Plan Overview

A Data Management Plan created using DMPonline.be

Title: C1 SwarmNet

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Principal Investigator: n.n., n.n., n.n.

Data Manager: n.n., Sam Michiels, Jonathan Oostvogels

Project Administrator: Sam Michiels, Jonathan Oostvogels

Affiliation: KU Leuven (KUL)

Template: KU Leuven BOF-IOF

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Data Manager: n.n. n.n., Sam Michiels https://orcid.org/0000-0002-3866-5425, Jonathan Oostvogels

Project abstract:

The SwarmNET project seeks to revolutionize multi-hop wireless networking and robotics control by achieving deterministic, low-latency communication (with a targeted 1000x reduction compared to prior multi-hop networks). The approach involves a miniaturized solution for pervasive deployment on sensorized robotic units. The project explores a symbol-synchronous modulation scheme using Pulse Position Modulation on mmWave, validating it with commercial kits at reduced speed, and translating it to a crystal-free Single Chip Micro Mote (SCμM) chip. Proof-of-Concept involves legged-wheeled hybrid robots interacting as a single virtual entity. With a focus on real-world impact, SwarmNET collaborates internationally with institutions like UC Berkeley (USA) and INRIA (France), leveraging funding for additional proposals.

ID: 210081

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C1 SwarmNet

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.

Dataset name / ID	Description	New or reuse	Digital or Physical data	Data Type	File format	Data volume	Physical volume
		*Indicate: **N**(ew data) or E(xisting data)*	Indicate: **D**(igital) or **P**(hysical)	Indicate: **A**udiovisual **I**mages **S**ound **N**umerical **T**extual **M**odel **SO**ftware Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
Design data/1	FPGA designs	N	D	M, SO	VHDL, Verilog	<1GB	KUL Gitlab
Design data/2	PCB designs	N	D	M	PCB files, Gerber files	<1GB	KUL RDR
Design data/3	Robot designs	N	D	M	Schematics, Sequence diagrams	<1GB	KUL RDR
Code/1	Algorithms and protocols	N	D	M, T, SO	Pseudocode, sequence diagrams	<1GB	KUL RDR, Open Access journals and conference proceedings
Code/2	Software	N	D	M, SO	Source code (Matlab, C, C++)	<1GB	KUL Gitlab
Data/1	Evaluation results and performance data (throughput, latency, power consumption)	N	D	T, M, N	Raw datasets (text files, graphs, time series data)	<100GB	KUL RDR
Documentation/1	Supporting documents	N	D	T	Word and PDF files	<1GB	KUL RDR

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:

At this moment, we are not relying on existing data.

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

We are only relying on wireless network protocol data (e.g. throughput, latency, jitter, packet delivery rate, bit-error rate, power consumption) collected from prototypes in our lab.

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

In the long term (when evaluation results confirm current hypotheses, the resulting network technology is applicable in a wide variety of applications, e.g. wireless control).

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

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

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).

All collected data and produced designs, algorithms and code will be documented by the researcher conducting the experiment (e.g. researchers in the context of their PhD):
During the project:
- Source code and supporting documentation will reside within KU Leuven's existing GitLab set-up.
- Time series and tabular data will reside within support infrastructure built on Amazon Web Services (e.g. InfluxDB and PostgresQL installations) set up and maintained by the author.
- Publication materials will be stored within KU Leuven's OneDrive cloud storage.

After the project:
- Exported versions of the data types mentioned above will be archived using the Large Volume Storage facility provided by KU Leuven.

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

Research data will be stored in KU Leuven Research Data Repository, which applies the DataCite metadata standard.
To the extent necessary, specific meta-data of the gathered network dataset will be created manually for internal use. A meta-

data dictionary will be created and saved as a readme file with the dataset. Each dataset will be assigned a unique number (consisting of the creator of the data
and the date of data capturing, also serving as file name). All adaptations to and
processing of the dataset will be documented. Major changes will lead to a new
version of the dataset which will be indicated using a hierachical numbering scheme
(v1.1).
The sensor data will be gathered in standard csv text format.
As far as we know, no other acknowledged meta-data standards are available. The DDI standard (Data Documentation Initiative) will be used in sofar it is suitable for the specific dataset.
The text data (e.g. the transcribed interviews) will be formatted in standard pdf format.

Data Storage & Back-up during the Research Project

Where will the data be stored?

- Large Volume Storage
- Other (specify below)
- ManGO
- Sharepoint online
- OneDrive (KU Leuven)

Time series and tabular data will reside within support infrastructure built on Amazon Web Services
(e.g. InfluxDB and PostgresQL installations) set up and maintained by the responsible researchers (e.g. in the context of their PhD Project). Source code
We will follow the KU Leuven storage guidelines (https://icts.kuleuven.be/storagewijzer/en).

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution
- Other (specify below)

Amazon Web Services (e.g. InfluxDB and PostgresQL installations) provide backup guarantees.

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

For the centrally stored data at KU Leuven, we will use the Backup-as-a-Service facilities of KU Leuven (using TSM technology), which provides a daily automatic back up service (cfr. https://icts.kuleuven.be/sc/english/large-volume-storage).

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

KU Leuven central ICTS facilities provide professional storage and backup services, and data management guidelines and tools to support the project consortium (
https://www.kuleuven.be/english/research/integrity/practices/datamanagement).
Access control (authentication, authorization, accounting): Online data access authorization is limited to specific accounts that will be defined for consortium members who will use the data set for their research.
The gathered data will be protected with state-of-the-art technologies for identity and
access management. For risk management, a restrictive need-to-know access policy is enforced that limits data access to only these researchers who need the data for their research activities. Access to the raw data is limited to the project co-PIs (all KU Leuven staff):
(Danny Hughes, Sofie Pollin, Alexander Badri-Sprowitz).

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

All data will be archived locally at KU Leuven. Costs related to long-term archival:
- expected size of the database (<1 TB)
- estimated costs: EUR 95,- per year (cfr. https://icts.kuleuven.be/sc/english/large-volume-storage).
Costs related to long-term archival will be covered by the PIs reserve funds.

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

The gathered data will be retained for scientific purposes (cfr. GDPR art. 17.3,d);
erasure of the data will make it impossible to continue the related research activities at KU Leuven.

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

- KU Leuven RDR
- Large Volume Storage (longterm for large volumes)

We will check and use the KU Leuven storage services as the project evolves (cf. https://icts.kuleuven.be/storagewijzer/en).

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

All data will be archived locally at KU Leuven.
Costs related to long-term archival will be covered by the PIs reserve funds.

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)

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

Research partners will be enabled to access and use the data. The project's PI (Danny Hughes) will act as gatekeeper.

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)

When will the data be made available?

- Upon publication of research results

Which data usage licenses are you going to provide?

If none, please explain why.

- MIT licence (code)

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.

- No

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

No idea yet.
Costs related to long-term archival will be covered by the PIs reserve funds.

Responsibilities

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

The individual researchers conducting experiments, in coordination of the project's PI (Danny Hughes).

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

The individual researchers conducting experiments, in coordination of the project's PI (Danny Hughes).

Who will manage data preservation and sharing?

The individual researchers conducting experiments, in coordination of the project's PI (Danny Hughes).

Who will update and implement this DMP?

The project's coordination team: Sam Michiels, Jonathan Oostvogels and Danny Hughes.