

DMP LUCAS VAN BELLE – KUL PDM

ADMIN DETAILS

Data Management Plan Name: DMP LUCAS VAN BELLE – KUL PDM

Project Identifier: PDMT1/23/025

Project Title: Sound perception based intelligent modeling and realization of innovative vibro-acoustic metamaterial solutions

Principal Investigator / Researcher: Lucas Van Belle

Institution: KU Leuven (KUL)

Template: KU Leuven BOF-IOF

1. GENERAL INFORMATION

Name applicant

Lucas Van Belle

Project

Number & title:

PDMT1/23/025 - Sound perception based intelligent modeling and realization of innovative vibro-acoustic metamaterial solutions

Abstract:

A growing awareness has emerged about the negative impact of noise on our health and well-being. However, classical noise and vibration solutions are typically heavy and bulky, which fits less and less in our modern-day striving for greener, lightweight design. Worse still, since lightweight design generally deteriorates the noise and vibration behavior, there is a strong need for innovative solutions.

In this context, vibro-acoustic metamaterials have appeared as promising candidates. Their superior performance arises from the sub-wavelength incorporation of resonant inclusions in a host structure, resulting in targeted frequency ranges of high sound insulation. However, the unconventional frequency content changes they induce may also have adverse sound perception effects, despite their sound insulation improvements. While the sound perception impact of these metamaterials is yet to be understood, the opportunity arises to include sound perception in metamaterial modelling and design. Not only can this enable discovering beneficial sound quality shaping potential, it may also benefit the often expensive metamaterial models by reducing details which lead to non-perceivable differences.

The goal of this project is to gain fundamental insights in the sound quality impact of vibro-acoustic metamaterials and exploit these in their modelling and design, in order to make the shift towards a novel generation of sound perception based intelligently designed metamaterial solutions.

2. RESEARCH DATA SUMMARY

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

Generated experiment-related data (digital)

Type of data	Format	Volume	How created
Geometric dimensions and structural material properties of samples and demonstrators (numerical)	Spreadsheets (.csv), structured text (.txt)	< 100 MB	Weighing, geometric calliper measurements, modal updating, Microsoft Office Excel, Notepad++
Raw and processed acoustic and vibration measurements (numerical)	Databases (.lms, .mat, .unv), graphs (.fig)	< 10 GB	In-lab vibration & acoustic measurements using Siemens Test.Lab and Polytec software
Images and videos (multimedia)	Image (.png), video (.mp4)	< 1 GB	Camera images/videos of samples and test setups
Metadata describing measurements setup and procedures (textual)	Text (.txt, .docx, .pptx, .pdf)	< 100 MB	Notepad++, Microsoft Office OneNote, Microsoft Office Word, Microsoft Office PowerPoint

Generated simulation-related data (digital)

Type of data	Format	Volume	How created
Vibro-acoustic (numerical) simulation models and input files (model)	Commercial finite element software specific formats (.sim, .fem, .afm, .prt, .mph), model input files (.bdf, .dat, .m), model matrices (.mat)	< 100 GB	Siemens Simcenter 3D, Siemens NX, COMSOL Multiphysics, Matlab
Raw and processed simulation data (numerical)	Simulation result files (.pch, .op4, .mat, .unv, .csv) Databases (.mat), graphs (.fig)	< 100 GB	Siemens Simcenter 3D, Siemens NX, COMSOL Multiphysics, Matlab
Images and animations (multimedia)	Image (.png), video (.gif, .mp4)	< 10 GB	Matlab
Metadata describing models and simulations setup and procedures (textual)	Text (.txt, .docx, .pptx, .pdf)	< 100 MB	Notepad++, Microsoft Office OneNote, Microsoft Office Word, Microsoft Office PowerPoint

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

- NA

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, refer to specific datasets or data types when appropriate and provide the relevant ethical approval number.

- No

Will you process personal data? If so, please refer to specific datasets or data types when appropriate and provide the KU Leuven or UZ Leuven privacy register number (G or S number).

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)? If so, please comment per dataset or data type where appropriate.

- Yes

The work in this project can result in research data which has potential for tech transfer and valorisation. Novel models and methodologies will be developed which interact with and/or are based upon existing models and methodologies of the hosting KU Leuven Division LMSD. The IP of the latter lies with KU Leuven and the Division LMSD and will also hold for the further developments made in this project.

The KU Leuven Division LMSD has expertise in and an excellent track record regarding tech transfer and valorisation which will be leveraged upon in this project. The research manager of the Division LMSD Bert Pluymers will be consulted regarding these IP aspects.

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material or Data transfer agreements, Research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

It is noted that novel models and methodologies will be developed, which interact with and/or are based upon existing models and methodologies of the hosting KU Leuven Division LMSD research group. In addition, the work in this project fits in the research of the hosting KU Leuven Division LMSD, where related activities within other projects are developed and can leverage upon the developments in this project to enhance interaction. The IP of the models and methodologies of the hosting research group lies with KU Leuven and the Division LMSD and will also hold for the further developments made in this project and for future developments based on these. Reference to existing models and methodologies of the hosting KU Leuven Division LMSD will be made by citing the associated journal paper publications.

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

It is noted that novel models and methodologies will be developed, which interact with and/or are based upon existing models and methodologies of the hosting KU Leuven Division LMSD research group. In addition, the work in this project fits in the research of the hosting KU Leuven Division LMSD, where related activities within other projects are developed and can leverage upon the developments in this project to enhance interaction. The IP of the models and methodologies of the hosting research group lies with KU Leuven and the Division LMSD and will also hold for the further developments made in this project and for future developments based on these. Reference to existing models and methodologies of the hosting KU Leuven Division LMSD will be made by citing the associated journal paper publications.

3. DOCUMENTATION AND METADATA

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, codebook.tsv etc. where this information is recorded).

Metadata on experiment-related data

- Test samples & demonstrators: an overview of the samples & demonstrators (named and labelled) will be kept in a dedicated lab notebook (e.g. using OneNote as ELN). In case a simulation model counterpart of the test sample or demonstrator has been created, the simulation model filenames will be included as well.
- Geometric dimensions and structural material properties: a measurement report per dataset will describe the procedural information on how dimensions and properties have been acquired and what the units and definitions of the measured variables are.
- Raw vibration and acoustic measurements: a measurement report per measurement dataset will detail the software parameters & instruments settings, dimensions, measurement methodology and procedural information on how the data was collected, required sensor & exciter labels and positions as well as units of measurements and calibration settings. This metadata is by default saved in the data files generated by the measurement software.
- Processed vibration and acoustic measurements: a readme file.txt will accompany the dataset, describing the labels and definitions of variables, the units of measurements and how the raw data have been processed.
- Photos of the measurement setup with clarifying file names, date and timestamps will be added as additional clarification.

Metadata on simulation-related data

- Vibro-acoustic simulation models and raw & processed simulation result data: a readme.txt file will describe the parameters, definitions, units and software settings used to construct the models/ obtain the result data. Modelling assumptions and underlying equations will be clearly reported such that each simulation result is accompanied with a description of the validity range of the model/ result data. This information is kept either in the CAE file format, or in an accompanying txt file.

In addition to the metadata per datatype as outlined above, a readme.txt file will be created which describes the structure of the dataset.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify which metadata standard will be used. If not, please specify which metadata will be created to make the data easier to find and reuse.

- Yes

Where possible, the EngMeta metadata standard will be used.

Otherwise, although not formalized, state-of-practice standards will be used regarding metadata. On the one hand, standardized CAE file format information and structure will be used. On the other hand, when working with transferable neutral text formats for experimental and simulation data, common engineering practice is used, deploying tabulated structures with clear column and row headers. A clear folder structure will be adopted for the data storage, in accordance with the different tasks carried out during the project. In every (sub)directory, a readme file will list all the present subdirectories and files as well as where the data is used and stored. Whenever publication or sharing of a dataset would be considered, it will be re-evaluated if an applicable metadata standard is available and can be applied to enhance sharing.

4. DATA STORAGE & BACK-UP DURING THE RESEARCH PROJECT

Where will the data be stored?

- Shared network drive (J-drive)
- Personal network drive (I-drive)
- OneDrive (KU Leuven)
- Sharepoint online

Above listed options are currently used and envisioned. In the context of BADM service of KU Leuven, the applicant is setting up an appropriate data storage approach for the hosting research group. When further matured, this approach will also be adopted, selecting the right storage option for the right type of data at the right moment during/after the project.

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution
- Personal back-ups I make (specify below)

The cloud-based and ICTS storage solutions are backed-up as part of the offered services. Backups from local desktop file storage to personal KU Leuven network drive will be regularly performed (e.g. using SyncBackFree backup software to mirror). In addition, back-up snapshot copies on personal external hard drives will allow to recover data files as additional redundancy.

Is there currently sufficient storage & backup capacity during the project? If no or insufficient storage or backup capacities are available, explain how this will be taken care of.

- Yes

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

On the one hand, in this project no sensitive personal data will be used. On the other hand, both cloud and ICTS based storage solutions are only accessible via proper credentials which are centrally managed. Hence, unauthorised access via legal means is not possible.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

In case expenses are needed, part of the allocated project budget can be used. However, this is currently not expected.

5. DATA PRESERVATION AFTER THE END OF THE RESEARCH PROJECT

Which data will be retained for 10 years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

- All data will be preserved for 10 years according to KU Leuven RDM policy

Particular focus for data preservation will be on:

- Data at the basis of publications such as journal papers, conference papers and presentations or posters. All data related to Open Access publications will be retained on Public Repositories (like RDR, Lirias).

- Developed models and measurement datasets which are likely to be reused in the research unit for future research and/or valorisation activities and for future research of the researcher. Potentially large (intermediate and non-processed/raw) result and measurement files will be discarded to reduce required storage space if the simulation models and experiments allow to recalculate/remeasure the results easily and at low cost and time.

Where will these data be archived (stored and curated for the long-term)?

- Large Volume Storage (longterm for large volumes)
- Shared network drive (J-drive)
- KU Leuven RDR

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

Expected costs for storage beyond project duration will be limited and covered by the research group.

6. DATA SHARING AND REUSE

Will the data (or part of the data) be made available for reuse after/during the project? Please explain per dataset or data type which data will be made available.

- Yes, as restricted data (upon approval, or institutional access only)
- Yes, as open data
- Yes, as embargoed data (temporary restriction)

Different data availability schemes will be considered, assuming “as open as possible, as closed as needed”, depending on the aspects discussed in Section 2. For embargoed and restricted data, metadata describing the content of datasets will be openly accessible.

If access is restricted, please specify who will be able to access the data and under what conditions.

For now, the data sharing policy “upon reasonable request” is envisioned (assuming “as open as possible, as closed as needed”). The precise procedures to evaluate access requests and to control access such as end-user agreements, data sharing agreements will have to be evaluated still.

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain per dataset or data type where appropriate.

- No

Where will the data be made available? If already known, please provide a repository per dataset or data type.

- KU Leuven RDR (Research Data Repository)
- Other data repository

Relevant datasets will be made available via KU Leuven RDR, Zenodo or similar.

When will the data be made available?

- Upon publication of research results

Publication related data will be made available upon publication of the results. Consolidated datasets can be made available at the end of the project. For the latter, the need for a possible embargo/restrictions will be evaluated, as clarified in the first point of this section.

Which data usage licenses are you going to provide? If none, please explain why.

- CC-BY 4.0 (data)
- Data Transfer Agreement (restricted data)
- Other (specify below)

The datasets uploaded as open access datasets will be provided under a CC BY-NC-ND 4.0 license. For embargoed/restricted datasets, Data Transfer Agreements will be considered if appropriate.

Do you intend to add a persistent identifier (PID) to your dataset(s), e.g. a DOI or accession number? If already available, please provide it here.

- Yes, a PID will be added upon deposit in a data repository

What are the expected costs for data sharing? How will these costs be covered?

Possible costs linked to open repositories and costs related to preparing data and uploading it, if any, will be covered by the project budget.

7. RESPONSIBILITIES

Who will manage data documentation and metadata during the research project?

The applicant will be the responsible for data documentation & metadata.

Who will manage data storage and backup during the research project?

The researcher will be responsible for data storage & back up during the project, with support of KU Leuven central IT and local IT (SET-IT). The applicant has received information at the start of this project on the guidelines which apply in the hosting research group. For the implementation, the applicant can rely on the support of the Division LMSD's research manager Bert Pluymers.

Who will manage data preservation and sharing?

The applicant will be responsible for ensuring data preservation and reuse. Towards the end of the project, responsibility for long-term data preservation and reuse will be assigned in agreement with the KU Leuven Division LMSD research manager Bert Pluymers.

Who will update and implement this DMP?

The applicant bears the end responsibility for updating & implementing this DMP.