Summary: "Future Sound Tech Solutions" – Meeting #10

Meeting # 10 in working group "Future Sound Tech Solutions" took place on December 12, 2022.

The meeting agenda was:

1. Webinars:
    a. Follow-up on proposals and ideas from meeting # 06 including additional comments and proposals.
    b. Proposals for possible speakers
    c. New themes?
2. Physical events during 2022
    a. Meetings? Workshops? Others?
3. Collaborative projects, update of proposals, indication of possible project consortia
4. Other ideas for Danish Sound Cluster activities
5. A.O.B.

Summary details

See the following pages.

Ad 1a & 1b: Proposals for Webinars

#	Subject	Background
8	"Emerging Acoustic Sensor Technologies and Applications"	Planned for execution early 2023 In the future, sensors will be integrated into all kinds of products. Influence on the traditional sensor market? Potential speakers: 1. Magnus Hemer alternative Sikko Van Reeuwijk (SIR@sonion.com), Sonion 2. Thomas Jensen, Knowles 3. HBK (Claus Blaabjerg to check)? 4. G.R.A.S. (Niels Kjærgaard/others)? 5. Sergei Rotger Griful (Eriksholm) 6. Others (e.g. Auricle-Pedro Costa)? Pedro has sent Emails to proposed speakers but received no response. Encouraged to make telephone contacts in addition. Niels will recontact Sergei Rotger Griful.
14.a 14.b	Noise cancellation Speech Prediction	**Time schedule:** February or March, 2023 Primarily a topic related to headset solutions. The two topic areas should be combined in one webinar, since it could prove difficult to find presenters for two events. Potential speakers: • Franz Maria Heuchel, DTU, (confirmed), Previously in Monica project (noise cancellation, outdoor sound field control). • Torben Christiansen, EPOS, or colleague of his may be an option ? • The automotive industry, Gorm Haldor Jørgensen, Harman in Struer in first contact appeared reluctant to participate. However, it would be nice to have someone from automotive industry to join. Pedro will recontact. • University people: e.g. professor Simon Doclo, Oldenburg University, Germany, https://hearing4all.de/en/h4a/people/principal-investigators/ Once we have accept from three possible speakers, we call a meeting with the three to discuss how each panelist see his/her focus and how that fits with the others. Pedro to take further actions.
15	Feedback cancellation/suppression/control	Focus here is feedback cancellation in e.g. PA systems (stage performance), speaker phones, hearing aids (microphone control), etc. (but not headsets) Underlying physical principles are in conflict so interesting to look into how echo cancellation can be bridged with feedback cancellation. A somewhat common denominator may be regulation control. Speakers/themes: • **Diego Caviedes Nozal**, Jabra (confirmed). Previously in Monica project (noise cancellation, outdoor sound field control). • **Meng Guo**, Oticon, (expert), Niels to provide contact details. • Acoustic echo control in speaker phones, i.e. real duplex in speaker phones? (ask e.g. Torben Christiansen, EPOS) • **Efren Fernandez Grande**, DTU. Pedro will contact and coordinate.

#	Subject	Background
16	DSP event	Broad focus on DSP. A lot can be said, but since we already had two DSP event in lae part of October 2022, there is consensus that a DSP theme should not be addressed for the next ½ year. Next DSP theme to be postponed until at least mid-2023.
17	Use of sound with robotics	Theme may include both use of sound to control robots and robots for use in test of or creation of sound.: **Potential speakers/contributors:** • **Søren Elmer**, Project Director, Odense Robotics • **Jesper Rindom Jensen**, AAU • **Jonas Jorgensen**, Assistant professor at SDU Biorobotics, **Theme:** Use of robotics in sound generation (gave a presentation on sound with biorobotics at the recent Digital HiTech Summit) • **Tore Stegenborg-Andersen**, FORCE Technology **Theme:** Loudspeaker rotation robots, for synchronizing loudspeaker positions during test. Used for listening & comparing loudspeakers loudspeaker spinner robot: • https://www.youtube.com/watch?v=B3KWJKsNFVg . • DTU use of robotics in reverberation room measurements, DTU (ask Finn Agerkvist), see also Appendix 4: Use of robotics in sound • Jens J. Tybo Jensen Pedro to contact potential speakers.
18	'Sound Quality in Digital Meetings'	The initiative is likely to take a long time to mature. The incentive is to spawn R&D work at universities and GTS institutes. It is important that we obtain more traction on the area. Two-three approaches that we should try next are: • Present the topic in the DSC network-group for entrepreneurs and see, if we can stir up some interests in this group. Possibly we should use ½ hour or so in presenting the challenges. • If this approach is successful, we could follow up with a symposium/sound meeting on the topic, or the topic be part of a symposium/sound meeting • At the upcoming calls for projects in January 2023 we could prioritize projects that fall in this category. In general, we should look for people that are likely to consider the area and bring them into our circles. **Discussion: Example:** A consortium is trying to define a pilot study aiming at understanding the biological response of people when using headsets for a longer duration in digital meetings. This is contrast to traditional hard measures of testing e.g. headset in a lab. The aim of a "biological" based approach is to better understand the cognitive load on people when joining digital meetings for a substantial part of a working day. The idea of the study project is to use appropriate biosensors to derive a better understanding. However, up to now it has proven difficult to identify SMEs to partner in such a pilot study. SMEs may have the interest but find it difficult to sponsor resources to participate. Proposals for potential partners are welcome. Torben encourage the consortium to contact the DSC secretariat for possible partner proposal. The discussion also revealed that the relatively short deadlines currently adopted for project calls are making e.g. university participation difficult. It was commented that deadlines for calls do have a certain flexibility. Contact the DSC secretariat to learn about flexibility.

#	Subject	Background
19	AI in Audio Applications	The presentations "AI in Audio Applications" give at the Hi-Tech Summit in Bella Center on October 26, 2022, will be shown again on December 13, 2022, now in a DSC webinar. Presentations: • *"Introduction"*, Birger Schneider, CHAMAJ Consult • *"Data driven AI based algorithm for speech enhancement",* Clément Laroche, JABRA • *"AI methods for enhanced voice pick-up"*, Torben Christiansen, EPOS. • *"Present and future applications of AI in hearing aids"*, Lars Bramsløw, ERIKSHOLM Research Centre .
20	AI and Sound in general	Brainstorming on activities related to uses of AI in sound: • AI related to e.g speech, Assistant professor Per Bækgaard, DTU Niels will contact Per Bækgaard. • Natural Language processing, NLP. Possibly some interactions with Dan Saattrup Nielsen, Alexandra Institute We will discuss the options in more depth at the next meeting.
21	Augmented sound in future society	How can augmented sound support our future life? How can we interact with sound ?: • When we are 'connected' ? • When we are not 'connected' ? which directions do we expect augmented sound to take, and howt do we envisage people would like to be supported by sound? • What type of help? • What service? • What features are needed? And do people actually know, what they would like to be supported on? Some universities are today visiting 'Meta reality Labs" to learn about and get inspired of new directions. Can we use different kinds of user groups to help in coming up with answers to support Danish sound industry? Ensure that we remain in the forefront of development, and who should help? Can we identify potential speakers who could assist in opening our minds for future directions of augments sound? At the next meeting, we will continue brainstorming this theme, since it is probably one of the most import directions for the future of sound tech solutions.

Ad 2: Physical Events

Ad 3: Collaborative projects

New round of calls for projects are planned for January 2023

Next meeting

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

- **Monday January 23, 2023 14:00 to 15:00**

Appendix 1: Participants in the meeting

Clément Laroche	GN Audio, Jabra	Senior Research Scientist
Morten Kroman	WS Audiology	VP R&D Electronics
Niels Pontoppidan	Eriksholm Research Centre	Research Manager
Tobias Neher	SDU, Klinisk Institut	Professor
Tore Stegenborg-Andersen	FORCE Technology	Senior Researcher
Birger Schneider	CHAMAJ Consult ApS	Director
Pedro Costa	Danish Sound Cluster	Project Manager
Torben Vilsgaard	Danish Sound Cluster	CEO

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	• Position paper • Conference session	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, 2002
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

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
13	Hearables, OTC	Theme is rather interesting. However, 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. University contribution is also not so likely since it is a topic mostly in the business domain. 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. • OTC ("over the counter" products) belongs to the category of medical product, i.e. hearing aids. The WG feels that this is a separate domain, and does not fit into the general term "hearables" • 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. 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&D funding, and are active in the area.

Appendix 4: Use of robotics in sound

Figure 1: Use of robotics (Universal Robots) in measurements in Reverberation Room, DTU

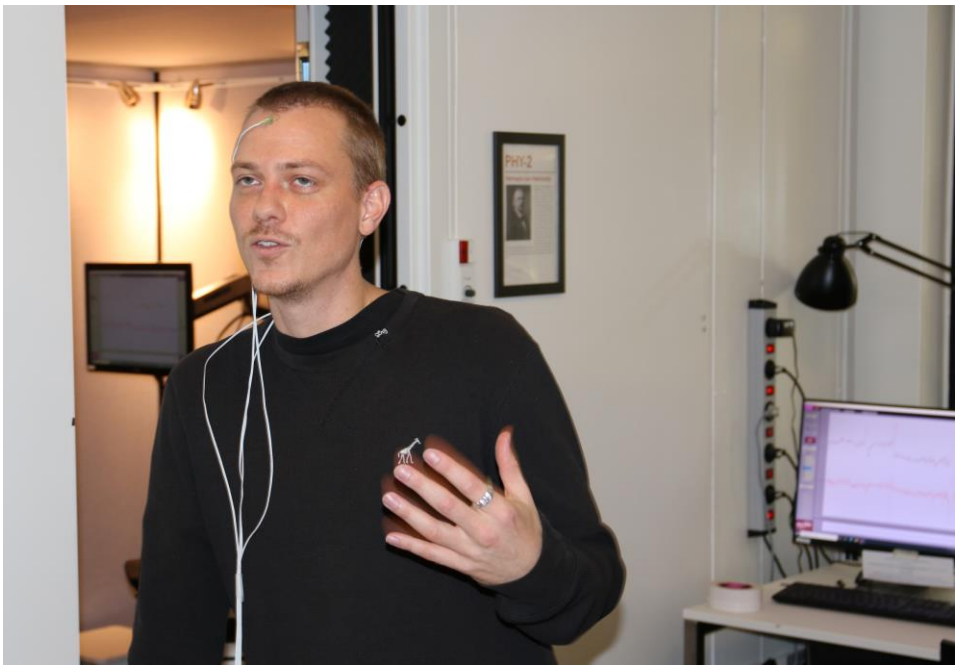

Figure 2: Example of using biosensors in sound experiments, DTU.