Chapter 9

zbMATH Open and community platforms

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Since the 1st of January 2021, zbMATH is an open access platform called zbMATH Open. It allows every mathematician to freely access zbMATH Open from anywhere in the world. The transition to an open access platform does not only mean free access but should give further benefit to the mathematical community by connecting zbMATH data with information systems of research data, collaborative community platforms, funding agencies and so on. This article focuses on the connection of zbMATH Open to MathOverflow and arXiv, which are the two most used community platforms in mathematics.

1 MathOverflow

MathOverflow describes itself as "a question and answer site for professional mathematics."[1] It is mainly used for asking questions on mathematical research but also for literature or reference requests, questions on the history of mathematics or about mathematical publishing, and many more. Some MathOverflow questions even inspire mathematical research.[2] An example is the question "Does every polyomino tile $\mathbb{R}^n$ for some n?"[3] Vytautas Gruslys, Imre Leader, and Ta Sheng Tan prove in their article "Tiling with arbitrary tiles" that this is indeed the case and even cite this MathOverflow question in the reference section, see [1].

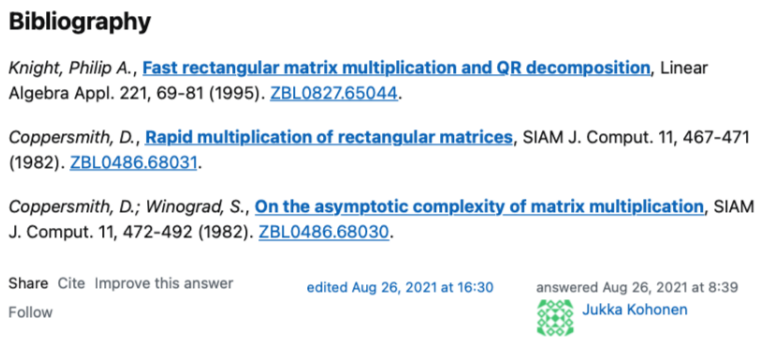
In a joint project with MathOverflow we added the possibility to cite zbMATH records directly in a MathOverflow post using an "Insert Citation" button. One starts typing a reference and the most similar zbMATH records are generated from which the user can choose the best matching one. More details are given in [2].

Figure 1 shows an example of a linking between zbMATH and MathOverflow. The zbMATH citations on the MathOverflow website are linked to the corresponding zbMATH record. On the zbMATH side, we use the StackExchange API to generate links to MathOverflow posts citing a zbMATH record. We also find links added manually and not by the "Insert Citation" functionality.

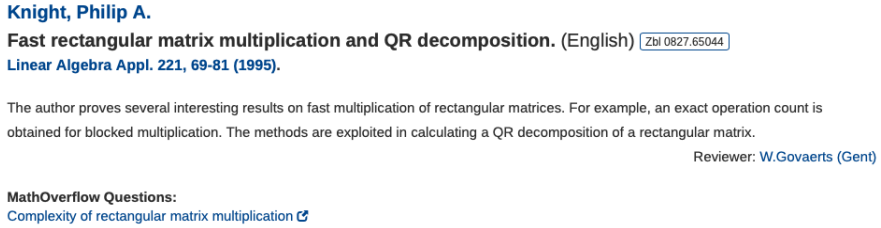
[1] https://mathoverflow.net/tour

[2] see https://meta.mathoverflow.net/q/617

[3] https://mathoverflow.net/q/49915



(a) An answer on MathOverflow linking to zbMATH (https://mathoverflow.net/a/402552)



(b) Backlink on zbMATH to the MathOverflow answer above (https://zbmath.org/0827.65044)

Figure 1. Example of a bidirectional linking between zbMATH and MathOverflow.

Furthermore, on the author profile page we display links to the author's MathOverflow user page. Currently 304 author profiles have links to their respective MathOverflow user profiles, which were all added manually. Everyone can edit the information on a zbMATH author profile via a public interface (click on the "Edit Profile" button at an author page). The suggested changes are checked, and applied if they are correct.

The ongoing development of several APIs will give rise to new possibilities in cooperation with MathOverflow. Several ideas are discussed in [3]. For example, one could compare the tags used on MathOverflow and the curated keywords used at zbMATH Open. It might be possible to recommend useful citations based on the tags given in a MathOverflow post or to generate tags automatically. Another idea would be to give users the possibility to connect their MathOverflow profile with the one on zbMATH Open. This would allow to display the publications and reviews of a user on its MathOverflow page.

2 arXiv

arXiv is a preprint server for mathematical articles and related fields as physics, computer science and economics. It is widely used and accepted in the mathematical community. Even some "arXiv overlay journals" exist which do not publish articles themselves but just link to the corresponding arXiv preprint. The refereeing process is similar to the one for non-overlay journals and is carried out by an editorial board. An example is the journal "Discrete Analysis" which has some well-known and respected mathematicians in its editorial board, e.g. the Fields Medal winners Timothy Gowers and Terence Tao.[4] This shows the wide acceptance and importance of arXiv in the mathematical community.

Some articles indexed at zbMATH Open already contain links to their corresponding arXiv preprint. These links were added manually or thanks to information provided by the publishers. However, many arXiv preprints are still missing, which should be changed in the future. Therefore, we developed an algorithm which finds an arXiv preprint for a given zbMATH article if one exists.

It is already possible to search for an arXiv identifier on zbMATH Open, using the syntax `en:<arXiv-id>`, where `<arxiv-id>` might contain the prefix "arxiv:". If there exists a corresponding zbMATH article linking to `<arxiv-id>`, then the search will return this article.

We are working on adding other open access full texts using information from unpaywall.[5] Having open access to the full-text of an article is not only important for mathematicians who might not have a subscription to some journals, but it also gives new possibilities, for example full-text search including formulae. Right now, the formula search[6] at zbMATH Open only searches in the abstracts and reviews. In the future we plan to expand the search to full-texts.

3 JabRef

JabRef[7] is an open source scientific reference management system which manages BibTeX files. It offers the possibility to import references from many online scientific catalogues. One of them is zbMATH Open. Since zbMATH became open, it is possible to fetch bibliographic data from zbMATH without subscription. JabRef supports three different possibilities to get bibliographic information from zbMATH Open:

[4] https://discreteanalysisjournal.com
[5] https://unpaywall.org
[6] https://zbmath.org/formulae
[7] https://www.jabref.org

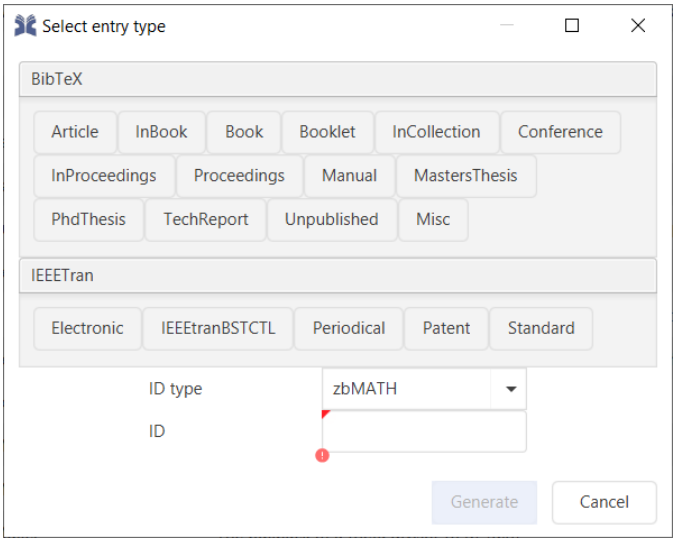


Figure 2. Adding bibliographic information via a zbMATH identifier in JabRef.

- Fetch the BibTeX file for a given article by its Zbl number (see Figure 2).
- Use a structured search to fetch all results of that search.
- Enrich an existing BibTeX file with bibliographic information from zbMATH.

In particular, the second option is very useful. An easy example would be to get all references for articles written by a given author. However, one can create more complex search queries. JabRef supports most of the query syntax of zbMATH, however, there are some differences. For example, one has to use `author:<name>` instead of `au:<name>` to search in the authors field. We refer to the documentation of JabRef for details of the query syntax.[8]

4 Conclusion

zbMATH Open incorporates information from community platforms such as MathOverflow. On the other hand, information from zbMATH is used in the open source project JabRef. In the future there will be much more possibilities to integrate data from zbMATH Open with data from further external partners. The OAI-PMH API[9]

[8] https://docs.jabref.org/collect/import-using-online-bibliographic-database
[9] https://oai.zbmath.org

for zbMATH Open already provides a subset of the zbMATH data under the CC-BY-SA 4.0 license which enables diverse use cases.

We are looking forward learning about the ideas and needs of the mathematical community for developing useful tools for researchers in mathematics.

References

[1] V. Gruslys, I. Leader, and T. S. Tan, Tiling with arbitrary tiles. *Proc. Lond. Math. Soc. (3)* **112** (2016), no. 6, 1019–1039

[2] F. Müller, M. Schubotz, and O. Teschke, References to research literature in QA forums – a case study of zbMATH links from MathOverflow. *Eur. Math. Soc. Newsl.* **114** (2019), 50–52

[3] M. Petrera, D. Trautwein, I. Beckenbach, D. Ehsani, F. Müller, O. Teschke, B. Gipp, and M. Schubotz, zbMATH Open: API solutions and research challenges. In *DISCO 2021: Digital Infrastructures for Scholarly Content Objects 2021, edited by W.-T. Balke, A. de Waard, Y. Fu, B. Hua, J. Schneider, N. Song, X. Wang, pp. 4–13, CEUR Workshop Proceedings 2976, CEUR-WS.org,* 2021