



D7.8 Third Open Access Data Release

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3D-games for TUNing and lEarnINg about hearing aids



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Table of Contents

Abbreviations and Acronyms.....	4
Executive summary.....	5
Section 1: INTRODUCTION.....	6
Section 2: Data Types and Repositories (from D7.9)	7
2.1: Software (D1).....	7
2.2: Subjects' data (D2).....	7
2.3: Scientific publications (D3)	8
2.4: Dissemination material (D4)	8
2.5: Data Repositories.....	8
2.5.1: Website (DR1).....	8
2.5.2: Zenodo (DR2).....	8
Section 3: M12 Open Access Research Data Release	9
3.1: D1.3 - Demonstration and testing platforms, with documentation	9
3.2: D3 - Scientific publications.....	9
3.3: D4 - Dissemination materials.....	10
References.....	11



Abbreviations and Acronyms

3DTI	3D Tune-In
DMU	De Montfort University
EU	European Union
GN	GN Hearing
ICL	Imperial College London
M	Month (e.g. M12 -> Month 12)
NLK	Nerlaska, S.L.
Reactify	Reactify Music
SME	Small and Medium-sized Enterprise
UMA	University of Malaga
UNott	The University of Nottingham
VIA	Vianet
WP	Work Package
XTeam	XTeam Software Solution



Executive summary

This is the public deliverable D7.8 Third Open Access Data Release, of the H2020 project 3D Tune-In (ICT - 644051). This work was carried out as part of WP7 Project Management.

3D Tune-In (3DTI) takes part in the Open Access Research Data Pilot which aims to improve and maximise access to and re-use of research data generated by projects. D7.9 – Data Management Plan (Picinali & Wedekind, 2015) submitted in October 2015, outlined the project's approach towards making research data available in the public domain. D7.8 – Third Open Access Data Release describes the content and location of the third and final release of open access research data within the 3D Tune-In project in M36.

Download links to the 3D Tune-In project Open Access Research Data releases can be found at the following link: <http://www.3d-tune-in.eu/open-access>



Section 1: INTRODUCTION

This is the public deliverable D7.8 Third Open Access Data Release, of the H2020 project 3D Tune-In (ICT - 644051). This work was carried out as part of WP7 Project Management.

As outlined in Article 29.3 of the 3DTI Grant Agreement, beneficiaries must deposit project data in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate data free of charge.

Data includes associated metadata needed to validate the results presented in scientific publications, and any other kind of data as specified in the Data Management Plan (DMP) outlined in deliverable D7.9 (Picinali & Wedekind, 2015). Moreover, beneficiaries must provide information (via the repository) about tools and instruments necessary for validating the results (and - where possible - provide the tools and instruments themselves).

This does not change the obligation to protect results, adhere to confidentiality and ethics considerations, security obligations or the obligations to protect personal data. As an exception, beneficiaries do not have to ensure open access to specific parts of their research data if this can compromise the achievement of the action's main objectives, as described in Annex 1. In this case, the data management plan must contain the reasons for not giving access.

Following D7.9, this deliverable describes the third open access research data release within the 3D Tune-In project. The project's approach towards data management is outlined in close accordance with the EU's Guidelines for Data Management (http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm).



Section 2: Data Types and Repositories (from D7.9)

For simplifying the reading of this report, and avoiding having to refer continuously to another document, the relevant information from the updated version of Section 2 in D7.9 – Data Management Plan (Picinali & Wedekind, 2015) has been reiterated here.

3D Tune-In will produce four types of data (D1-2-3-4) to be included in the Open Access Research Data Pilot.

2.1: Software (D1)

The software production of 3DTI is divided into three separate stages. Firstly, all partners will work towards the creation of a 3D Tune-In Toolkit, then this will be used to create 5 separate applications, and each application will be linked with a specific commercial partner and involve all the academic partners.

- D1.1 The Toolkit will serve as a basis for building specific applications, and will be shared as open source software. Once ready, the Toolkit, including relevant documentation, will be made available to the public, as described in Sections 3 and 4 of this report.
- D1.2 In order to address the concerns of the commercial partners related to sharing sensitive information about their products and services (e.g. GN Hearing sharing sensitive information about their hearing aid devices) and potential clashes in the market in terms of competitors having similar tools, the 3DTI applications will not be open source, and will not be part of the Open Access Research Data Pilot.
- D1.3 During the project, several demonstration and testing platforms will be created. These will include simple interfaces to use the Toolkit, testing platforms to evaluate its various functionalities, and tools/interfaces for demonstration purposes. These, including relevant documentation, will be made available to the public, as described in Sections 3 and 4 of this report. Data will be made available to the public in accordance with the needs of 3DTI's exploitation strategy and legal framework(s) of the Applications and Toolkit.

2.2: Subjects' data (D2)

Within 3DTI three separate activities will be carried out in which individuals will be involved for evaluation and testing purposes.

- D2.1 Qualitative analysis for the participatory design stage (WP1).
- D2.2 Quantitative analysis for the technical development stage (WP2).
- D2.3 Quantitative and qualitative analysis for the evaluation stage (WP4).

Considering the sensitive nature of this data type, special attention will be paid in sharing it with the general public. In particular, data in which individuals could be potentially recognised (e.g. qualitative analysis for the participatory design and evaluation stages) will not be included in the Open Access Research Data Pilot. However, it is important to note that once data has been anonymised, it would not be possible to be withdrawn. Participants can withdraw from a study at any time (as stated in the consent form) but by providing consent and completing the study/questionnaire they have agreed for their data to be anonymised and used for the research. Data can only be withdrawn if it can be linked to a specific participant. Advice from the Quality Manager, Ethics Coordinator and external Ethics Advisor will be sought before making public any data within this category (D2).



2.3: Scientific publications (D3)

All scientific publications produced within the 3DTI project will be included in the Open Access Research Data Pilot where this does not contravene any copyright issues and will be made publicly available.

2.4: Dissemination material (D4)

All dissemination material produced within the 3DTI project will be included in the Open Access Research Data Pilot, and will be made publicly available.

2.5: Data Repositories

3DTI will employ two separate data repositories in order to comply with the Open Access Research Data Pilot (as described below DR1 and DR2).

Before the public release, every partner will be responsible for archiving the data they produced on local hard-drives, which will be regularly backed up. Each partner has the obligation to conduct a monthly back-up of all analysis data and resources produced during the project lifecycle. Furthermore, a RedMine portal (access only for project partners) hosted at UMA was employed for storing and archiving project data and documentation from all partners (<http://150.214.59.100/redmine/projects/dti>), and a GitHub open repository was used for the 3D Tune-In Toolkit code (https://github.com/3DTune-In/3dti_AudioToolkit/tree/develop).

2.5.1: Website (DR1)

The 3DTI website (<http://www.3d-tune-in.eu>) has been online since July 2015, and contains an *Open Access Research Data* section, as well as a *Downloads* section. The 3DTI website will be locked at the end of the project (May 2018), and will be kept available at the same URL for 7 years after that date (10 years from the project start date).

2.5.2: Zenodo (DR2)

Zenodo (<http://zenodo.org/>) is an open dependable home for the long tail of science, enabling researchers to share and preserve any research outputs in any size, any format and from any science. An account in Zenodo has been created for 3DTI, and the repository will be used for sharing 3DTI data.



Section 3: M36 Open Access Research Data Release

The following data has been released in DR1 and DR2 between M24 and M36.

3.1: D1.1 - The 3D Tune-In Toolkit

The Toolkit served as a basis for building specific applications, and it has now been shared as open source software.

The 3D Tune-In Toolkit can be found in the 3D Tune-In project GitHub page, at the following link: https://github.com/3DTune-In/3dti_AudioToolkit

Within this release, a zip file containing the 3D Tune-In Toolkit version updated to April 2018 has also been included.

3.2: D1.3 - Demonstration and testing platforms, with documentation

The 3D Tune-In Toolkit Test Apps, both for binaural and loudspeaker spatialisation, have been released in their final versions. They can now be downloaded for Windows, Mac and Linux operative systems. They perform real-time binaural and loudspeaker spatialisation with multiple sources, simulating different virtual spaces, and emulating the presence of fully configurable hearing loss and hearing aids.

Within this release, the following items are included:

- Binaural Test Application for Windows
- Binaural Test Applications for Mac
- Binaural Test Applications for Linux (both Red Hat and Debian releases)
- Speaker Test Applications for Windows
- Speaker Test Application for Mac
- Resources Management Package for Windows
- Set of HRTF in 3DTI format - seven selected HRTF from LISTEN database (Andreopoulou & Katz, 2016) plus a few synthetic ones
- Set of BRIR in 3DTI format (*Small, Medium and Large* rooms)
- Look-up table for near-field filter simulation in 3DTI format
- HRTF Converter from sofa to 3DTI (HRTF using SimpleFreeFieldHRIR convention)
- BRIR Converter from sofa to 3DTI (BRIR using SimpleFreeFieldHRIR convention)

All programs are released as installable applications, not open-source.

The Binaural Test apps are released in their v2.9, while the Loudspeaker Test apps are in v2.2. The following documentation is provided together with each of the apps:

- A user guide explaining all the elements of the interface
- A features guide, explaining what the app does, but without giving details of the algorithms inside, as they will be published in scientific journals.

3.3: D3 - Scientific publications

Seven scientific papers were published between M24 and M36 within the 3D Tune-In project and are all included in this release. An eighth publication is currently being prepared (Journ3.1), and only the pre-prints are included in this release.



- [Conf3.1] Cuevas-Rodriguez, M., Gonzalez-Toledo, D., de La Rubia-Cuestas, E., Garre, C., Molina-Tanco, L., Reyes-Lecuona, A., Poirier-Quinot, D. & Picinali, L. (2017) An open-source audio renderer for 3D audio with hearing loss and hearing aid simulations. Proceedings of the 142nd Audio Engineering Society Convention, Berlin Germany, May 2017.
- [Conf3.2] Picinali, L., Wallin, A., Levtoy, Y. & Poirier-Quinot (2017) Comparative perceptual evaluation between different methods for implementing reverberation in a binaural context. Proceedings of the 142nd Audio Engineering Society Convention, Berlin Germany, May 2017.
- [Conf3.3] Patel, H., D’Cruz, M. & Hallewell, M. (2017) The iterative design and evaluation of gaming applications to facilitate the use of appropriate hearing aid functionalities in different acoustic contexts. 13th European Federation of Audiology Societies Congress 2017, Interlaken, Switzerland, June 2017.
- [Conf3.4] D’ Cruz. M., Patel, H., Hallewell, M., Salanitri, D., Velzen, J. and Picinali, L. (2017) Novel 3D games for people with and without hearing loss 3D Tune-In outcomes 3D Tune-In Toolkit. 9th International Conference on Virtual Worlds and Games for Serious Applications, 6 – 8 September 2017, Athens, Greece.
- [Conf3.5] Hallewell, M., Patel, H., Salanitri, D., D’Cruz, M., Levtoy, Y., & Simeone, L. (2017). 3D Tune-In: Evaluating applications designed to support hearing aid users in the customisation of their hearing experience. In the proceedings of the British Academy of Audiology 14th Annual Conference, Bournemouth, UK, 15th-17th November.
- [Conf3.6] Salanitri, D., Patel, H., Hallewell, M., D’Cruz, M., Tamascelli, S., Linares, T., Vallina, B. (2017). 3D Tune-In (3DTI): Evaluation of games to improve knowledge of hearing aids in children with and without hearing loss. In the proceedings of the British Academy of Audiology 14th Annual Conference, Bournemouth, UK, 15th-17th November.
- [Conf3.7] Cuevas-Rodriguez, M., Gonzalez-Toledo, D., de La Rubia-Cuestas, E., Garre, C., Molina-Tanco, L., Reyes-Lecuona, A., Poirier-Quinot, D. & Picinali, L. (2018). The 3D Tune-In Toolkit – 3D audio spatialiser, hearing loss and hearing aid simulations. In Proceedings of the IEEE 4th Workshop on Sonic Interactions for Virtual Environments, IEEEVR 2018, Reutlingen, Germany, April 2018.
- [Journ3.1] Steadman, M., Kim, C., Lestang, J., Goodman, D. & Picinali L. (TBC). Effects of gamification and active listening on short-term sound localization training in virtual reality. To be submitted to PlosONE. Expected publication date: Summer 2018. Pre-print available here: <https://www.biorxiv.org/content/early/2017/10/23/207753>

3.4: D4 - Dissemination materials

Within this category, the following data has been released:

- 3DTI_Article_AoHL.pdf – article on the 3D Tune-In project (*Tuning into 3D Games*) written by the project coordinator, published in the Action on Hearing Loss magazine in June 2017.
- 3DTI_Article_BAA.pdf – article on the 3D Tune-In project (*The design of digital applications to facilitate the use of appropriate hearing aid functionalities in different acoustic contexts*) written by Harshada Patel (UNott), published in the BAA Magazine in Spring 2017.
- 3DTI_Article_BSHAAPeople.pdf – article on the 3D Tune-In project (*3D-games for TUNing and lEarnINg about hearing aids*) written by Emily Frost (ICL) and the project coordinator, published in the British Society of Hearing Aid Audiology (BSHAA) People magazine in February 2018.



- 3DTI_PromoVideo.mp4 – the 3D Tune-In project promo video created in collaboration with Kindea Labs (available also at https://www.youtube.com/watch?v=g_FsF28bsmw&t=4s)
- 3DTI_V&AEventPoster.pdf – the poster/flyer for the final 3D Tune-In workshop/event held at the Victoria&Albert museum in London on the 18th April 2018.

References

- [1] Andreopoulou, A., & Katz, B. F. G. (2016) Subjective HRTF evaluations for obtaining global similarity metrics of assessors and assessees. *Journal on Multimodal User Interfaces*, 10(3), 259–271. <https://doi.org/10.1007/s12193-016-0214-y>
- [2] Picinali, L. and Wedekind, G. (2015) Data Management Plan. Public deliverable D7.9 of the European funded H2020 3D Tune-In project (ICT-644051) <http://www.3d-tune-in.eu>. *October 2015*