Data Enhancements in a Digital Mathematical Library

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EuDML

The EUROPEAN DIGITAL
MATHEMATICS LIBRARY

Goals of a Digital Library

- The quality of digital mathematical library depends on the quality of data it offers.
- The viability of a digital library rests with new acquisitions emerging mainly in the form of born-digital publications.
- It is important to
  - provide data as soon as possible,
  - in a digital-use-friendly format,
  - and exactly matching printed originals.

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Goals of a Digital Library (cont.)

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  - a lightweight XML metadata extraction system for mathematical journal editors,
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Need for a Lightweight XML Metadata Extraction System

- It has been necessary to prepare appropriate software support for the mathematical journals involved in the DML-CZ project that will enable editors to prepare born-digital data easily.
- Main idea: born-digital data acquisition as a by-product of publishing printed version of the journal.
- The first approach was a complex system inspired by the French CEDRAM project.
- Sometimes the complex journal processing system is too complex.
  - Great interference with the current workflow of the editor.
  - Not all the editors use (and are ready to use) LaTeX.
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- A simple, universal and flexible solution was needed.

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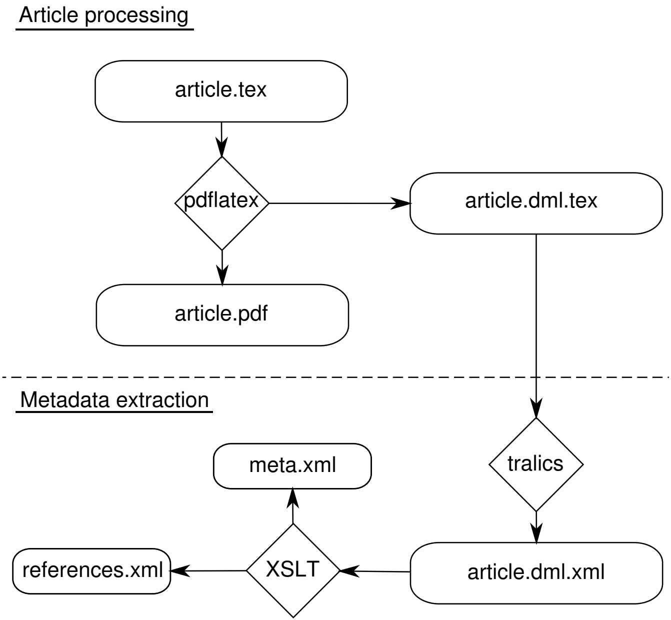
Article processing
article.tex
pdflatex
article.dml.tex
article.pdf
Metadata extraction
meta.xml
tralics
references.xml
XSLT
article.dml.xml

How Does It Work

- A lightweight set of LaTeX macros in the form of a LaTeX macro package.
    - Can be easily customized to meet needs of a particular journal document class / style file.
    - The LaTeX macro package itself does not transform the LaTeX source code to XML.
    - Literally exports selected parts of the LaTeX document to an external file.
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How Does It Work (cont.)

```
\documentclass[runningheads]{llncs}
\usepackage{dmlcommon}
\usepackage{dmlcz}

\begin{document}

\author{Petr Sojka}
\dmlaindex{Sojka}{Petr}
\dmltitle{Towards a Digital Mathematical Library}
...
\maketitle

\begin{dmlabstract}
The workshop's objectives were to formulate the strategy
and goals of a global mathematical digital library...
\end{dmlabstract}
...
```

How Does It Work (cont.)

```
\documentclass{dmlczmeta}\begin{document}

\begin{xmlelement}{author}{Sojka, Petr
\XMLaddatt{order}{1}}\end{xmlelement}

\begin{xmlelement}{title}{Towards a Digital Mathematical
Library\XMLaddatt{lang}{eng}}\end{xmlelement}

\begin{xmlelement}{abstract}\XMLaddatt{lang}{eng}\bgroup
The workshop's objectives were to formulate the strategy
and goals of a global mathematical digital library...
\egroup\end{xmlelement}

\begin{xmlelement}{keyword}{OCR\XMLaddatt{lang}{eng}}
\end{xmlelement}

...
\end{document}
```

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- Tralics is a LaTeX to XML translator.
  - The most indispensable part of the system.
  - Its engine is able to process regular LaTeX code.
  - It is not necessary to
    - convert the LaTeX code to plain text directly,
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```
<?xml version='1.0' encoding='UTF-8'?>
<!DOCTYPE std SYSTEM 'classes.dtd'>
<!-- Translated from latex by tralics 2.13.5,
     date: 2010/07/03-->
<std><p>
<author order='1'>Sojka, Petr</author>
<title lang='eng'>Towards a Digital Mathematical
Library</title>

<abstract lang='eng'>The workshop's objectives were to
formulate the strategy...</abstract>
<keyword lang='eng'>OCR</keyword>
<keyword lang='eng'>OpenMath</keyword>

<language>eng</language>
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Why It Is Useful

- It is easy to integrate this procedure to an existing journal processing workflow. It is thus acceptable to all the involved editors.
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    - Platform independent.
        - The TEX itself produces the source file.
        - XML generated using Tralics and XSLT.
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- Thanks to pdfTEX, PDF is also the *de facto* standard output format of the modern TEX distributions.
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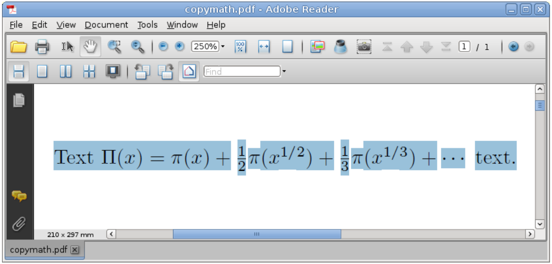
Standard PDF document

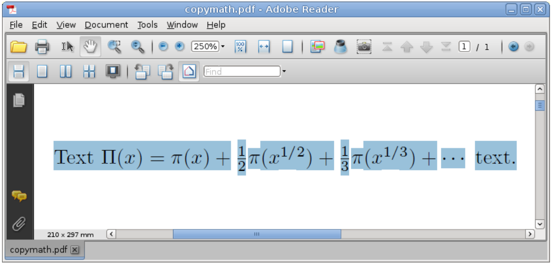

copymath.pdf - Adobe Reader
File Edit View Document Tools Window Help
250%
1 / 1
Find
210 x 297 mm
copymath.pdf

Text $\Pi(x) = \pi(x) + \frac{1}{2}\pi(x^{1/2}) + \frac{1}{3}\pi(x^{1/3}) + \cdots$ text.

LaTeX source code:

```
Text $\Pi(x) = \pi(x) +
\frac{1}{2}\pi(x^{1/2}) +
\frac{1}{3}\pi(x^{1/3}) + \cdots$
text.
```

Standard PDF document


copymath.pdf - Adobe Reader
File Edit View Document Tools Window Help
250%
1 / 1
Find
210 x 297 mm
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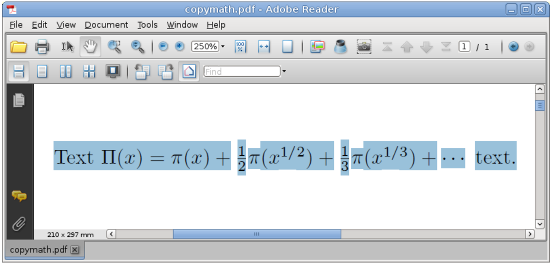
PDF code:

```
BT
/F16 9.9626 Tf 148.712 707.125 Td [(T)83(ext)]TJ/F17 9.9626 Tf 23.247 0 Td
[(\005\050)]TJ/F20 9.9626 Tf 11.346 0 Td [(x)]TJ/F17 9.9626 Tf 5.694 0 Td
[(\051)-278(=)]TJ/F20 9.9626 Tf 17.158 0 Td [(\031)]TJ/F17 9.9626 Tf 6.036 0 Td
[(\050)]TJ/F20 9.9626 Tf 3.875 0 Td [(x)]TJ/F17 9.9626 Tf 5.694 0 Td
[(\051)-222(+)]TJ/F18 6.9738 Tf 17.247 3.923 Td [(1)]TJ
ET
```

Standard PDF document


copymath.pdf - Adobe Reader
File Edit View Document Tools Window Help
250%
1 / 1
Find
210 x 297 mm
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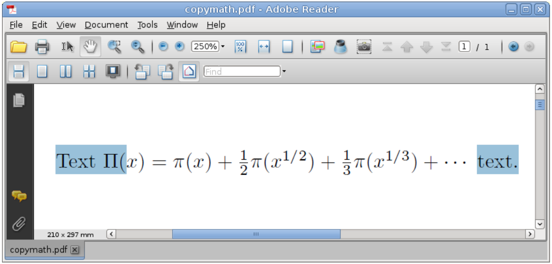
$$\text{Text } \Pi(x) = \pi(x) + \frac{1}{2}\pi(x^{1/2}) + \frac{1}{3}\pi(x^{1/3}) + \cdots \text{ text.}$$

Text obtained using Copy & Paste function of PDF reader:

```
Text  ( ) =  ( ) + 1
2 ( 1/2) + 1
3 ( 1/3) + · · · text.
```

CopyMath-enabled PDF document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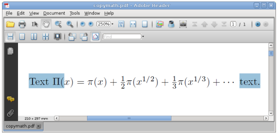
copymath.pdf - Adobe Reader
File Edit View Document Tools Window Help
250%
1 / 1
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PDF code:

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BT
/F16 9.9626 Tf 148.712 707.125 Td [(T)83(ext)]TJ
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1 0 0 1 171.959 707.125 cm
/Span <<
/ActualText<245C506920287829203D205C706920287829202B205C66726163207B317D7B32
7D5C70692028785E7B312F327D29202B205C66726163207B317D7B337D5C70692028785E7B31
2F337D29202B205C63646F74732024> >> BDC
1 0 0 1 -171.959 -707.125 cm
BT
/F17 9.9626 Tf 171.959 707.125 Td [(\005\050)]TJ/F20 9.9626 Tf 11.346 0 Td
[(x)]TJ/F17 9.9626 Tf 5.694 0 Td [(\051)-278(=)]TJ/F20 9.9626 Tf 17.158 0 Td
[(\031)]TJ/F17 9.9626 Tf 6.036 0 Td [(\050)]TJ/F20 9.9626 Tf 3.875 0 Td
[(x)]TJ/F17 9.9626 Tf 5.694 0 Td [(\051)-222(+)]TJ/F18 6.9738 Tf 17.247 3.923
Td [(1)]TJ
ET
```
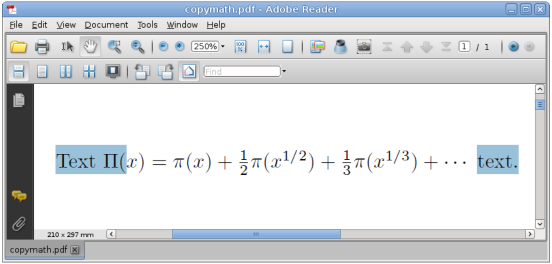

CopyMath-enabled PDF document


copymath.pdf - Adobe Reader
File Edit View Document Tools Window Help
250%
1 / 1
Find
210 x 297 mm
copymath.pdf

Text $\Pi(x) = \pi(x) + \frac{1}{2}\pi(x^{1/2}) + \frac{1}{3}\pi(x^{1/3}) + \cdots$ text.

Text obtained using Copy & Paste function of PDF reader:

```
Text $\Pi (x) = \pi (x) +
      \frac {1}{2}\pi (x^{1/2}) +
      \frac {1}{3}\pi (x^{1/3}) + \cdots $
text.
```

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- The `ActualText` command of the PDF language is used to mark the region of the mathematical expression inside the PDF document.
- We want the package to be as user friendly as possible – users should not be forced to modify their mathematical expressions in any way, `\usepackage{copymath}` should cater for all their needs.
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Conclusions

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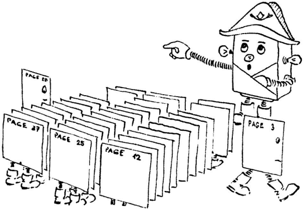
Questions?



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