ILUMIS

A Data Management Plan created using DMPonline.be

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Project abstract:

Actuation, energy storage, sensing, and logic are four functionalities of both natural and artificial organisms, giving them the ability to thrive in their environment. The blueprint of conventional robots localizes these functionalities in discrete components supported by rigid materials. However, in soft robots that consist of compliant materials, localization of functionality severely limits autonomous operation and intelligent behaviour. This limitation is the result of the functional architecture, not of the used materials. Alternatively and as demonstrated in nature by the common octopus, the distribution of these four functionalities throughout the body allows to overcome these limitations. This concept of ‘functional embodiment’ is currently non-existing in soft robotics. ILUMIS will create soft robots with embodied functionality by transitioning from a conventional robotic architecture to a fluidic network architecture. Further, by incorporating nonlinearities in all the network elements, the global system acts as a state machine, meaning that the output not only depends on the input, but also on its internal state. How to navigate this state space will be encoded within the nonlinearities, creating embodied logic. Energy and actuation are embodied and intricately linked to the elastic deformations of the components in the network, powering the actions of the soft robot. By creating network components that are sensitive to triggers from the environment, embodied sensing emerges, leading to truly interactive fluidic state machines. ILUMIS will overcome the main challenges of inverse design, where a desired behaviour requires the optimization of a network of nonlinear structures. Thereby ILUMIS will create a new blueprint for soft robotic design with embodied functionality that closes the gap with nature’s soft organisms. This knowledge will impact applications ranging from surgical micro-robots and exploration robots to haptic interfaces for virtual reality.

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ILUMIS
GDPR Record

GDPR record

Have you registered personal data processing activities for this project?

- Not applicable

ILUMIS
DPIA

DPIA

Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

ILUMIS
ERC DMP +

Project information

Project Acronym

ILUMIS

Project Number

101076036

Data summary

Summary

Dataset	description	new or re-use	Data type	File format	Data volume
Forward design script	Script to build finite element simulations of inflatable voids (WP1), interconnections (WP2) and fluids (WP3)	new	digital	.txt or .py	<1GB
Database of structures	Dataset that links geometrical and material parameters to output characteristics in the pressure-volume-displacement domain (WP1), the pressure-flow domain (WP2), or the pressure-volume domain (WP3)	new	digital	.txt	<10GB
Network simulator	Software program that solves fluidic networks (WP4)	new	digital	.py	<1GB
Inverse design script	Script that will be used to optimize a structure to achieve a goal characteristic in the pressure-volume-displacement domain (WP1), the pressure-flow domain (WP2), the pressure-volume domain (WP3). Or to optimize the network configuration for a certain functionality	new	digital	.txt or .py	<1GB
Experimental data: Images	Images taken of prototypes	new	digital	.png/.jpg	<10GB
Experimental data: Videos	videos taken of prototypes	new	digital	.avi/.mp4	<100GB
Experimental data: Measurements	data gathered during the experimental testing of prototypes, that could be pressures, volume flows, displacements or forces	new	digital	.txt	<1GB

FAIR data

1. Making data findable

Data will be deposited on Github (software scripts) and in the RDR data repository of KU Leuven (other data). The data will be identified by a persistent identifier. Zenodo will be used in combination with GitHub to provide a DOI (digital object identifier) to software. RDR assigns DOIs to uploaded data automatically.

2. Making data openly accessible

Data will be made publicly available in depositories as soon as possible, without restrictions. For scientific publications, open access will be done through either the journal’s open access system or through KULeuven’s preproof open access system, Lirias.

3. Making data interoperable

Data will be deposited in a format that can be accessible for everyone (using txt files and MS Word/Excel). Standards will be used that are common in our scientific discipline.

4. Increase data re-use

Research outputs will be made available through open licenses (Creative Commons Attribution International Public Licence (CC BY))

5. Allocation of resources and data security

According to our plans, there will be no costs to make data and research outputs FAIR in this project, as repositories and other resources are provided by KU Leuven free of charge (including Github and RDR). The researcher is responsible for data management during the project. Furthermore, the supervisor of the project will ensure the long-term storage of the data at KU Leuven.