

PREPARING A SCIENTIFIC PUBLICATION WITH LyX

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Abstract. In this overview, our goal was to briefly present how and with which technologies scientific articles can be efficiently prepared using the LyX. The system is a scientific word processor, which particularly well-suited for academic writing, technical documentation, and scientific publishing. Researchers, mathematicians, and users of technical sciences, authors, editors, and reviewers can also use the described procedures and methods. We have assumed that the reader of this article has basic information technology skills.

Keywords: TeX, LaTeX, LyX, scientific publication, reference manager, virtual computer.

1. ABOUT TEX - AN INTRODUCTION

TeX is a typesetting system designed and written by Donald Knuth [1] [2], primarily for the creation of high-quality documents with complex mathematical content. It is widely used in academia, particularly in fields such as mathematics, physics, computer science, and engineering. Overall, TeX remains a popular choice for typesetting documents, especially those with mathematical or technical content, due to its quality, flexibility, and extensive community support.

TeX is open source, allowing users to inspect and modify its source code as needed. This has led to various distributions and implementations of TeX, such as TeX Live, MiKTeX, and MacTeX. TeX is available on multiple platforms, including Windows, macOS, and various Unix-like operating systems, making it accessible to a wide range of users. TeX is known for its stability and reliability. Donald Knuth famously declared TeX as bug-free in the sense that it will no longer be updated unless a bug is found that poses a serious obstacle to typesetting.

Nowadays, the system has become the standard tool for creating scientific publications. Researchers, mathematicians, and users of technical sciences must be familiar with this system, so in our article we describe one possibility of use. TeX includes a powerful macro language called TeX macro language (TeX macros) that allows users to create custom commands and formatting rules. LaTeX is a macro package built on top of TeX, which provides a higher-level interface for document preparation. It simplifies the process of formatting documents and is widely used for academic papers, books, and technical documents.

To write scientific publications, we need a computer and suitable TeX software. We can use a virtual computer in our university's network, so in the next chapter we describe how to start such a machine. In addition, we describe what software we will need to prepare the TeX publications.

2. THE USAGE OF A VIRTUAL COMPUTER

The IT infrastructure of our and other university enables the use of virtual computers. The virtual computer is suitable for installing and using TeX software. In this chapter, we briefly describe the installation of such a virtual computer in the computer network of our university. There are several advantages of using a virtual computer, one of these advantages is the enormous speed of data transfer, since the system uses the Sanet network (<https://www.sanet.sk/>). If you want to install the TeX software on your own computer, you can skip this chapter.

3. VIRTUAL COMPUTER IN THE TUKE NETWORK

The first step to get a virtual computer is to apply for access to Cloud services (on the TUKE network). When submitting the application, it is necessary to specify the operating system used and the computer's hardware parameters (how many CPUs, RAM size, HDD size). The request must be submitted electronically from the website <https://cloud.tuke.sk>, while it is necessary to enter the unique identifier of the TUKE network user. After a positive request, the administrator sends the user access information for using the virtual computer. It is the IP address of the computer in the TUKE network, the name and password of the administrator (user) of the computer. It is a good idea to update the name and password after the first use. In the case of the Windows operating system, it is necessary to activate the system.

Management of the virtual computers is possible via the website <https://cloud.tuke.sk>. Here it is possible to extend the system usage time (lease) or turn on/off and back up the computer. The use of the virtual computer takes place via remote access. Through remote access, you need to enter the computer's IP address, username, and password. This is how you can log in to the virtual computer. An electronic course about using the virtual computer with a detailed description can be found [here](#) [3]. When you want to use a virtual computer from home, you will see the TUKE VPN chapter of course on how to create and log into a TUKE virtual network.

4. TEX SOFTWARE INSTALLATION AND USAGE

TeX can also be used directly through its plain TeX format, which provides a lower-level interface compared to LaTeX. Plain TeX is often used for more specialized typesetting tasks or for creating custom document formats.

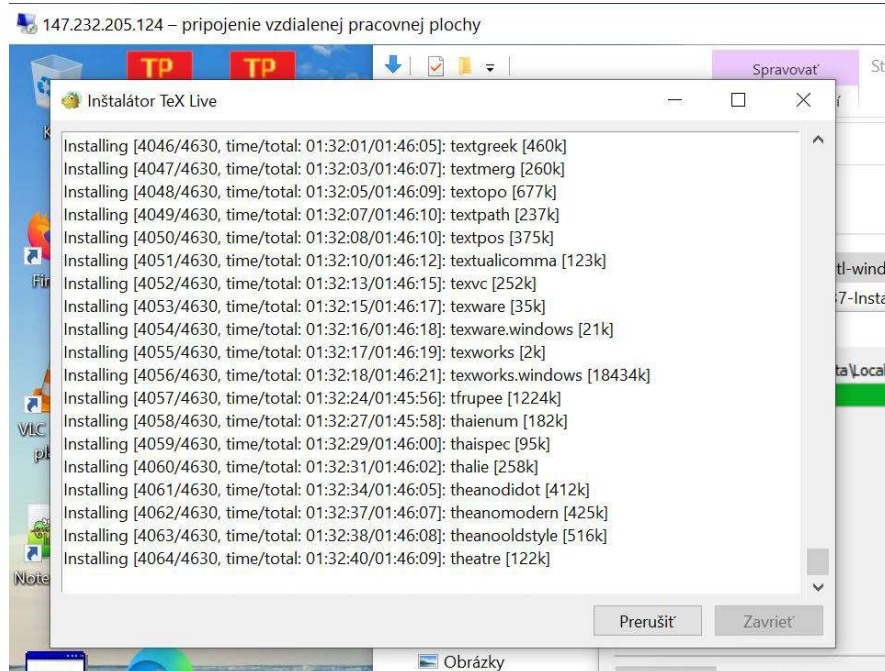


Figure 1 Installation of the TeX Live system

We will use the LyX system to prepare a scientific publication. LyX is a document processor that combines the power and flexibility of LaTeX with a more user-friendly graphical interface. It aims to provide a more intuitive way of creating documents, especially for users who are not familiar with the intricacies of LaTeX markup language. LyX follows a What You See Is What You Mean (WYSIWYM) approach, where users focus on the structure and content of the document rather than the formatting details. This makes it easier for users to create complex documents without dealing directly with LaTeX commands.

Before installing the LyX system, it is necessary to install the MiKTeX or TeX Live. TeX Live is a comprehensive distribution of the TeX typesetting system, along with various related programs and packages. To work with the TeX system on the Windows operating system, it is possible to install TeX Live, located at: <https://tug.org/texlive/windows.html>. The installation of the 2023 version may take 2 hours because the system contains 4630 macros that must be uploaded from some TeX FTP site. The Figure 1 shows the installation process. It is possible to run the installation on the virtual machine and then log off. The installation process will continue.

5. TEXWORKS EDITOR

After installing the system, we get several programs.

TeX Live manager is a package manager, which allows users to easily install, update, and manage packages and components within the distribution. This enables users to customize their TeX setup by installing only the packages they need.

TeXworks editor is a TeX editor in which we can write publications together with the application of TeX commands for formatting documents. The document thus prepared needs to be translated into pdf format. Therefore, the system should also include a program for reading pdf documents. This editor can be used e.g. during the proofreading process as seen in Figure 2. Reviewers mark his comments in TeX document and the author can correct it or take a position on the issue. The image was created during the publication of the article [4].

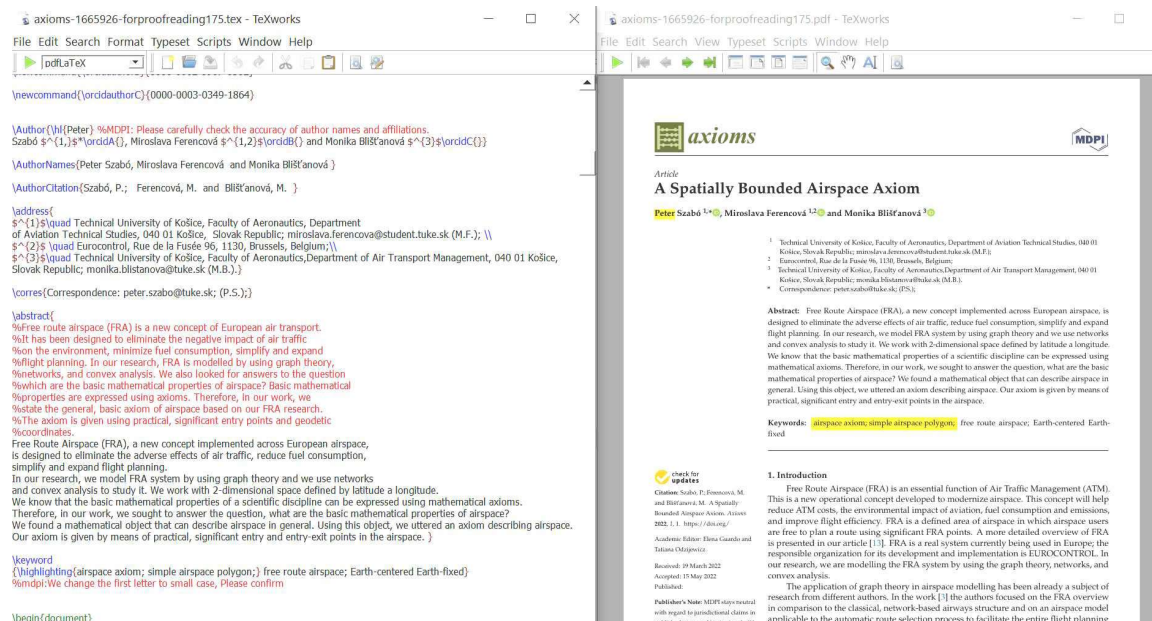


Figure 2 TeX Live at work

On the left side of the image, we see the source code in TeXworks editor. On the right side, the result, as it will be published in the journal.

6. LYX EDITOR

Using the TeXworks editor requires knowledge of TeX commands. LyX was created to eliminate this requirement. The system does not require or require only minimal knowledge of TeX commands and LaTeX macros.

We can install LyX from the site: <https://www.lyx.org/Download>. After installing the system, we can open the help system, which contains an extensive manual on how to use the system. Using the

program is like MS Word with some extra features. We would like to note that the program is suitable for writing not only articles, but also books. Figure 3 shows the source code of the book [5]. On the left side is a list of chapters and reference links. On the right side, one chapter from the book. The book can be downloaded from ResearchGate.

Some electronic scientific journals also work this way. The editor writes the title page of the journals and the list of articles into a LyX (or TeX) file and then translates the file into pdf and/or HTML5 format, depending on the type of use.

LyX can also be used in local languages. The spelling checker is adjustable for the given languages of the publication. Files generated in the LyX system can be exported to TeX or LaTeX formats.

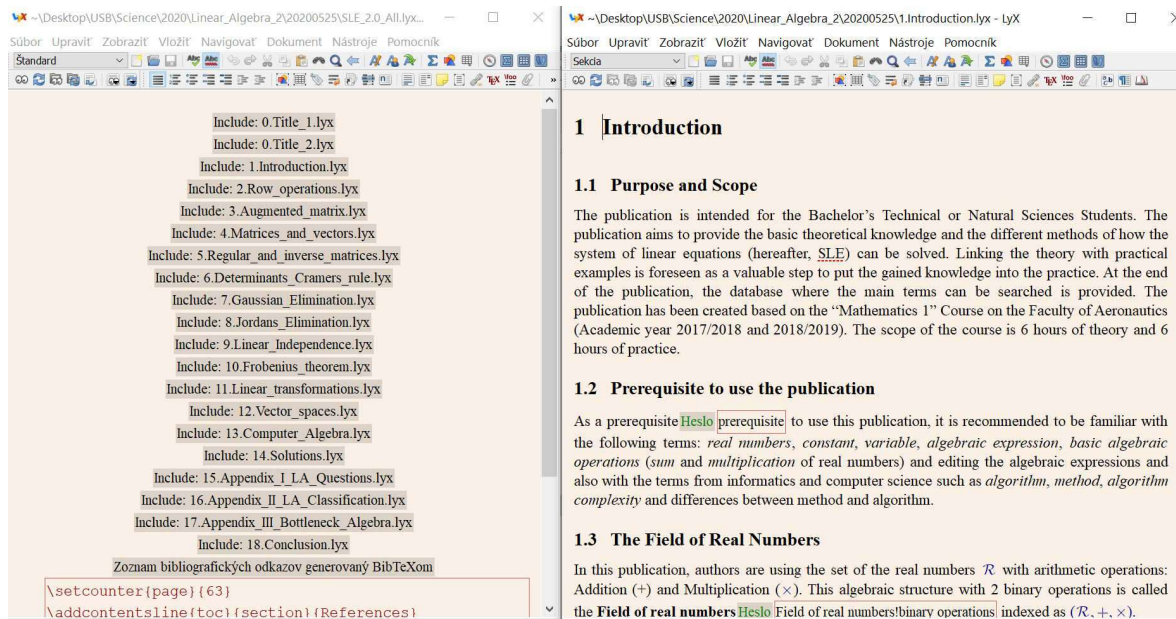


Figure 3 Writing a book with LyX

7. REFERENCE MANAGER JABREF

Reference management programs are an important part of scientific publications. JabRef is an open-source reference management software primarily used for managing bibliographies and references in LaTeX documents. This system generates references in BiBTeX format. We can use this format of references in Web of Science as well. These references can be attached to publications with cross-references (see [5]).

References created in the JabRef can also be applied in MS Word files. The program can be downloaded from page <https://www.jabref.org/>. The system allows you to use (import, export) the main reference formats and fetch complete bibliographic information based on ISBN, DOI, PubMed-ID and arXiv-ID. JabRef provides tools for searching online databases and importing references directly into the software. JabRef integrates with online bibliographic databases such as PubMed, IEEE Xplore, Google Scholar, and others, allowing users to search and import references directly into their JabRef library. The Figure 4 shows the creation of a JabRef reference database.

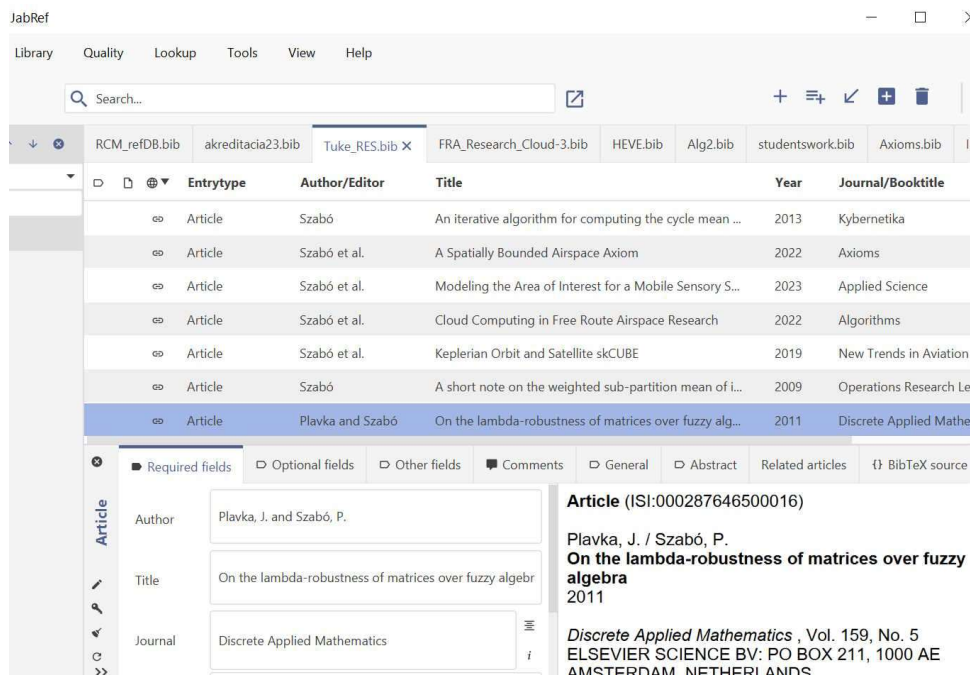


Figure 4 Editing the reference database in the JabRef

7. REFERENCE MANAGER ENDNOTE

EndNote is a commercial reference management software package, used primarily for managing bibliographies and references when writing essays and articles. EndNote integrates with popular word processors like Microsoft Word and LibreOffice Writer, allowing users to easily insert citations and generate bibliographies in their documents. EndNote offers online synchronization capabilities, enabling users to access their reference libraries from multiple devices and locations. This feature helps in collaborative research projects and ensures consistency across different documents.

8. PUBLISHERS, JOURNALS AND TEMPLATES

Every major publisher (Elsevier, IEEE) of scientific publications has its own template for the creation of a publication. These templates can be found in LyX. When opening a new file, you can select which publisher you want to send your article to. After selecting a template, the system sets the parameters of the given publisher. Some publishers have customizable templates that can be entered into the system. This fact makes it possible to parameterize templates. Such setting parameters can also be seen in Figure 2. For the MDPI publisher, it is possible to use the parameters to specify which journal the article was sent to, and in which phase the review process is.

9. RECOMMENDED PREPARATION OF THE SCIENTIFIC ARTICLE

Based on our experience, the LyX system is the fastest way of preparing a scientific publication and its references. After preparation, the publication needs to be converted into the LaTeX system, where fine-tuning and special settings of the publisher's or journal's conditions can take place. If necessary, the publisher's specialists can help with this.

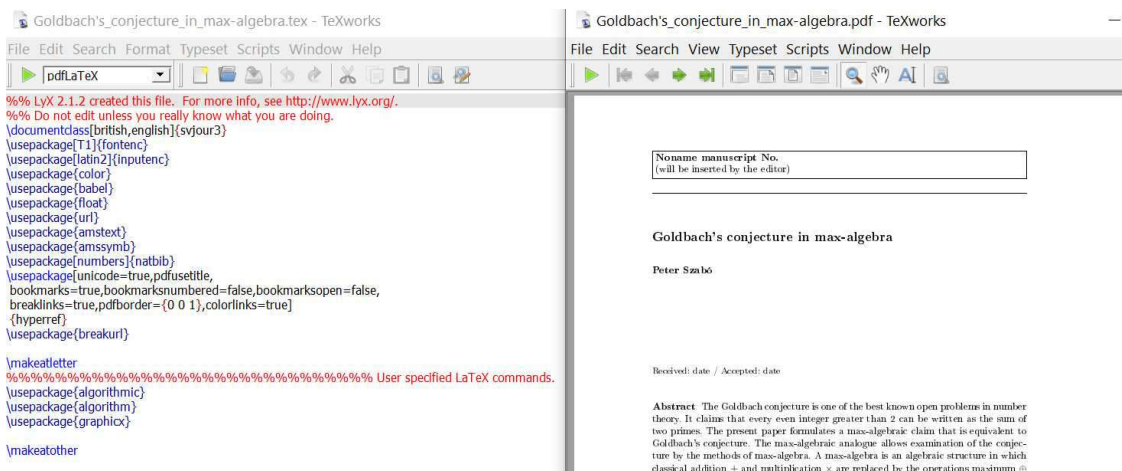


Figure 5 LyX and LaTeX cooperation.

Figure 5 shows how LyX and LaTeX work together. A scientific article [6] was created in the LyX editor. The review process required the conversion of the article file to LaTeX and the application of Springer Nature publishing macros.

10. ELECTRONIC PUBLICATION FORMATS

LyX documents can be exported to the most used formats, such as: pdf, eBook, html5, docx, latex.

PDF (Portable Document Format) is a widely used format for documents of all types, including eBooks. PDFs maintain the layout and formatting of the original document, making them suitable for textbooks, manuals, and other content where precise formatting is important. However, PDFs are not as flexible on different screen sizes as EPUB.

EPUB (Electronic Publication) is one of the most widely supported eBook formats, designed for reflowable content, meaning it can adapt to different screen sizes and orientations. It's commonly used for fiction and non-fiction eBooks and is compatible with most eBook readers except for Kindle devices.

HTML5 has become the standard markup language for creating web pages and applications, and it is supported by all modern web browsers. It provides developers with powerful tools and capabilities for creating rich, interactive, and accessible web experiences.

DOCX format is a file format used for documents created by Microsoft Word, a popular word processing software. It is part of the Microsoft Office Open XML (OOXML) file format specification. Some publishers require only the use of this format (e.g. in medicine or social sciences).

11. CONCLUSION

We will briefly summarize what is required to use the LyX system. First, it is necessary to install the TeX Live system and a reference manager JabRef. Then LyX can be installed. When installing, you must specify where the LaTeX support is located, that is, TeX Live a distribution of the TeX typesetting system. The publications (articles, book) to which we referred in this publication were created in the LyX system. References in reference manager JabRef.

The best way to learn how to use this system is to write an article in it. This article was also created in this system. The source code of the article and its references can be found in the article Cloud [7]. Reputable publishing companies also use the TeX typesetting system.

References

- [1] D. E. Knuth, *The TeXbook*, Addison-Wesley, 1986.
- [2] D. E. Knuth, *Computers & typesetting. Volume A–E. Boxed set. Volume A: The TeXbook. Volume B: TeX: the program. Volume C: The Metafontbook. Volume D: Metafont: the program. Volume E: Computer modern typefaces, Updated Millenium ed. ed.*, Amsterdam : Addison-Wesley Longman, 2000.
- [3] P. Szabó a T. Muszka, *E-course: Virtual computer on the TUKE network (Slovak)*, 2023.
- [4] P. Szabó a M. Ferencová, *A Brief Introduction to the Linear Algebra - Systems of Linear Equations*, TUKE, 2019.
- [5] P. Szabó, M. Ferencová a M. Blišťanová, „A Spatially Bounded Airspace Axiom,“ *Axioms*, Vol. 11, pp. 244, May 2022.
- [6] P. Szabó, „Goldbach's conjecture in max-algebra,“ *Computational Management Science*, Vol. 14, pp. 81-89, January 2017.
- [7] P. Szabó a T. Muszka, *Article cloud: Preparing a scientific publication with LyX*, 2024.

Received 10, 2024, accepted 6, 2024



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