Research-Data Management Plan
"Real Algebraic Geometry and Path Finding"
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The project aims to develop new algorithmic approaches to decomposition of semi-algebraic sets with a view to relevant applications in robotics. The project has theoretical parts, like a complexity analysis or existence proofs of decompositions respecting the underlying geometric properties, as well as computational aspects, like the development of software packages and numerical experiments.

2.4 DATA HANDLING

This project will consult with the Mathematical Research Data Initiative (MaRDI), in particular with their Help Desk and their task area Computer Algebra. This is in order to establish FAIR Principles in collaboration with scientific publishers and to develop and continuously adapt to new mathematics-specific recommendations for metadata standards. We support technical peer review for supplementary material, including computational results and software packages.

Data description. We expect to generate diverse mathematical research data in this project ranging from traditional research papers and mathematical formulae to results of symbolic and numerical computations and software packages. For symbolic compuations, we expect to use Macaulay2 and the OSCAR system (including Singular and polymake). For numerical computation, we expect to use Julia and in particular homotopyContinuation.jl.

Data documentation. During development of collaborative computational projects, code will be developed with version control based on git instances. Computational results are documented in a continually edited and updated .md file. This living document, containing information on the files' location and technical properties, is accessible to all researchers involved directly in the project.

Data storage. For data safety, we will be implementing the 3-2-1-rule: we save three copies of any document in two different locations and at least one of these not locally. Non-local data storage will be done by cloud-services (Sharelatex, nextcloud) also used to share files with each other.

Access to and publishing of data. During the funding period every involved researcher has access to all data. After completion we want the scientific community to have easy access to all of our final results. To achieve this, we will publish our papers together with their .tex files on arXiv and aim to publish in open-access journals, ideally under CC-BY-SA licences. We prioritize journals with technical infrastructure and next-generation peer review for supplementary material. Results of small- to medium-size symbolic computations will be made accessible via MathRepo, hosted at the Max-Planck Institute for Mathematics in the Sciences, together with appropriate metadata and code. For large-scale symbolic computations, we mostly rely on OSCAR and make code and data accessible via their repositories which come with built-in version control. For long-term findability, we will get DOIs for supporting files, preferably via Zenodo.

Ethics and legal aspects. Data privacy rights do not pose a limitation to our research. At this point we are not aware of any contract-law provisions regarding data publishing.

Incurring costs for RDM.. We do not predict extra costs neither for personnel implementing RDM, hardware, software, nor research-data storage.