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Eurocontrol Project "Aircraft Identification Tag" Signature for voice communication in air traffic control

Together with the Institute for Communications Engineering at the Technical University of Graz, the Frequentis Technology Center Graz is working on a research and development project for the European air traffic control authority Eurocontrol. The project encompasses a scientific treatment of the broadband technology called "watermarking", the construction of two stand-alone prototypes based on digital signaling processing (DSP) hardware, as well as the complete realisation of the theoretical concept to a fully functional working system.

The project began in January of this year: Eurocontrol showed interest in a method with which data could be transmitted dispersed within voice communication. This would make it possible to provide each message with an additional "signature", which would grant an enormous increase in security during communication between pilots and air traffic controllers as well as between air traffic controllers themselves. In addition to the voice message, the sender identification would also be sent, in effect making it impossible to falsify the message. A broadband solution to this challenge is called watermarking, which hides data in the modulation of white noise (this technology is used to copy protect CDs for example).

A concrete research and development contract developed from this interest, and the Frequentis team in Graz, which has specialised in DSP technology, developed an offer in cooperation with the Institute for Communications Engineering at the Technical University of Graz under Professor Gernot Kubin. The Data in Voice (DiV) development realised by Frequentis helped make it possible for Frequentis Graz to win the contract despite the stiff competition from the renowned Fraunhofer-Institut.

What is Watermarking?

Digital watermarking already plays a large role in the multimedia consumer sector where it is predominately used for copy right protection. This technique is used for example to provide music on digital media (CD, DVD etc.) with signals inaudible to the human ear that contain digital information (codes in the form of copy right protection) that can be decoded by suitable decoders.

Watermarking thus allows additional information to be transmitted in the existing medium at levels beyond the human limits of perception so that they are not disturbing or influencing and can therefore easily be filtered out.

This additional information must of course be specially encoded into the medium. This is achieved in audio watermarking by exploiting the masking effect (frequency range) as well as the pre- and post-occlusion effects in the time range. Watermarking is therefore not disturbing in aviation either, since the noise level of communication is generally very high and the watermarking technology does not represent any additional (auditory) burden.

Aircraft Identification Tag as Aircraft Identification

The Aircraft Identification Tag (AIT) is a short signature at the beginning of a transmission with the goal of positively identifying the speaker. This fully automated identification mechanism simplifies communication in the ATC sector and increases security. Such a possibility does not exist in the air traffic control sector with today's analog systems and must be carried out verbally using identifications such as Kilo, Alpha, Bravo, Charley, Tango etc.

The idea of AIT is similar to the DiV system also developed by Frequentis. Both systems make it possible to simultaneously transmit data with voice communications, yet the technology used for data transmission differs substantially between the two. AIT enjoys the advantage of resistance against compression, yet the disadvantages of voice quality degradation and a low bit rate (100 baud).

The prerequisite for a competent analysis was a deep scientific insight into the signaling processing theory. This was achieved with the support of the Technical University of Graz (Institute for Communications Engineering), whose new approaches in very close cooperation with Frequentis led to the development of a new model.

Successful Acceptance of the Project at the Beginning of July

At the beginning of July, the complete AIT-System was presented and turned over to Eurocontrol at their research center (Eurocontrol Experimental Centre ECC) in Brittany, France. The intensive live tests conducted on site at the acceptance showed that despite the highest degree of noise on the channel, the aircraft identification was always received reliably.

Eurocontrol has again taken a strategic position in this project: They wish to test the acceptance of the system amongst their members during the widespread AIT tests and controller trainings that are planned (which indirectly makes it possible to predict the reaction of the Air Traffic Management community to similar technologies such as DiV).

Aside from everything else, one thing can readily be observed, and that is that in today's digital world the security and traceability of data is becoming of ever increasing importance. Watermarking processes will thus become increasingly important as well, either becoming a standard itself or being integrated into other standards.

About Frequentis

For Background Information about Frequentis please see www.frequentis.com.