried ultrasound market segment is literally exploding.

Live-3D ultrasound currently is based on an about-turn of the scanning plane, which allows determining the precise co-ordinates of the analysed tissues within a 3D-matrix. It may likewise include Doppler methods for the precise monitoring of the blood flow, valvular heart defects or vascular deficiencies.

The same principle of inverse problem theory, as are used today in physics, measurement techniques, or image and video coding and may be applied with VoiCode® Measurement, may be used, for instance, with Live-3D ultrasound to retrieve additional imaging data. It may likewise further stabilize and introduce Live-3D sonography with hand-carried ultrasound, which may revolutionize the entire segment of clinical ultrasound diagnostics.

9. VoiCode® Audiology: Making Hearing Aids Smart

Hearing aids are currently based on two mono microphones by which the localization of sound sources is being determined. The sound then is being processed by means of HRTF (Head-Related Transfer Functions), which simulate this calculated localization. Additionally advanced binaural hearing aids are equipped with interfaces (particularly Bluetooth), which allow the transmission and processing of monophonic audio data such as phone signals or television set

signals.

swissaudecs's entire technology portfolio may therefore be introduced with binaural hearing aids – then showing all the features of a natural acoustic environment!

For further detailed technical information, please contact **mail@swissaudec.com**.

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