DMP JONAS ADRIAENSSENS

Project Name Jonas Adriaenssens (FWO DMP)
Project Identifier u0139121
Grant Title 1S89722N
Principal Investigator/Researcher Jonas Adriaenssens
Project Data Contact 0474774496; jonas.a323@gmail.com
Description Rapid diagnostic testing at the site of the patient, so-called point of care testing, is essential to provide healthcare when a fully equipped laboratory is not accessible. These POC diagnostics are crucial for developing countries, as they could save millions of lives each year by early diagnosis of for example malaria or the Covid-19 virus.

However, current solutions lack miniaturization because of the need for external equipment to operate the device, also known as active microfluidics. On the other hand, passive microfluidics overcome this problem by using porous substrates to autonomously handle liquid flow by capillary action. The most common passive diagnostics right now are lateral flow assays, which use a single strip of paper, but they lack sensitivity as it's difficult to integrate multistep protocols. Therefore, our group has recently developed a new method to fabricate passive devices by depositing liquid binders on a powdered build material in a layer-by-layer fashion. The resulting macroporosity and altered surface chemistry creates 3-dimensional channels for autonomous liquid flow.

The final goal will be to create a hybrid POC device containing a 3D printed capillary pump to drive liquid flow through a classic microfluidic chip. This will be achieved by (1) designing and modeling the fundamental parts for a single operation channel, followed by (2) their fabrication and (3) characterization in a feedback loop. Eventually, (4) multiple channels will be integrated into a multistep proof-of-concept.
Institution KU Leuven

1. GENERAL INFORMATION

Name applicant
Jonas Adriaenssens

FWO Project Number & Title
1S89722N
Autonomous diagnostics by combining 3D printed passive pumps and conventional microfluidics.

Affiliation

● KU Leuven

2. DATA DESCRIPTION
Will you generate/collect new data and/or make use of existing data?

● Generate new data

Describe the origin, type and format of the data (per dataset) and its (estimated) volume. This may be easiest in a table (see example) or as a data flow and per WP or objective of the project.

Type of data	Format	Volume	Origin
CAD files pre-processing	.ipt .stl .wrl	100 MB	CAD files designed in Autodesk Inventor (IPT), exported in STL format and converted into WRL through Blender
3D printing files	.zbd .sl1(s) .gcode	1 GB	3DPrint software for binder jetting (ZBD) PrusaSlicer for generation of SL1 and GCODE files
Render images	.tiff	10 MB	Rendering through Autodesk Inventor
Sliced images pre-processing	.bmp .txt	1 GB	Autodesk Netfabb for image generation Matlab for image processing and output to BMP and TXT
Data images	.jpg .mp4 .avi	1 TB	Canon camera Logitech webcam
Data processing	.mat .xlsx	1 GB	Performed in Matlab and Excel
Text	.docx .txt	5 GB	Proposals, protocols, SOPs
Data representation	.pptx	100 GB	Electronic lab book Presentations Posters
Modelling	.mph	100 GB	Comsol models

3. ETHICAL AND LEGAL ISSUES

Will you use personal data? If so, shortly describe the kind of personal data you will use AND add the reference to your file in your host institution's privacy register.

- No

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, add the reference to the formal approval by the relevant ethical review committee(s).

- No

Does your work possibly result in research data with potential for tech transfer and valorisation? Will IP restrictions be claimed for the data you created? If so, for what data, and which restrictions will be asserted?

- Yes

The study holds great potential for tech transfer and valorization. The foundations for valorization of the project's results are already present in the IP portfolio maintained by the host group on the controlled capillary wicking in porous 3D printed objects ('3D printing of porous liquid handling device', Granted WO2018162476 A1, Pending US20200016829 A1, Pending EP3592562 A1). Further opportunities for IP Generation during the project will be identified in close dialogue with

the tech transfer office KU Leuven Research & Development (LRD) and the host's group valorization manager Dr. Bart Van Duffel. The asserted information would enclose a hybrid 3D printed – conventional microfluidic assay, this may include pump and chip design, assay sequence timing and fabrication strategy.

Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?

- No

4. DOCUMENTATION AND METADATA
What documentation will be provided to enable understanding and reuse of the data collected/generated in this project?
The host group implements a data management system to preserve the collection, storage and reuse of data generated by group members.
The PhD study is subdivided in several projects. Each project is described in detail, the project goal and the predetermined workplan are identified in the Project Description (word/PDF). Secondly, the researcher lists all his/her conducted experiments per project in a Central Experiment Index (excel). This document includes per experiment a short description and further explanation on where to find the raw and processed data files. An overview of the performed tasks and processed data/outcome (linked to a specific analysis folder) can be found in the Electronic Lab Book (Powerpoint/One Note/Excel) of the researcher. This document entails a more detailed description per experiment. All data is stored in a data storage system, which contains the entire project data and is stored in a secured cloud (Dropbox/Drive).
Project Description → Central Experiment Index → Electronic Lab Book + Data Storage System
A physical sample inventory is stored per researcher in a well-ventilated laboratory. A defined space is assigned to each researcher in order to individually organize their sample inventory. Sample details are clarified in the Electronic Lab Book.

Will a metadata standard be used? If so, describe in detail which standard will be used. If not, state in detail which metadata will be created to make the data easy/easier to find and reuse.

- No

No uniform metadata standard is available for all different aspects and disciplines of this project. Therefore, the data management system, implemented by all group members, provides a uniform system to enhance the use of secondary data. The meta data (date, objective, protocol (data types and conducted characterization techniques), processed data, roadmap,…) is covered by a number of predetermined topics which are entailed in the Central Experiment Index and Electronic Lab Book.

5. DATA STORAGE & BACKUP DURING THE FWO PROJECT
Where will the data be stored?
All generated data will be curated in consultation with the PI (R. Ameloot) and will be stored via a secure cloud storage solution.

How will the data be backed up?

Unlimited versioning via Dropbox.

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

● Yes

There is currently sufficient storage and backup capacity, more precisely 10 TB of storage is provided. This can be expanded if necessary.

What are the expected costs for data storage and backup during the project? How will these costs be covered?
The cost is 12 euro per month per person, which will be covered by the bench fee.

Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?
A secured environment is provided by the cloud system (Dropbox). Only after receiving an invitational link one can access a predetermined space in the cloud. Hereby unauthorized persons cannot access the information unless personally given.

6. DATA PRESERVATION AFTER THE END OF THE FWO PROJECT
Which data will be retained for the expected 5-year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues...).
All data will be preserved for at least 5 years after the end of this project.

Where will these data be archived (= stored for the long term)?
All data will be stored using secure cloud storage, also on long term.

What are the expected costs for data preservation during these 5 years? How will the costs be covered?
No practical funding is available, other means will be used.

7. DATA SHARING AND REUSE
Are there any factors restricting or preventing the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?

● No

Which data will be made available after the end of the project?
Relevant data, considering the IP-related restrictions, will be published and therefore made publicly available. Other data will still be available to people within the involved research groups.

Where/how will the data be made available for reuse?

● In a restricted access repository

● Upon request by mail

When will the data be made available?

- Upon publication of the research results

Who will be able to access the data and under what conditions?
All collaborators of the involved research groups will be authorized to have access to data relevant to their contributions during and after the project. Published data will be publicly available.

What are the expected costs for data sharing? How will these costs be covered?
Expected cost is very low due to the flexible nature of the used cloud storage.

8. RESPONSIBILITIES
Who will be responsible for the data documentation & metadata?
The PhD student working on this FWO project will be responsible for the data collection, documentation and metadata. Supervisors will manage the data storage facilities.

Who will be responsible for data storage & backup during the project?
The PhD student on this FWO project will curate the data in structured folders within a secure cloud storage solution. According to the data management plan in the host group, the files will be named using a predetermined convention, referring to the data, sample name and brief description. Further description of the samples will be provided in a centralized table.

Who will be responsible for ensuring data preservation and sharing?
The PIs will be responsible for the data preservation and eventual reuse of obtained data.

Who bears the end responsibility for updating & implementing this DMP?
The applicant bears the end responsibility of updating and implementing this DMP.