

## Summary: "Future Sound Tech Solutions" – Meeting #16

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Meeting # 16 in the working group "Future Sound Tech Solutions" took place on January 30, 2024.

### Agenda

1. Discussion on:
  - a. Other initiative than webinars and physical events?
2. Webinars & Physical events during 2024:
  - a. Follow-up on proposals and ideas from meeting # 15 including additional comments and proposals.
  - b. Proposals for possible speakers
  - c. New themes?
3. Collaborative projects, update of proposals, indication of possible project consortia.
4. News from DSC secretariate
5. A.O.B.

### Presentation of new Work Group Member

Facundo Ramón, GN Hearing has joined the working group. Facundo joined GN-Hearing about 8 months ago and he serves as an acoustic engineer engaged in hearing aid developments. Prior to joining GN-Hearing, Facundo worked at GN-Audio in the consumer site developing headsets and speaker phones employing ANC. His focus was on acoustic and electroacoustic issues using extensive simulations.

Facundo Ramón is originally from Argentina, and in 2018 he and his wife (she is a psychologist) moved to Denmark.

### Other new members in the Working Group

**Torben Christiansen**, Director of Technology, Technology Development at EPOS Group A/S, will join the working group as from next meeting. Torben is a well-known contributor to Danish Sound Cluster activities over the years, and it is good to have him on-board in the working group.

**Miikka Tikander**, Director, Head of Acoustics, Bang & Olufsen A/S, will also join the working group at the next meeting. Miikka first wants to join for a few meetings to see, if he can actively contribute to the working group before deciding to become a regular member. It is good to have a strong insider from the consumer industry join the group.

**Niels H. Pontoppidan**, Ph.D., M.Sc.E., Principal Scientist at Eriksholm Research Centre, recently announced that he had to retire from the working group due to changes in his responsibilities at Eriksholm Research Centre. Niels is actively looking for a replacement inside the Oticon group to join the working group.

In general, it is encouraging that we get new members in the working group bringing new inspiration. After 2½ year of active work some feel that they have used up ideas for activities, and new members are likely to offer new ideas to ensure our future focus on topics of interest for the Danish Sound Cluster and its many companies and research institutions.

We welcome the new working Group members and hope that they will find the activities in the working group interesting and help to change the direction of our work to ensure continued strong focus on Future Sound Tech Solutions.

## Ad 2: Proposals for Webinars & Physical Events

#	Subject	Background
15	Speech Prediction	<p><b>Background:</b></p> <p>Speech Prediction is a topic in its own right - and interests seem high. The aim is to find an approach to overcome the middle frequency range challenge, where existing solutions (see below) appear to fail.</p> <p>Active noise cancellation, ANC, can remove low frequency noise and passive noise cancellation can remove high frequency elements.</p> <p>Some research on speech Prediction exists, but in general it is today still a tiny R&amp;D domain.</p> <p><b>Potential speakers:</b></p> <ul style="list-style-type: none"> <li>• Johannes Sars ? (check with Niels Pontoppidan)</li> <li>• Yurii lotov, Ph.D. Student, AAU in collaboration with Jabra (contact e.g. Jesper Rindom, AAU)</li> <li>• Ivan ?, Microsoft</li> </ul> <p>Facundo will contact Yurii lotov on the topic and also try to obtain other potential speakers for an event.</p>
21	Augmented sound in future society <b>(Panel discussion, SoundDay 2023)</b>	<p><b>Originally in Working Group proposed as Bluetooth Auracast™</b></p> <p><i>(Auracast broadcast audio will let people invite others to share audio experiences. People can log on to streams that are in the air. Is likely to change our society already short term).</i></p> <p>Completed at Sound Day 2023, November 7</p>
21a	Augmented sound in future society Focus on Auracast <b>(Webinar 2024)</b> <b>Follow-up to the SoundDay panel discussion</b>	<p><b>Timing:</b></p> <ul style="list-style-type: none"> <li>• Q2, 2024</li> </ul> <p><b>Industrial perspective.</b> The Hearing Aid industry is promoting Bluetooth Auracast, and some companies are investing significantly in Bluetooth Auracast.</p> <p><b>Moderator:</b></p> <ul style="list-style-type: none"> <li>• <b>Nick Hunn</b> should moderate and give an overview presentation.</li> </ul> <p><b>Potential other candidates for industry case presentations:</b></p> <ul style="list-style-type: none"> <li>• <b>Bjarne Klemmensen</b>, Oticon (confirmed by Niels, mail 11 May 2023)</li> <li>• <b>Søren Møllskov Larsen</b>, WS-Audiology (Morten has checked with Søren Møllskov Larsen and he is willing to take an active role)</li> <li>• Thomas Olsgaard, focus on Auracast applications in hearing aids <b>(Facundo will contact Thomas Olsgaard).</b></li> </ul> <p>Auracast (focus on broadcast) applications. Auracast is an extension to Bluetooth LE (peer-to-peer communication).</p> <p><b>We agreed that we should call a pre-meeting between Nick Hunn, Bjarne Klemmensen and Søren Møllskov Larsen with an aim to frame the webinar.</b></p> <p>Auracast can be employed in broadcast applications in airports, museums, churches, pubs with more TV displayed sports events, etc. Once people use earbuds or similar communication devices, they can connect into preferred broadcast channels.</p> <p>Auracast has been pushed by not least the hearing aid industry.</p> <p>Hardware units supporting Auracast are already emerging in the market. A recent Samsung smart phone, Google Pixel phone, hearing aids from GN-Hearing, and other types of Auracast transmitter are now available in the market, and Auracast will be a mainstream technology soon. Silent Disco for use on the dance floor, where partners select the type of music they want to dance to.</p>

#	Subject	Background
21b	Augmented sound in a Metaverse society	<p>The aim of this topic is also to look for general trends in augmented sound that could pivot the Danish sound Industry into a future leading technologically position in sound – rather than just wait for trends to come to us from the outside.</p> <p>Directions to investigate could be:</p> <ul style="list-style-type: none"> <li>• <b>System devices</b></li> <li>• <b>Metaverse, virtual/augmented audio</b> (<i>Metaverse: Improved digital environment where it is possible to move seamlessly between work, play, shopping, socializing and creativity in one digital landscape</i>).</li> </ul> <p>Professor Damian Murphy, University of York (see item #21a) and his Lab also seems to be quite active in this domain and may be able to give a presentation.</p> <p><i>Theme postponed to next meeting, where Jeremy may give some recommendations and whether the present theme makes sense in addition to them 21a, Jeremy will also try to identify people that can contribute.</i></p>
23	Better tools for ensuring good audio quality in e.g. field recordings, hence reducing the need for dubbing	<p>A long discussion did not bring a clear strategy to the theme. The original idea was to look for augmented audio support solutions for use already at the time of recording. A preferred aim would be that relatively novice users could make successful recordings of sound in the field, also noisier environments like Tivoli or in busy street.</p> <p>However, although some AI supported solutions are available, the most straight forward solutions seem to be to apply efficient post processing solutions (e.g. Adobe tools).</p> <p>We have not yet defined a clear strategy for an event. Maybe the most optimal approach could be to present some solutions, including post processing that users could employ to improve the situation of sound recording, especially in the field (less controlled environment). Although experienced people in sound recording in the field (including using post processing tools) will already know how to handle the challenges, we may focus on educating a broader community in how to make decent recordings in the field, including advise what post processing makes sense.</p> <p>The target audience could e.g. be the growing community of less experienced people making audio recordings, for example in conjunction with podcast recording.</p> <p><i>Postponed to the next meeting, since Jeppe, who is supposed to bring more information, could unfortunately not be present in the meeting due to double booking of another arrangement. Jeppe has some ideas on what could be done in this context, and he will try to present a updated strategy for discussion of the theme at the next meeting.</i></p>

#	Subject	Background
25	<p>"Sound Quality in communication systems"</p> <p>Reshaped from the original themes: 'Sound Quality in Digital Meetings (#18) and 'Quality of sound in cell phone communication' (#25)</p>	<p>Topic also postponed to next meeting since Jeppe has been unable to join the meeting, and he is anchoring man in setting up the event.</p> <p>Jeppe has had initial communications to Stefan Bruhn (Dolby) and Markus Multrus (Fraunhofer), Status?</p> <p><b>Background:</b> Transmission of sound quality in communication systems (i.e. digital meetings") depends on several factors in the individual devices (headsets, speakerphones), echo cancellation, CODECS, compression algorithms, transmission solutions, etc. Even placement of the microphone close to the mouth of the speaker and the acoustic performance of the speaker/listener environments are essential. Add to that that products are getting more complex. E.g. employing several microphones per unit to ensure better performance. 'AI' in various implementations is part of this in part of the entire chain of transmission. Success in a quality transmission of sound depends on the fact that basically all elements in a cascaded effort are performing in an optimal manner.</p> <p>The current webinar theme tries to address some of these vital elements.</p> <p><b>Timing:</b></p> <ul style="list-style-type: none"> <li>• Q1 of 2024</li> </ul> <p><b>Audience:</b> Researchers and developers of solutions, audio engineers in general, and other people interested in the technical details of communication links in relation to sound quality.</p> <p><b>Potential speakers and topics:</b></p> <ul style="list-style-type: none"> <li>• Sebastian Braun - Microsoft "DNN-based speech enhancement for real-time communication"</li> <li>• Pejman Mowlae, Jabra</li> <li>• Stefan Bruhn (Dolby) or Markus Multrus (Fraunhofer) New immersive CODEC, 3GPP SA4 Codec supporting multi channels. Converts between headphones and multichannel systems.</li> </ul> <p>Mads will provide additional names for potential speakers. Tore will assist in establishing contacts to 3GPP CODEC people.</p>
26	<p>Autonomous Response to Audio</p>	<p>Postponed to next meeting due to absence of Jeremy.</p> <p>Some companies, e.g. hearing aid companies, are highly interested in how sound influences human bodies, i.e. human nerve systems. In the past, these companies frequently sent students to Roskilde Festival with equipment to measure and indicate the effects that sound had on the human body. Today, some companies instead send students to New York, so that students can experience on their own body how the surrounding sound and noise are influencing them.</p> <p>Some companies also work closely with schools on the topic. However, there are ethical aspects related to this as well, when techniques are transformed into use in other contexts, e.g. the office, at political events, etc.</p> <p><b>Potential speaker:</b></p> <ul style="list-style-type: none"> <li>• Dorothea Wendt, Eriksholm Research Lab</li> <li>• Jens Hjortkær, DTU (group of Jeremy)</li> </ul> <p>The topic is about physiological response to different stimuli. Noise is well known to create a lot of issues in that context.</p> <p>Jeremy will come with a revised plan at our next meeting.</p>

#	Subject	Background
28	Cultural, ethical, and social consequences of new use of sound	<p>How will the way we consume music/sound in the future affect the way we interact?                      What are the social consequences?                      As audio producers how do we take this into account?</p> <p>For example, future use of Auracast may also have an undesired effect of isolation people socially, since the sound transmitted directly into earbud may counteract social contact to people around. Similar effect when people use artificial vision solutions.</p> <p>Important that we also understand how to handle the negative effects of new sound solutions. Topic is probably difficult to get people to give presentations, so a panel debate may prove a more efficient way to structure the theme.</p> <p>The theme had originally been proposed by Lotte M. Klixbüll, Senior UX designer, Jabra.</p> <p>Facundo will talk to Lotte Klixbüll and at the next meeting we will try to obtain more structure on the theme. ?</p>

## Next meeting

The next meeting in the working group on “Future Sound Tech Solutions” will take place:

- **Tuesday, April 16, 2024, 14:00 – 15:00**

## Appendix 1: Participants in the meeting

Facundo Ramón	GN Hearing	Senior Research Scientist
Morten Kroman	WS Audiology	VP R&D Electronics
Birger Schneider	CHAMAJ Consult ApS	Director
Murielle De Smedt	Danish Sound Cluster	Secretariat & Communications

## Appendix 2: Events proposed and promoted by the working group

#	Title	Comments	Event type	Date
1.a	AI/Machine Learning	Workshop (Edge)	On-line	5 April, 2022
1.c	AI in signal processing		Webinar	
2	"Demant Discovery"	Start-up in dialogue with Demant	Networking event	17 March, 2022
4	Audio & privacy	Part of physical conference	Panel discussion	4 May, 2022
5	Sound Quality in Digital Meetings	<ul style="list-style-type: none"> <li>• Position paper</li> <li>• Conference session</li> </ul>	Conference	4 May, 2022
6	Multisensory Processing		Webinar	7 December 2021
7	Sustainable transformation in Audio Companies	Green footprint in sound	Webinar	25 January, 2022
9	Personalization of User Needs		Webinar	1 June, 2022
10	Data Simulation for AI		Webinar	7 June, 2022
11	Perceptual Audio Evaluation		Webinar	13 October, 2021
12	Key Note, Sound Day 2021 "The Sound of Metal"	Oscar Winning Mikkel E.G: Nielsen, Film editor & Nicolas Becker, Sound Designer	Conference, Sound Day 2021	17 November, 2021
	AI in Audio Applications	Conference event at Digital Hi-Tech Summit, Bella Center	Conference	26 October, 2022
19	AI in Audio Applications		Webinar	13 December, 2022
8	Emerging Acoustic Sensor Technologies and Applications		Webinar	14 March, 2023
14	Feedback and noise cancellation		Webinar	9 May, 2023
17	Use of sound with robotics		Webinar	23 May, 2023
27	AI in Music & Sound		Webinar	26 October 2023

### Appendix 3: List of potential Themes

Addressed or proposed in previous meetings but for the time being put on the list of potential topics until the topics are better matured - or the need better identified.

#	Subject	Background	Proposers
13	Hearables, OTC	<p>Theme is rather interesting.</p> <p>However, it is difficult to find speakers. Hearing aid companies are reluctant to contribute since the topic is too close to current business interests. It is not the products themselves but where and how such products are placed in the competitive landscape.</p> <p>University contribution is also not so likely since it is a topic mostly in the business domain.</p> <p>A discussion on what type of products is included under the term "hearables". The product term "hearables" was originally coined for a hybrid of the terms: wearable and headphone.</p> <ul style="list-style-type: none"> <li>• OTC ("over the counter" products) belongs to the category of medical products, i.e. hearing aids. The WG feels that this is a separate domain and does not fit into the general term "hearables".</li> <li>• Instead, most of the "hearables" seen to date are Bluetooth devices that use phones or PCs as the central computing unit. Focus seems to be on mobile communication, real time information services, activity tracking including biometric data, e.g. temperature, heart rate or oxygen saturation.</li> </ul> <p>Although "hearables" is a business domain for many consumer technology manufacturers, several SME's and start-ups also have managed to obtain crowdfunding and soft funding from e.g. EU R&amp;D funding and are active in the area.</p>	<p>Niels Pontoppidan Jonas Raun Hansen Morten Kroman Clément Laroche Tobias Neher Peder Costa</p>