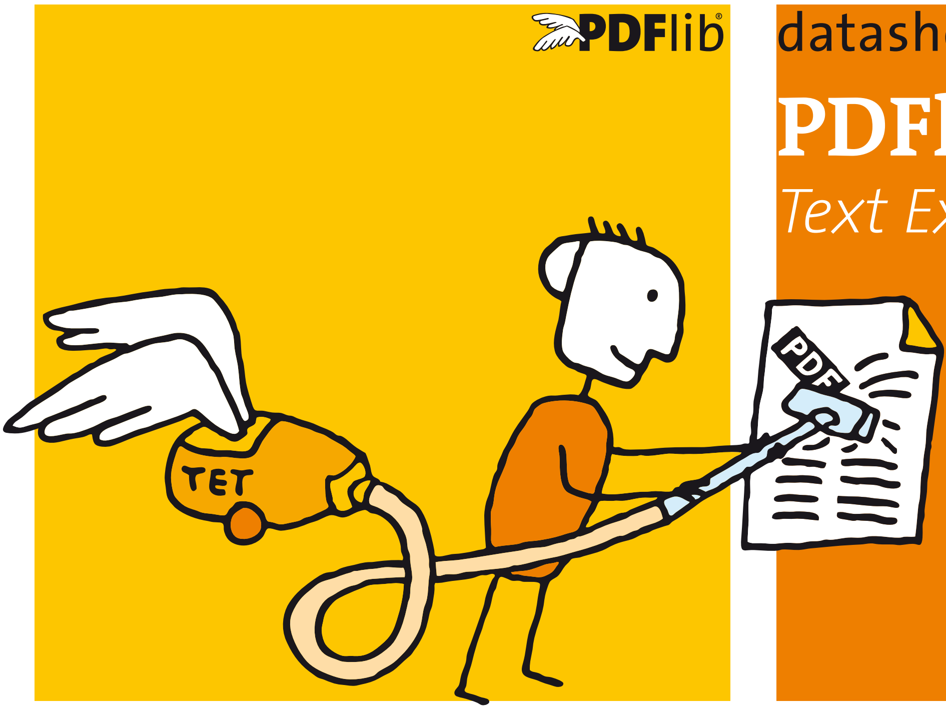
datasheet

PDFlib TET 4

Text Extraction Toolkit



What is PDFlib TET?

PDFlib TET (Text Extraction Toolkit) reliably extracts text, images and metadata from PDF documents. TET makes available the text contents of a PDF as Unicode strings, plus detailed glyph and font information as well as the position on the page. Raster images are extracted in common raster formats. TET optionally converts PDF documents to an XML-based format called TETML which contains text and metadata as well as resource information.

TET contains advanced content analysis algorithms for determining word boundaries, grouping text into columns and removing redundant text. Using the integrated pCOS interface you can retrieve arbitrary objects from the PDF, such as metadata, interactive elements, etc.

With PDFlib TET you can:

- Implement the PDF indexer for a search engine
- Repurpose the text and images in PDFs
- Convert the contents of PDFs to other formats
- Process PDFs based on their contents, e.g. splitting based on headings (requires PDFlib+PDI in addition to TET)

PDFlib TET Features

Accepted PDF Input

TET supports all relevant flavors of PDF input:

- All PDF versions up to Acrobat 9, including ISO 32000-1
- Protected PDFs which do not require a password for opening the document
- Damaged PDF documents will be repaired

Unicode

Since text in PDF is usually not encoded in Unicode, PDFlib TET normalizes the text in a PDF document to Unicode:

- TET converts all text contents to Unicode. In C and other non-Unicode aware languages the text is returned in the UTF-8 or UTF-16 formats, and as native strings in Unicode-capable programming languages.
- Ligatures and other multi-character glyphs are decomposed into a sequence of the corresponding Unicode characters.
- Glyphs without appropriate Unicode mappings are identified as such, and are mapped to a configurable replacement character in order to avoid misinterpretation.
- TET implements various workarounds for problems with specific document creation packages, such as InDesign and TeX documents or PDFs generated on mainframe systems.

Content Analysis and Word Detection

TET includes advanced content analysis algorithms:

- Patented algorithm for determining word boundaries which is required to retrieve proper words
- Recombine the parts of hyphenated words (dehyphenation)
- Remove duplicate instances of text, e.g. shadow and artificially bolded text
- Recombine paragraphs in reading order
- Correctly order text which is scattered over the page

Page Layout and Table Detection

The page content is analyzed to determine text columns. Tables are detected, including cells which span multiple columns. This improves the ordering of the extracted text. Table rows and the contents of each table cell can be identified.

Geometry

TET provides precise metrics for the text, such as the position on the page, glyph widths, and text direction. Specific areas on the page can be excluded or included in the text extraction, e.g. to ignore headers and footers or margins.

Image Extract

Images on PDF pages can be extracted as TIFF, JPEG, or JPEG 2000 files. Precise geometric information (position, size, and angles) are reported for each image. Fragmented images will be combined to larger images to facilitate repurposing. Image fidelity is guaranteed since no downsampling or color space conversion occurs. This ensures the highest possible image quality.

PDF Analysis

The TET library includes the pCOS interface for querying details about a PDF document, such as document info and XMP metadata, font lists, page size, and many more (see separate datasheet for the pCOS product).

Configuration Options for problematic PDF

TET contains special handling and workarounds for various kinds of PDF where the text cannot be extracted correctly with other products. In addition, it includes various configuration features to improve processing of problem documents:

- Unicode mapping can be customized via user-supplied tables for mapping character codes or glyph names to Unicode.
- PDFlib FontReporter is an auxiliary tool for analyzing fonts, encodings, and glyphs in PDF. It works as a plugin for Adobe Acrobat. This plugin is freely available for Mac and Windows.
- Embedded fonts are analyzed to find additional hints which are useful for Unicode mapping. External font files or system fonts are used to improve text extraction results if a font is not embedded.

Unicode Postprocessing

TET supports various Unicode postprocessing steps which can be used to improve the extracted text:

- Foldings preserve, remove or replace characters, e.g. remove punctuation or characters from irrelevant scripts.
- Decompositions replace a character with an equivalent sequence of one or more other characters, e.g. replace narrow, wide or vertical Japanese characters or Latin superscript (e.g. ª) variants with their respective standard counterparts.
- Text can be converted to all four Unicode normalization forms, e.g. emit NFC form to meet the requirements for Web text or a database.

Document Domains

PDF documents may contain text in other places than the page contents. While most applications will deal with the page contents only, in many situations other document domains may be relevant as well. TET extracts the text from all of the following document domains:

- page contents
- predefined and custom document info entries
- XMP metadata on document and image level
- bookmarks
- file attachments and PDF portfolios can be processed recursively
- form fields
- comments (annotations)
- general PDF properties can be queried, such as page count, conformance to standards like PDF/A or PDF/X, etc.

XMP Metadata

TET supports XMP metadata in several ways:

- Using the integrated pCOS interface, XMP metadata for the document, individual pages, images, or other parts of the document can be extracted programmatically.
- TETML output contains XMP document and image metadata if present in the PDF.
- Images extracted in the TIFF or JPEG formats contain image metadata if present in the PDF.

TETML represents PDF Contents as XML

TET optionally represents the PDF contents in an XML flavor called TETML. It contains a variety of PDF information in a form which can easily be processed with common XML tools. TETML contains the actual text plus optionally font and position information, resource details (fonts, images, colorspaces), and metadata.

TETML is governed by a corresponding XML schema to make sure that TET always creates consistent and reliable XML output. TETML can be processed with XSLT stylesheets, e.g. to apply certain filters or to convert TETML to other formats. Sample XSLT stylesheets for processing TETML are included in the TET distribution.

The following fragment shows TETML output with glyph details:

```
<Word>
 <Text>PDFlib</Text>
 <Box llx="111.48" lly="636.33" urx="161.14" ury="654.33">
 <Glyph font="F1" size="18" x="111.48" y="636.33" width="9.65">P</Glyph>
 <Glyph font="F1" size="18" x="121.12" y="636.33" width="11.88">D</Glyph>
 <Glyph font="F1" size="18" x="133.00" y="636.33" width="8.33">F</Glyph>
 <Glyph font="F1" size="18" x="141.33" y="636.33" width="4.88">l</Glyph>
 <Glyph font="F1" size="18" x="146.21" y="636.33" width="4.88">i</Glyph>
 <Glyph font="F1" size="18" x="151.08" y="636.33" width="10.06">b</Glyph>
 </Box>
 </Word>
```

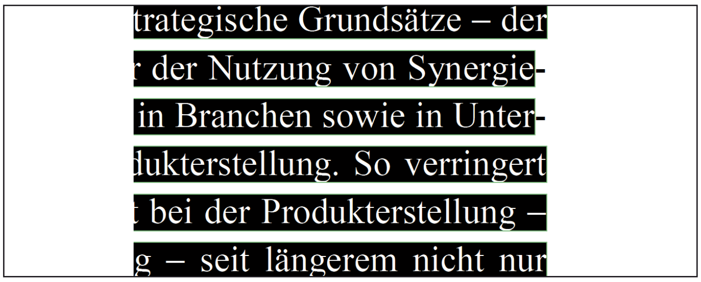
TET Connectors

TET connectors provide the necessary glue code to interface TET with other software. The following TET connectors make PDF text extraction functionality available for various software environments:

- TET connector for the Lucene Search Engine
- TET connector for the Solr Search Server
- TET connector for Oracle Text
- TET connector for MediaWiki
- TET PDF IFilter for Microsoft products is available as a separate product. It extracts text and metadata from PDF documents and makes it available to search and retrieval software on Windows (see separate datasheet for details).

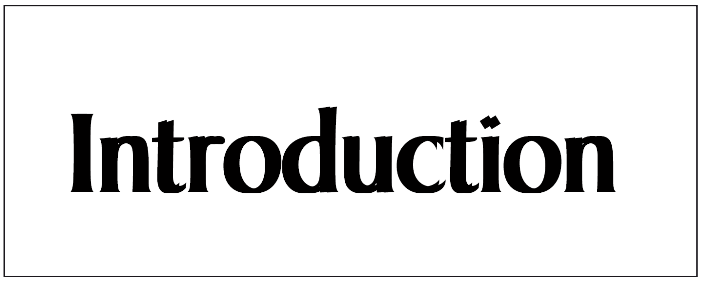
TET Cookbook

The TET Cookbook is a collection of programming examples which demonstrate the use of TET for various text and image extraction tasks. Several Cookbook samples show how to combine the TET and PDFlib+PDI products in order to process and enhance PDF documents, e.g. add bookmarks or links based on the text on the page.



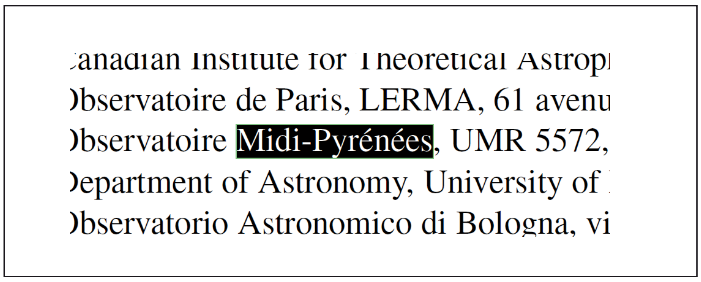
trategische Grundsätze – der
r der Nutzung von Synergie-
in Branchen sowie in Unter-
dukterstellung. So verringert
t bei der Produkterstellung –
g – seit längerem nicht nur

TET correctly removes the hyphen, but keeps the dash.



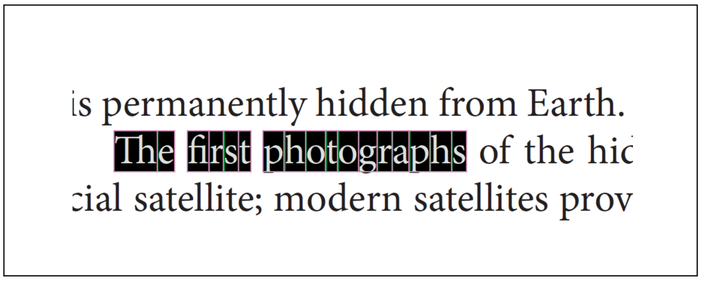
Introduction

Other products extract »Inttrroducctiion«.
TET correctly extracts »Introduction«.



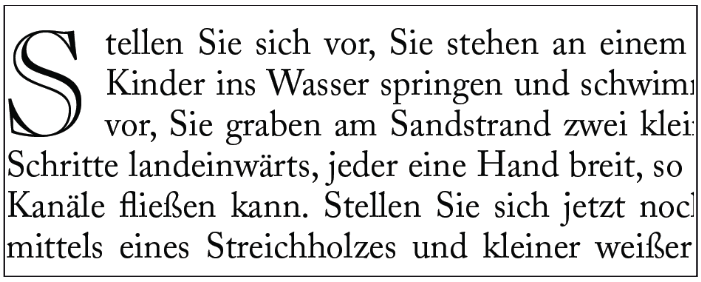
anadian Institute for Theoretical Astrop
bservatoire de Paris, LERMA, 61 avenu
bservatoire Midi-Pyrénées, UMR 5572,
epartment of Astronomy, University of
bservatorio Astronomico di Bologna, vi

Other products extract »Midi-Pyr´en´ees«.
TET correctly extracts »Midi-Pyrénées«.



is permanently hidden from Earth.
The first photographs of the hic
cial satellite; modern satellites prov

Other products extract » e rst photographs«.
TET correctly extracts »The first photographs«.



Stellen Sie sich vor, Sie stehen an einem
Kinder ins Wasser springen und schwim
vor, Sie graben am Sandstrand zwei klei
Schritte landeinwärts, jeder eine Hand breit, so
Kanäle fließen kann. Stellen Sie sich jetzt noc
mittels eines Streichholzes und kleiner weißer

Other products extract two words: the drop cap »S« and »tellen«.
TET correctly extracts the single word »Stellen«.

Challenges with PDF Text Extraction

Dehyphenation

TET detects hyphenated words which span multiple lines, removes the hyphen, and combines the individual parts to form a complete word. This is important to make sure that searches for the full word will be successful although only hyphenated parts are present in the document. Dashes (different from hyphens) will be treated separately since they must not be removed.

Shadow and artifical bold Text Detection

Digital documents often contain shadowed text where the shadow effect is achieved by placing the text multiply on the page, using a small offset between the instances of text. Similarly, bold text is often simulated by overprinting the same text multiply. As a result, the document contains the characters in the shadowed or bold word more than once. TET's patented shadow detection algorithm identifies and removes redundant instances of text to avoid excess text extraction. While other software extracts the shadowed or bold text multiply, TET correctly removes the redundant copies. While extra instances of a word will still result in a search engine hit, no more hits would be found if the text is duplicated character by character as in the example.

Accented Characters

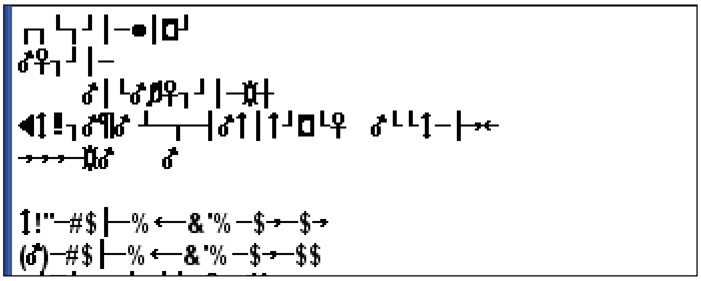
In many languages accents and other diacritical marks are placed close to other characters to form combined characters. Some typesetting programs, most notably TeX, emit two characters (base character and accent) separately to create a combined character. For example, to create the character *ä* first the letter *a* is placed on the page, and then the dieresis character ¨ is placed on top of it. TET detects this situation and recombines both characters to form the appropriate combined character.

Ligatures

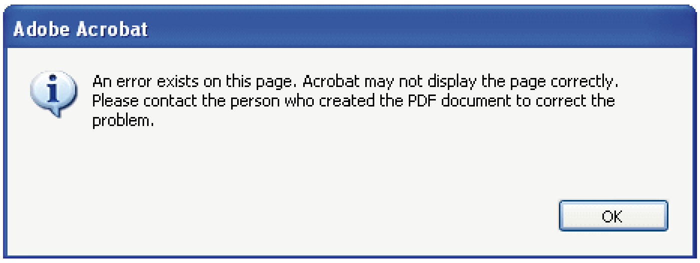
Ligatures combine two or more characters in a single glyph. The most common ligatures are in use for the combinations *ﬁ*, *ﬂ*, and *ﬃ*; less common ligatures are used for the combinations *Th*, *sp*, *ct*, *ﬆ*, and many others. When extracting text from digital documents, ligatures must be analyzed and separated to the constituent characters to allow proper text processing. TET detects ligatures and delivers two or more characters as appropriate.

Drop Caps

Drop caps are large initial characters at the beginning of a paragraph where the top of the initial aligns with the top of the line, and the remainder of the character drops down several lines. Drop caps are used to emphasize the start of a paragraph. If they are not treated properly the initial word is extracted in two parts: the single initial character and the remainder of the word.



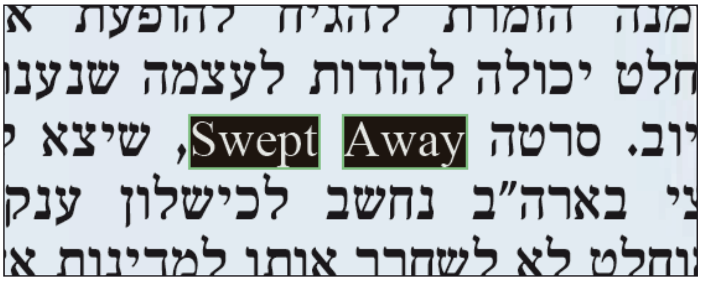
Other products extract unusable garbage, while TET delivers text.



Adobe Acrobat

An error exists on this page. Acrobat may not display the page correctly. Please contact the person who created the PDF document to correct the problem.

The page contents are not even displayed in Acrobat, but TET still correctly extracts the text.



מנה הזמרת להגיח להופעת א
חלט יכולה להודות לעצמה שנענו
יוב. סרטה Swept Away, שיצא ק
צי בארה”ב נחשב לכישלון ענק
וחלט לא לשחרר אותו למדינות א

TET reorders the visual mixture of right-to-left and left-to-right text to create proper logical text output.

Other products extract 133 tiny little strips.
TET extracts a single large image.

Challenges with PDF Text Extraction

Unicode Mapping

Unicode mapping forms the foundation of PDF text extraction: every glyph on the page must be assigned the corresponding Unicode value. PDF complicates this tasks by supporting a variety of font and encoding variants which may or may not provide the information required to assign proper Unicode values. In the worst case the document does not provide enough information with the result that no usable text can be extracted from the document.

TET's patented Unicode mapping algorithm implements a cascaded algorithm which takes all available pieces of information in order to determine Unicode values. For many problematic documents TET extracts proper Unicode text where other products deliver only unusable garbage.

Damaged PDF Documents

PDF documents may get damaged because of transmission errors or other problems. TET's repair mode recovers many kinds of damaged PDFs. Sometimes PDF documents are damaged so heavily that the pages cannot even be displayed in Acrobat. Even in such extreme cases TET often delivers the page contents of the document.

Bidirectional Text with Arabic and Hebrew

PDF does not encode logical text, but is simply a container for glyphs on the page. Text in the Arabic and Hebrew script runs from right to left. Since it often contains left-to-right inserts such as numbers or names in Western languages, text must be interpreted in both directions – hence the term »bidirectional«. Arabic poses additional challenges since the characters can be used in up to four different contextual forms. These shaped forms of characters must be normalized to the corresponding standard (isolated) form.

Challenges with PDF Image Extraction

Color Spaces and Compression

Raster image data in PDF may be encoded in any combination of eleven color spaces and nine compression filters, but common image file formats such as JPEG and TIFF support only a subset of those. TET's image extractor carefully balances the characteristics of the PDF image with the capabilities of the image output format. Regardless of the internal structure of the PDF image, the pixel image will be extracted in one of the common image file formats.

Image Merging

The images in many PDF documents are broken into smaller pieces by the software producing the PDF. What appears as a single image on the page may actually consist of hundreds or thousands of small fragments. Among others, Microsoft Office applications and TeX are known to produce such documents. TET detects fragmented images and merges the pieces to form a usable larger image. Only with image merging such images can be repurposed in any way.

Many Ways to use TET

TET is available as a programming library for various development environments, and as a command-line tool for batch operations. Both offer similar features, but are suitable for different deployment scenarios. Both the TET library and the TET command-line tool can create TETML, TET's XML-based output format.

TET offers the following deployment options:

- The TET programming library (component) is used for integration into desktop or server applications. Examples for using the library are included in the TET package.
- The TET command-line tool is suited for batch processing PDF documents. It doesn't require any programming, but offers command-line options which can be used to integrate it into complex workflows.
- TETML output is suited for XML-based workflows and developers who are familiar with the wide range of XML processing tools and languages, e.g. XSLT.
- TET connectors are suited for integrating TET in various common software packages, e.g. databases and search engines.

The TET Family of Products

The TET family comprises the following products:

- The TET core product as described in this datasheet.
- TET PDF IFilter is available as a separate product. It is suitable for use with Microsoft search products, e.g. Windows Search, SharePoint and SQL Server (see separate datasheet for details).
- The TET Plugin for Adobe Acrobat is a free utility for extracting text and images from PDF. It can be used to evaluate TET interactively.

Supported Development Environments

PDFlib TET is everywhere – it runs on practically all computing platforms. We offer 32-bit and 64-bit packages for all common flavors of Windows, Mac OS, Linux and Unix, as well as for IBM i5/iSeries and zSeries systems.

The TET core is written in highly optimized C code for maximum performance and small overhead. Via a simple API (Application Programming Interface) the TET functionality is accessible from a variety of development environments:

- COM for use with VB, ASP, Borland Delphi, etc.
- C and C++
- Java, including servlets and Java Application Server
- .NET for use with C#, VB.NET, ASP.NET, etc.
- Perl
- PHP
- Python
- REALbasic
- RPG (IBM i5/iSeries)

Benefits of using PDFlib Software

Rock-solid Products

Tens of thousands of programmers worldwide are working with our software. PDFlib meets all quality and performance requirements for server deployment. All PDFlib products are suitable for robust 24x7 server deployment and unattended batch processing.

Speed and Simplicity

PDFlib products are incredibly fast – up to thousands of pages per second. The programming interface is straightforward and easy to learn.

PDFlib Products all over the World

Our products support all international languages as well as Unicode. They are used by customers in all parts of the world.

Professional Support

If there's a problem, we will try to help. We offer commercial support to meet the requirements of your business-critical applications. By adding support you will have access to the latest versions, and have guaranteed response times should any problems arise.

Licensing

We offer various licensing programs for server licenses, integration and site licenses, and source code licenses. Support contracts for extended technical support with short response times and free updates are also available.

About PDFlib GmbH

PDFlib GmbH is completely focused on PDF technology. Customers worldwide use PDFlib products since 1997. The company closely follows development and market trends, such as ISO standards for PDF. PDFlib GmbH products are distributed all over the world with major markets in North America, Europe, and Japan.

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