Python-Fitz Documentation

version 1.7

Ruikai Liu

Jorj McKie

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Contents

The Python-Fitz Documentation

Introduction

python-fitz is a Python binding for MuPDF - "a lightweight PDF and XPS viewer".

MuPDF can access files in PDF, XPS, OpenXPS and EPUB (e-book) formats.

These are files with extensions `*.pdf`, `*.xps`, `*.oxps` or `*.epub` (so in essence, with this binding you can develop **e-book viewers in Python** ...)

python-fitz provides access to all important functions of MuPDF from within a Python environment. Nevertheless, this function set is continuously being increased.

MuPDF stands out among all similar products for its top rendering capability and unsurpassed processing speed.

You can check this out yourself: Compare the various free PDF-viewers. In terms of speed and rendering quality SumatraPDF ranges at the top - and it is based on MuPDF!

While python-fitz has been available since several years for an earlier version of MuPDF (1.2), it was until only recently (mid May 2015), that its creator and a few co-workers decided to elevate it to the current release 1.7a of MuPDF.

And we are determined to keep python-fitz current with future MuPDF changes!

This work is almost completed: we are now mainly working to bring the documentation up to date.

If you know how to build MuPDF on your platform (or you could use our development binaries - just drop a note), then you can use this repository to **make PDF, XPS, OpenXPS and EPUB available** to your Python scripts already **today** - everything works!

python-fitz has been tested and can be used today on Linux, Windows 7, Python 2 and Python 3.

So, what do we have?

- We have ready and working installation procedures for Linux and Windows.
- We have example and demo scripts for typical use cases that you can take as templates for your development.
- We have greatly simplified the installation procedure for Windows x86 and Linux platforms.

So, what is still missing then?

- New documentation is almost complete - you are looking at the result. Do also have a look at the demos and examples provided.
- Some tests are still outstanding, e.g. for the combination Win & Python 3.

We invite you to join our efforts by contributing to the the wiki pages, by testing what is there - and, of course, by submitting issues and bugs to the site!

Installation

This describes how to install python-fitz.

Step 1: Download python-fitz

Download this repository and unzip it. This will give you a folder, let us call it `PyFitz`.

Step 2: Download MuPDF 1.7a

Download MuPDF version 1.7a source, and unzip it. Let us call the resulting folder `mupdf17`.

Put it inside `PyFitz` as a subdirectory, if you want to keep everything in one place.

Step 3: Build / Setup python-fitz

If necessary, adjust the setup.py script now. E.g. make sure that

- the include directory is correctly set in sync with your directory structure

It is no longer necessary to generate MuPDF object code if your platform is either Windows (32 Bit) or Linux. The required object libraries for these two platforms have been put into respective directories, and the setup script has been updated. These are the names of those directories:

- LibLinux - for the Linux-generated MuPDF libraries
- LibWin32 - for the Windows-generated MuPDF libraries

Now perform a `python setup.py install`

Tutorial

This tutorial will show you the use of MuPDF in Python step by step.

Because MuPDF supports not only PDF, but also XPS, OpenXPS and EPUB formats, so does python-fitz. Nevertheless we will only talk about PDF's for the sake of brevity.

Import the Bindings

The Python bindings to MuPDF are made available by this import statement:

```
import fitz
```

Open a Document

In order to access a supported document, it must be opened with the following statement:

```
doc = fitz.Document(filename)
```

This will create `doc` as a *Document* object. `filename` must be a Python string or unicode object that specifies the name of an existing file (with or without a fully or partially qualified path). A *Document* contains several attributes and functions. Among them are meta information (like "author" or "subject"), number of total pages, outline and encryption information.

Some Document methods and attributes

Method / Attribute	Description
`Document.pageCount`	Number of pages of `filename` (integer).
`Document.metadata`	Metadata of the `Document` (dictionary).
`Document.outline`	First outline entry of `Document`
`Document.ToC()`	Table of contents of `Document` (list).
`Document.loadPage()`	Create a `Page` object.

Access Meta Data

Document.metadata is a Python dictionary with the following keys. For details of their meanings and formats consult the PDF manuals. The meta data fields are of type string if not otherwise indicated and may be missing, in which case they contain `None`.

Key	Value
`producer`	Producer (producing software)
`format`	PDF format, e.g. 'PDF 1.4'
`encryption`	Encryption method used
`author`	Author
`modDate`	Date of last modification
`keywords`	Keywords (dictionary)
`title`	Title

creationDate	Date of creation
creator	Creating application
subject	Subject

Work with Outlines

Entering the documents outline tree works like this:

```
olItem = doc.outline    # the document's first outline item
```

This creates olItem as an *Outline* object.

Some Outline methods and attributes

Method / Attribute	Description
Outline.saveText()	Save table of contents as a text file
Outline.saveXML()	Save table of contents as a quasi-XML file
Outline.next	Next item of the same level
Outline.down	Next item one level down
Outline.title	Title of this item (UTF-8)
Outline.dest	Destination ('where does this entry point to?')

Some `Outline.dest` attributes

Attribute	Description
Outline.dest.page	Target page number
Outline.dest.lt	Top-left corner of target rectangle
Outline.dest.rb	Bottem-right corner of target rectangle

MuPDF also supports outline destinations to other files and to URIs. See *Outline*.

In order to get a document's table of contents as a Python list, use the following function:

```
toc = doc.ToC()       # [[level, title, page], ...], or []
```

Work with Pages

Tasks that can be performed with a *Page* are at the core of MuPDF's functionality. Among other things, you can render a *Page*, optionally zooming, rotating or shearing it. You can write it's image to files (in PNG format), extract text from it or perform searches for text elements. At first, a page object must be created:

```
page = doc.loadPage(n)        # represents page n of the document
```

Here are some typical uses of *Page* objects:

Inspect the links on a Page

Here is an example that displays all links and their types:

```
#--------------------------------------------------------------------------------
# Get all links of the current page
#--------------------------------------------------------------------------------
```

```
ln = page.loadLinks()
#--------------------------------------------------------------------------------
# Links are organized as a single linked list. We need to check each occurrence
# to see what info we can get
#--------------------------------------------------------------------------------
while ln:
    if ln.dest.kind == fitz.LINK_URI:
            print '[LINK]URI: %s' % ln.dest.uri
    elif ln.dest.kind == fitz.LINK_GOTO:
        print '[LINK]jump to page %d' % ln.dest.page
    else:
        pass
    ln = ln.next
```

Render a Page

This example creates an image out a page's content:

```
#--------------------------------------------------------------------------------
# Get the page's rectangle
#--------------------------------------------------------------------------------
rect = page.bound()
#--------------------------------------------------------------------------------
# create the smallest pixel area containing the rectangle
#--------------------------------------------------------------------------------
irect = rect.round()
#--------------------------------------------------------------------------------
# create an empty RGBA pixel map of the pixel area's size
#--------------------------------------------------------------------------------
pix = fitz.Pixmap(fitz.Colorspace(fitz.CS_RGB), irect)
pix.clearWith(255)             # Initialize with color "white" and "no transparency"
dev = fitz.Device(pix)         # Create a draw device for the pixel map
page.run(dev, fitz.Identity)   # finally render the page with no changes
#--------------------------------------------------------------------------------
# now pix contains an image of the page, ready to be used
#--------------------------------------------------------------------------------
```

Save the page image in a file

We can simply store the image in a PNG file:

```
pix.writePNG("test.png")
```

Use the image in a dialog manager

Or we convert the image into a bitmap usable by a dialog manager:

```
data = pix.samples                  # data = bytearray of raw pixel data (RGBA)
bitmap = wx.BitmapFromBufferRGBA(irect.width,
            irect.height, str(data)) # wxPython only accepts strings, no bytearrays
```

Extract and search for text of a Page

We can also extract all text of a page in a big chunk of string:

```
dl = fitz.DisplayList()                 # create a DisplayList
ts = fitz.TextSheet()                   # create a TextSheet
tp = fitz.TextPage()                    # create a TextPage
dev = fitz.Device(ts, tp)               # create a text Device
# now run the page through the created device
dl.run(dev, fitz.Identity, irect)
# Extract the complete text of the page now contained in the TextPage.
```

```
# Includes all whitespace (tabulation, end-of-line, etc.) characters, too.
text = tp.extractText()                    # remember: UTF-8 encoding!
```

If you want more details, you can determine exactly where on a page a certain string appears:

```
# search for at most 4 page locations with specific contents
res = tp.search('MuPDF', 4)
```

The result `res` will now be `[]` or a list of no more than 4 *IRect* rectangles that contain the string 'MuPDF'.

Classes

The list of python-fitz classes, accessible via the prefix `fitz.`.

Class	Short Description
Colorspace	Define the color space of a *Pixmap*.
Device	Target object for rendering or text extraction.
DisplayList	A list containing drawing commands.
Document	Basic class for dealing with files.
Identity	The do-nothing *Matrix*
IRect	A rectangle (pixel coordinates).
Link	A destination
linkDest	The destination of an outline entry
Matrix	A 3x3 matrix used for transformations.
Outline	Outline element (a.k.a. bookmark).
Page	A document page.
Pixmap	A pixel map (for rendering).
Point	Represents a point in the plane.
Rect	A rectangle (float coordinates).
TextPage	Text content of a page.
TextSheet	A list of text styles used in a page.

Colorspace

Represents the color space of a *Pixmap*.

Class API

class **`Colorspace`**

`__init__` (***`self`***, ***`colorspace`***, ***`irect`***)
Constructor

`colorspace`
A number identifying the colorspace. Currently only RGBA is supported (`fitz.CS_RGB`).

Type: int

`irect`
A *IRect* object representing the area of the image.

Type: instance

Device

The different format handlers (pdf, xps, etc.) interpret pages to a "device". These devices are the basis for everything that can be done with a page: rendering, text extraction and searching. The device type is determined by the selected construction method.

Class API

class **Device**

__init__ (*self*, *object*)
Constructor for either a pixel map or a display list device.

object
An object representing one of *Pixmap*, or *DisplayList*

Type: instance

__init__ (*self*, *textsheet*, *textpage*)
Constructor for a text page device.

textsheet
A *TextSheet* object.

Type: instance

textpage
A *TextPage* object.

Type: instance

DisplayList

DisplayList is a list containing drawing commands (text, images, etc.). The intent is two-fold:

1. as a caching-mechanism to reduce parsing of a page
2. as a data structure in multi-threading setups, where one thread parses the page and another one renders pages.

A `DisplayList` is populated with objects from a page by running **`Page.run()`** on a *Device*. Replay the list (once or many times) by invoking the display list's **`run()`** function.

Methods

`run()`	(Re)-run a display list through a device.

Class API

class **`DisplayList`**

`fitz.DisplayList (self)`
Create a rendering device for a display list.
When the device is rendering a page it will populate the display list with drawing commands (text, images, etc.). The display list can later be reused to render a page many times without having to re-interpret the page from the document file.

Return type: *Device*

`run (self, dev, ctm, area)`

Parameters:

- **dev** (*Device*) -- Device obtained from *Device*
- **ctm** (*Matrix*) -- Transform matrix to apply to display list contents.
- **area** (*IRect*) -- Only the part of the contents of the display list visible within this area will be considered when the list is run through the device. This does not imply for tile objects contained in the display list.

Document

This class represents a document and is constructed by `fitz.Document(filename)`. This will also **open** the document specified as `filename`. Returns a `Document` object.

Methods and Attributes

Method / Attribute	Short Description
`Document.authenticate()`	Decrypts the document
`Document.loadPage()`	Reads a page
`Document.save()`	Saves a copy of the document
`Document.ToC()`	Creates a table of contents
`Document.close()`	Closes the document
`Document.outline`	First *Outline* item
`Document.name`	filename of document
`Document.needsPass`	Is document is encrypted?
`Document.pageCount`	The document's number of pages
`Document.metadata`	The document's meta data

Class API

class **`Document`**

`authenticate (password)`
Decrypts the document with the string `password`. If successfull, the document's data can be accessed (e.g. for rendering).

Parameters: **password** (*string*) -- The password to be used.
Return type: int
Returns: `True` (`1`) if decryption with `password` was successfull, `False` (`0`) otherwise.

`loadPage (number)`
Loads a `Page` for further processing like rendering, text searching, etc. See the *Page* object.

Parameters: **number** (*int*) -- page number, zero-based (0 is the first page of the document).
Return type: *Page*

`save (filename)`
Saves a copy of the document under the `filename` (absolute or relative path specifications). Internally the document may have changed, i.e. if the document has been decrypted before, an unencrypted copy will be saved.

Parameters: **filename** (*string*) -- The filename to save to. Must be different from the original file name.

`ToC ()`
Creates a table of contents from the `outline` entries. This will be a Python list `[[level, title, page], [...], ...]` or `[]` if there are no outline entries. Note that the title entries are unicode strings.

Return type: list

`close ()`
Closes `filename` thus freeing it for other purposes.

outline
Contains either None or the first *Outline* entry of the document. Can be used as a starting point to walk through all outline items.

Return type: *Outline*

needsPass
Contains an indicator showing whether the document is encrypted (True (1)) or not (False (0)).

Return type: bool

metadata
Contains the document's meta data as a Python dictionary. Its keys are format, encryption, title, author, subject, keywords, creator, producer, creationDate, modDate. For the most part, these key names in an obvious way correspond to the PDF's "official" meta data fields /Creator, /Producer, /CreationDate, /ModDate, /Title, /Author, /Subject, /Keywords respectively. format contains the PDF format version of the file (e.g. 'PDF 1.4'), encryption contains either None when not encrypted, or a string naming the encryption method used (e.g. 'Standard V4 R4 128-bit RC4'). Note that all other metadata values are encrypted if the value for 'encoding' is not None. All item values are UTF-8 encoded strings (or None), except keywords. If keywords is not None, it contains a Python dictionary specifying the document's keywords (again, as UTF-8 encoded strings). The date fields are strings with the PDF-internal timestamp format "D:<DateTime><TZ>", where <DateTime> is the 12 character ISO date YYYMMDDhhmmss (YYYY - year, MM - month, DD - day, hh - hour, mm - minute, ss - second), and <TZ> is a time zone value (time intervall relative to GMT) containing a sign ('+' or '-'), the hour (hh), and minute ('mm', attention: enclose in apostrophies!). For example, a Venezuelan value might look like D:20150415131602-04'30', which corresponds to the timestamp April 15, 2015, at 1:16:02 pm local time Venezuela.

Return type: dict

name
Contains the filename value with which Document was created.

Return type: dict

pageCount
Contains the number of pages of the document. May return 0 for documents with no pages.

Return type: int

Identity

Identity is just a *Matrix* that performs no action. The default constructor of *Matrix* creates an identity matrix.

IRect

IRect is a rectangular bounding box similar to *Rect*, except that all corner coordinates are integers. IRect is used to specify an area of pixels, e.g. to receive image data during rendering.

Attributes

Attribute	Short Description
`IRect.width`	Width of the bounding box
`IRect.height`	Height of the bounding box
`IRect.x0`	X-coordinate of the top left corner
`IRect.y0`	Y-coordinate of the top left corner
`IRect.x1`	X-coordinate of the bottom right corner
`IRect.y1`	Y-coordinate of the bottom right corner

Class API

class **`IRect`**

`__init__` **(*`self`*, *`x0=0`*, *`y0=0`*, *`x1=0`*, *`y1=0`*)**
Constructor. The default values will create an empty rectangle. Function **`Rect.round()`** creates the smallest `IRect` containing `Rect`.

`width`
Contains the width of the bounding box. Equals `x1 - x0`.

Type: int

`height`
Contains the height of the bounding box. Equals `y1 - y0`.

Type: int

`x0`
X-coordinate of the top left corner.

Type: int

`y0`
Y-coordinate of the top left corner.

Type: int

`x1`
X-coordinate of the bottom right corner.

Type: int

`y1`
Y-coordinate of the bottom right corner.

Type: int

Link

Represents a pointer to somewhere (this document, other documents, the internet). Links exist per document page, and they are forward-chained to each other, starting from an initial link which is accessible by the `Page.loadLinks()` method.

Attributes

Attribute	Short Description
`Link.rect`	Clickable area in untransformed coordinates.
`Link.dest`	Kind of link destination.
`Link.next`	Link to next link

Class API

class **`Link`**

`rect`
The area that can be clicked in untransformed coordinates.

Return type: *Rect*

`dest`
The link destination kind. An integer to be interpreted as one of the `FZ_LINK_*` values.

Return type: int

`next`
The next `Link` or `None`

Return type: *Link*

linkDest

Class representing the *dest* property of an outline entry.

Attributes

Attribute	Short Description
linkDest.dest	Destination
linkDest.fileSpec	File specification (path, filename)
linkDest.flags	Descriptive flags
linkDest.isMap	Is this a MAP?
linkDest.isUri	Is this an URI?
linkDest.kind	Kind of destination
linkDest.lt	Top left coordinates
linkDest.named	Name if named destination
linkDest.newWindow	Name of new window
linkDest.page	Page number
linkDest.rb	Bottom right coordinates
linkDest.uri	URI

Class API

class **linkDest**

dest
Destination of `linkDest`.

Return type: *Link*

fileSpec
Contains the filename (including any path specifications) this link points to, if applicable.

Return type: string

flags
A one-byte bitfield consisting of indicators describing the validity and meaning of the different aspects of the destination. As far as possible, link destinations are constructed such that e.g. **`linkDest.lt`** and **`linkDest.rb`** can be treated as defining a bounding box, though the validity flags (see `LINK_FLAG_*` values) indicate which of the values were actually specified. Note that the numerical values for each of the LINK_FLAGs are powers of 2 and thus indicate the position of the bit to be tested. More than one bit can be `True`, so do not test for the value of the integer.

Return type: int

isMap
This flag specifies whether to track the mouse position when the URI is resolved. Default value: False.

Return type: bool

isUri
Specifies whether this destination is an internet resource.

Return type: bool

`kind`
Indicates the type of this destination, like a place in this document, a URI, a file launch, an action or a place in another file. Look at index entries `FZ_LINK_*` to see the names and numerical values.

Return type: int

`lt`
The top left *Point* of the destination.

Return type: *Point*

`named`
This destination refers to some named resource of the document (see Adobe PDF documentation).

Return type: int

`newWindow`
This destination refers to an action that will open a new window.

Return type: bool

`page`
The page number (in this document) this destination points to.

Return type: int

`rb`
The bottom right *Point* of this destination.

Return type: *Point*

`uri`
The name of the URI this destination points to.

Return type: string

Matrix

Matrix is a row-major 3x3 matrix used image transformations in MuPDF. With matrices you can manipulate the rendered image of a page in a variety of ways: (parts of) pages can be rotated, zoomed, flipped, sheared and shifted by setting some or all of just six numerical values.

Since all points or pixels live in a two-dimensional space, one column vector of that matrix is a constant unit vector, and only the remaining six elements are used for manipulations. These six elements are usually represented by `[a,b,c,d,e,f]`. Here is how they are positioned in the matrix:

$$\begin{bmatrix} a & b & 0 \\ c & d & 0 \\ e & f & 1 \end{bmatrix}$$

It should be noted, that

- the below methods are just convenience functions. Everything they do, can also be achieved by directly manipulating `[a,b,c,d,e,f]`
- all manipulations can combined - you can construct a matrix to rotate **and** shear **and** scale **and** shift etc. in one go

Methods

Method	Description
`Matrix.__init__()`	Constructor.
`Matrix.preRotate()`	Perform a rotation
`Matrix.preScale()`	Perform a scaling
`Matrix.preShear()`	Perform a shearing

Attributes

Atribute	Description
`Matrix.a`	Zoom factor X direction
`Matrix.b`	Shearing effect Y direction
`Matrix.c`	Shearing effect X direction
`Matrix.d`	Zoom factor Y direction
`Matrix.e`	Horizontal shift
`Matrix.f`	Vertical shift

Class API

class **`Matrix`**

`__init__` **(*`self`*, *`a=1`*, *`b=0`*, *`c=0`*, *`d=1`*, *`e=0`*, *`f=0`*)**
Constructor. `Matrix(1, 1)` will construct the *Identity* matrix.

`preRotate` **(*`deg`*)**
Performs a clockwise rotation for `deg` degrees. This will change the matrix elements in the following way: `a = cos(deg)`, `b = sin(deg)`, `c = -sin(deg)`, `d = cos(deg)`. `e` and `f` will remain unchanged.

Parameters: **deg** -- The extent of the rotation in degrees.

Return type: *Matrix*

`preScale (sx, sy)`
Scales by the zoom factors sx and sy. Has effects on attributes `a` and `d` only.

Parameters:
- **sx** -- Zoom factor in X direction. For the effect see description of attribute `a`.
- **sy** -- Zoom factor in Y direction. For the effect see description of attribute `d`.

Return type: *Matrix*

`preShear (sx, sy)`
Performs shearing, i.e. transformation of rectangles into parallelograms (rhomboids).

Parameters:
- **sx** -- Shearing effect in X direction. See attribute `c`.
- **sy** -- Shearing effect in Y direction. See attribute `b`.

Return type: *Matrix*

a
Scaling in X-direction **(width)**. For example, a value of 0.5 performs a shrink of the **width** by a factor of 2. If a < 0, a vertical flip will occur, i.e. mirrors the rectangle's picture along the Y axis.

Type: float

b
Causes a shearing effect: each `Point(x, y)` will become `Point(x, y - b*x)`.

Type: float

c
Causes a shearing effect: each `Point(x, y)` will become `Point(x - c*y, y)`.

Type: float

d
Scaling in Y-direction **(height)**. For example, a value of 1.5 performs a stretch of the **height** by 50%. If d < 0, a horizontal flip will occur, i.e. mirrors the rectangle's picture along the X axis.

Type: float

e
Causes a horizontal shift effect: Each `Point(x, y)` will be shifted right to become `Point(x + e, y)`. Note that negative values of `e` will shift left.

Type: float

f
Causes a vertical shift effect: Each `Point(x, y)` will be shifted down to become `Point(x, y - f)`. Note that negative values of `f` will shift up.

Type: float

Outline

`outline` is a property of `Document`. If not `None`, it stands for the first outline item of the document. Its properties in turn define the characteristics of this item and also point to other outline items in either "horizontal" direction by property `.next` to the next item of same level, or downwards with property `.down` to the next item one level lower. The full tree of all outline items for e.g. a conventional table of contents can be recovered by following these "pointers".

Methods and Attributes

Method / Attribute	Short Description
`Outline.down`	Next item downwards
`Outline.next`	Next item same level
`Outline.dest`	Link destination
`Outline.title`	Title (UTF-8 string)
`Outline.saveText()`	Prints a conventional table of contents to a file
`Outline.saveXML()`	Prints an XML-like table of contents to a file

Class API

class **`Outline`**

`down`
The next outline item on the next level down. Is `None` if the item has no children.

Return type: *Outline*

`next`
The next outline item at the same level as this item. Is `None` if the item is the last one in its level.

Return type: *Outline*

`dest`
The destination this entry points to. Can be a place in this or another document, or an internet resource. It can include actions to perform like opening a new window, invoking a javascript or opening another document.

Return type: *linkDest*

`title`
The item's title as a UTF-8 string.

Return type: string

`saveText ()`
The chain of outline items is being processed and printed to a file `filename` as a conventional table of contents.

Parameters: **filename** (*string*) -- Name of the file to write to.

`saveXML ()`
The chain of outline items is being processed and printed to a file `filename` as an XML-like table of contents.

Parameters: **filename** (*string*) -- Name of the file to write to.

Page

Page interface, created by `Document.loadPage()`.

Methods and Attributes

Method / Attribute	Short Description
`Page.bound()`	The Page's rectangle
`Page.loadLinks()`	Get all the links in a page
`Page.run()`	Run a page through a device
`Page.number`	Page number

Class API

class **Page**

bound ()
Determine the a page's rectangle (before transformation).

Return type: *Rect*

loadLinks ()
Get all the links in a page.

Return type: list

Returns: A python list of *Link*. An empty list is returned if there's no link in the page.

run (*dev*, *transform*)
Run a page through a device.

Parameters:

- **dev** (*Device*) -- Device, obtained from one of the *Device* constructors.
- **transform** (*Matrix*) -- Transformation to apply to the page. May include for example scaling and rotation, see `Matrix.preScale()` and `Matrix.preRotate()`. Set it to *Identity* if no transformation is desired.

number
The page number

Return type: int

Pixmap

Pixmaps represent a set of pixels for a 2 dimensional region. Each pixel consists of n bytes ("components"), plus always an alpha. The data is in premultiplied alpha when rendering, but non-premultiplied for colorspace conversions and rescaling.

Methods and Attributes

Method / Attribute	Short Description
`Pixmap.clearWith()`	Clears a pixmap (with given value)
`Pixmap.writePNG()`	Saves a pixmap as a png file
`Pixmap.invertIRect()`	Invert the pixels of a given bounding box
`Pixmap.samples`	The components data for all pixels
`Pixmap.h`	Height of the region in pixels
`Pixmap.w`	Width of the region in pixels
`Pixmap.x`	X-coordinate of top-left corner of pixmap
`Pixmap.y`	Y-coordinate of top-left corner of pixmap
`Pixmap.n`	Number of components per pixel
`Pixmap.xres`	Resolution in X-direction
`Pixmap.yres`	Resolution in Y-direction
`Pixmap.interpolate`	Interpolation method indicator

Class API

class **`Pixmap`**

`clearWith (self, value=0)`
Clears a pixmap.

Parameters: **value** (*int*) -- Values in the range 0 to 255 are valid. Each color byte of each pixel will be set to this value, while alpha will always be set to 255 (non-transparent). Default is 0.

`samples`
The color and transparency values for all pixels. Samples is a memory area of size `width * height * n` bytes. The first n bytes are components 0 to n-1 for the pixel at point (x,y). Each successive n bytes gives another pixel in scanline order. Subsequent scanlines follow each other with no padding. E.g. for an RGBA colorspace this means, `samples` is a bytearray like `..., R, G, B, A, ...`, and the four byte values R, G, B, A describe one pixel (RGBA is the only supported colorspace at this time).

Return type: bytearray

`w`
The width of the region in pixels.

Return type: int

`h`
The height of the region in pixels.

Return type: int

`x`
X-coordinate of top-left corner

Return type: int

y
Y-coordinate of top-left corner

Return type: int

n
Number of components per pixel

Return type: int

xres
Horizontal resolution

Return type: int

yres
Vertical resolution

Return type: int

invertIRect (*self*, *irect*)
Invert all pixels in *IRect*. All components except alpha are inverted.

Parameters: **irect** -- Invert all the pixels in the irect. If not given, the whole pixmap will be inverted.

writePNG (*self*, *filename*, *savealpha=False*)
Save a pixmap as a png.

Parameters:
- **filename** (*string*) -- The filename to save as (including extension).
- **savealpha** (*bool*) -- Save alpha or not.

interpolate
A boolean flag set to `True` if the image will be drawn using linear interpolation, or set to `False` if image is created using nearest neighbour sampling.

Return type: bool

Point

`Point` represents a point in the plane, defined by its x and y coordinates.

Methods

`Point.__init__()`	Constructor.

Attributes

`Point.x`	The X- coordinate.
`Point.y`	The Y- coordinate.

Class API

class **`Point`**

`__init__` (***`self`***, ***`x=0`***, ***`y=0`***)
Constructor, defaulting to "top left".

`x`

Type: float

`y`

Type: float

Rect

`Rect` represents a rectangle defined by its top left and its bottom right *Point* objects, in coordinates: ((x0, y0), (x1, y1)).

Rectangle borders are always in parallel with the respective X- and Y-axes. A rectangle is called "finite" if x0 <= x1 and y0 <= y1 is true, else "infinite".

Methods

Methods	Short Description
`Rect.round()`	creates the smallest *IRect* containing `Rect`
`Rect.transform()`	transform `Rect` with a *Matrix*

Attributes

Attribute	Short Description
`Rect.height`	`Rect` height
`Rect.width`	`Rect` width
`Rect.x0`	Top left corner's X-coordinate
`Rect.y0`	Top left corner's Y-coordinate
`Rect.x1`	Bottom right corner's X-coordinate
`Rect.y1`	Bottom right corner's Y-coordinate

Class API

class **`Rect`**

`__init__` (***`self`***, ***`x0=0`***, ***`y0=0`***, ***`x1=0`***, ***`y1=0`***)
Constructor. The default values will create an empty rectangle.

`round` ()
Creates the smallest *IRect* that contains `Rect`.

Return type: *IRect*

`transform` (*m*)
Transforms `Rect` with a *Matrix*.

Parameters: **m** -- A *Matrix* to be used for the transformation.
Return type: *Rect*

`width`
Contains the width of the rectangle. Equals `x1 - x0`.

Return type: float

`height`
Contains the height of the rectangle. Equals `y1 - y0`.

Return type: float

`x0`
X-coordinate of the top left corner.

Type: float

y0
Y-coordinate of the top left corner.

Type: float

x1
X-coordinate of the bottom right corner.

Type: float

y1
Y-coordinate of the bottom right corner.

Type: float

TextPage

`TextPage` contains the text of a page.

Methods

`TextPage.extractText()`	Extract the page's text.
`TextPage.search()`	Search for a string in the page.

Class API

class **`TextPage`**

`extractText (self)`
Extract the text from a `TextPage` object. Returns a UTF-8 encoded string of the page's complete text.

Return type: string

`search (self, string, maxhit)`
Search for the string `string`.

Parameters:
- **string** (*string*) -- The string to search for.
- **maxhit** (*int*) -- Maximum number of expected hits (default 16).

Return type: list

Returns: A python list. Each element of the list is an *IRect* (without transformation) surrounding a found `string` occurrence (or an empty list).

TextSheet

`TextSheet` contains a list of distinct text styles used on a page (or a series of pages).

Constants and Enumerations

Constants and enumerations of MuPDF as implemented by python-fitz. If your import statement was `import fitz` then each of the following variables `var` is accessible as `fitz.var`

Constants

Constant	Description
CS_RGB	1 - Type of *Colorspace* is RGBA
VersionBind	'1.7.0' - Version of python-fitz
VersionFitz	'1.7a' - Version of MuPDF

Enumerations

Possible values of **`linkDest.kind`** (link destination type).

Value	Description
FZ_LINK_NONE	0 - No destination
FZ_LINK_GOTO	1 - Points to a place in this document
FZ_LINK_URI	2 - Points to an URI
FZ_LINK_LAUNCH	3 - Launches (opens) a file
FZ_LINK_NAMED	4 - Performs some action
FZ_LINK_GOTOR	5 - Points to a place in another document

Possible values of **`linkDest.flags`** (link destination flags). **Attention**: This is a one-byte bit field. The values represent boolean indicators showing whether the corresponding bit is `ON`.

Value	Description
LINK_FLAG_L_VALID	1 (bit 0) Top left x value is valid
LINK_FLAG_T_VALID	2 (bit 1) Top left y value is valid
LINK_FLAG_R_VALID	4 (bit 2) Bottom right x value is valid
LINK_FLAG_B_VALID	8 (bit 3) Bottom right y value is valid
LINK_FLAG_FIT_H	16 (bit 4) Horizontal fit
LINK_FLAG_FIT_V	32 (bit 5) Vertical fit
LINK_FLAG_R_IS_ZOOM	64 (bit 6) Bottom right x is a zoom figure

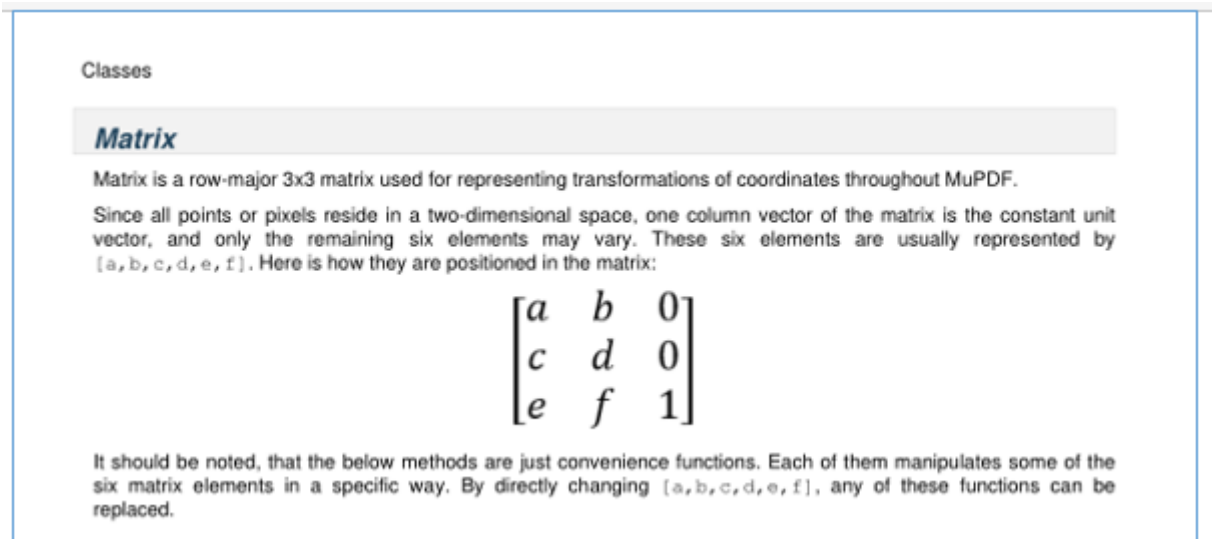
Matrix Examples

This page illustrates some of the effects achievable with matrices. The following pictures start with a page of this help file. We show what will happen when a matrix is being applied. Though we always create full pages, only parts are displayed here to save space.

As the original we take a page of this help file.

Original

This is the original page image


Classes

Matrix

Matrix is a row-major 3x3 matrix used for representing transformations of coordinates throughout MuPDF.

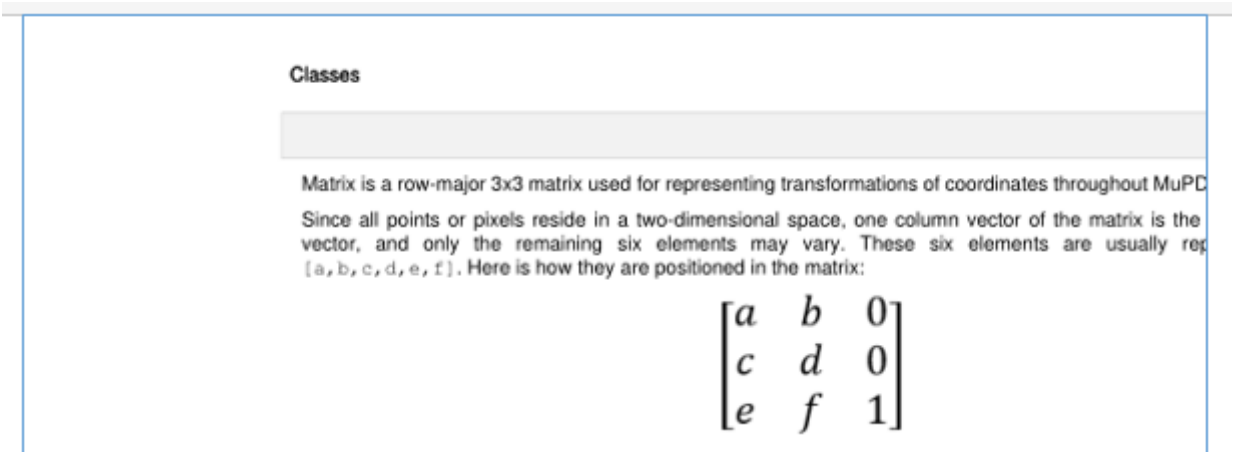
Since all points or pixels reside in a two-dimensional space, one column vector of the matrix is the constant unit vector, and only the remaining six elements may vary. These six elements are usually represented by `[a,b,c,d,e,f]`. Here is how they are positioned in the matrix:

$$\begin{bmatrix} a & b & 0 \\ c & d & 0 \\ e & f & 1 \end{bmatrix}$$

It should be noted, that the below methods are just convenience functions. Each of them manipulates some of the six matrix elements in a specific way. By directly changing `[a,b,c,d,e,f]`, any of these functions can be replaced.

Shifting

We transform it with a matrix where `e = 100` (right shift by 100 pixels)

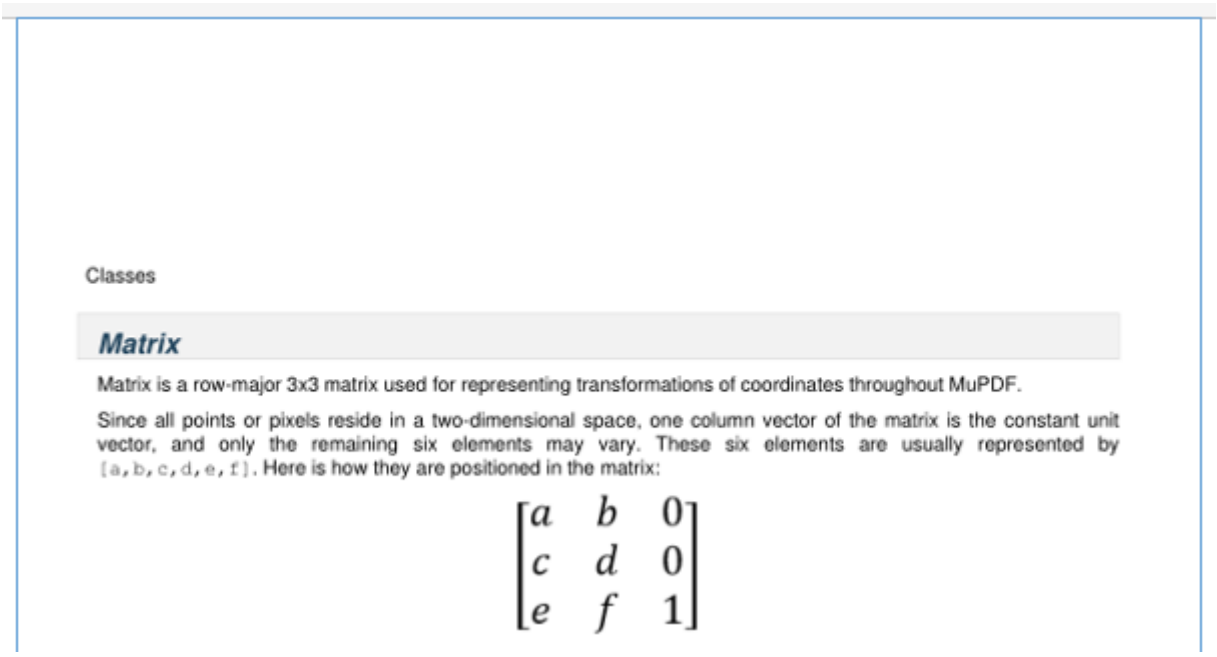

Classes

Matrix is a row-major 3x3 matrix used for representing transformations of coordinates throughout MuPD

Since all points or pixels reside in a two-dimensional space, one column vector of the matrix is the vector, and only the remaining six elements may vary. These six elements are usually re `[a,b,c,d,e,f]`. Here is how they are positioned in the matrix:

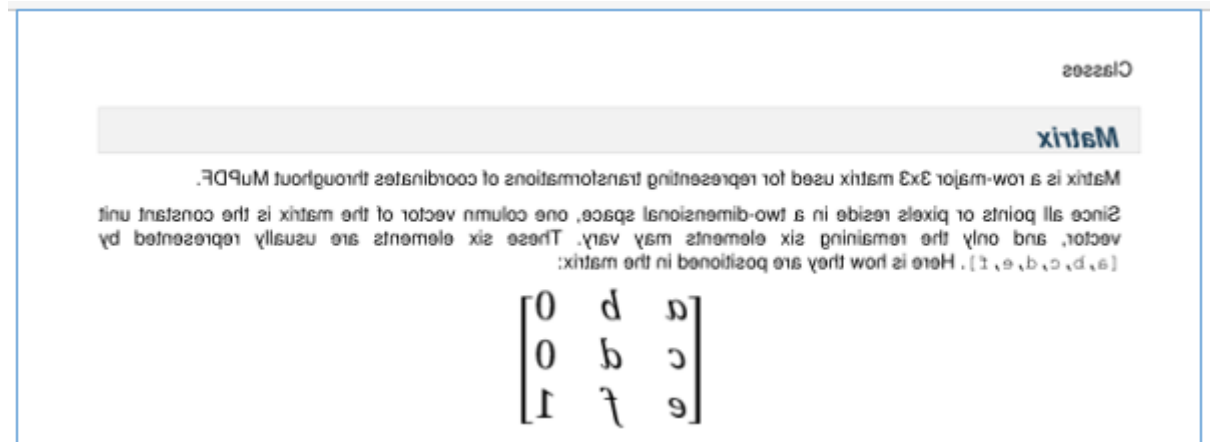
$$\begin{bmatrix} a & b & 0 \\ c & d & 0 \\ e & f & 1 \end{bmatrix}$$

Next we do a down shift by 100 pixels: `f = 100`

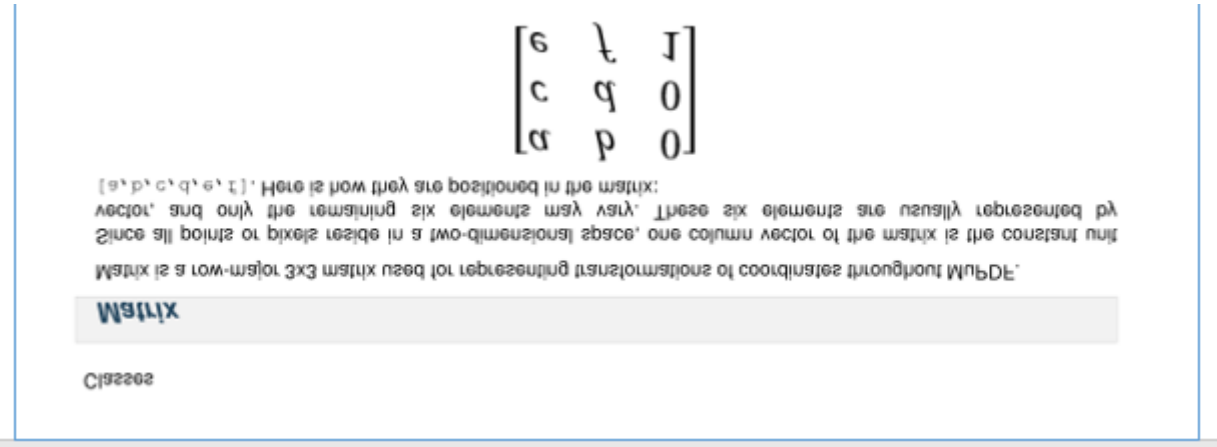


Flipping

Flip the page vertically (`a = -1`)



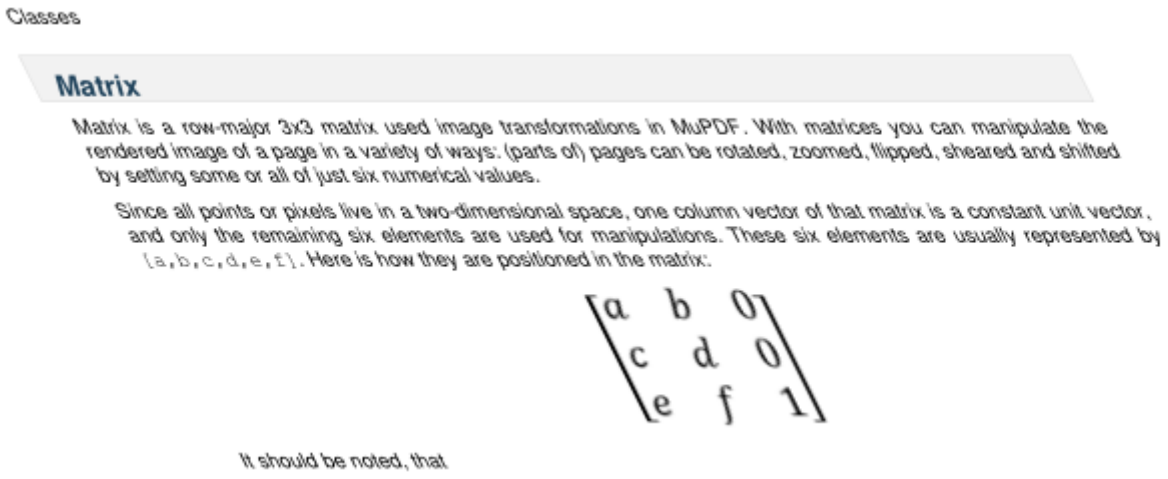
Flip horizontally (`d = -1`)



Shearing

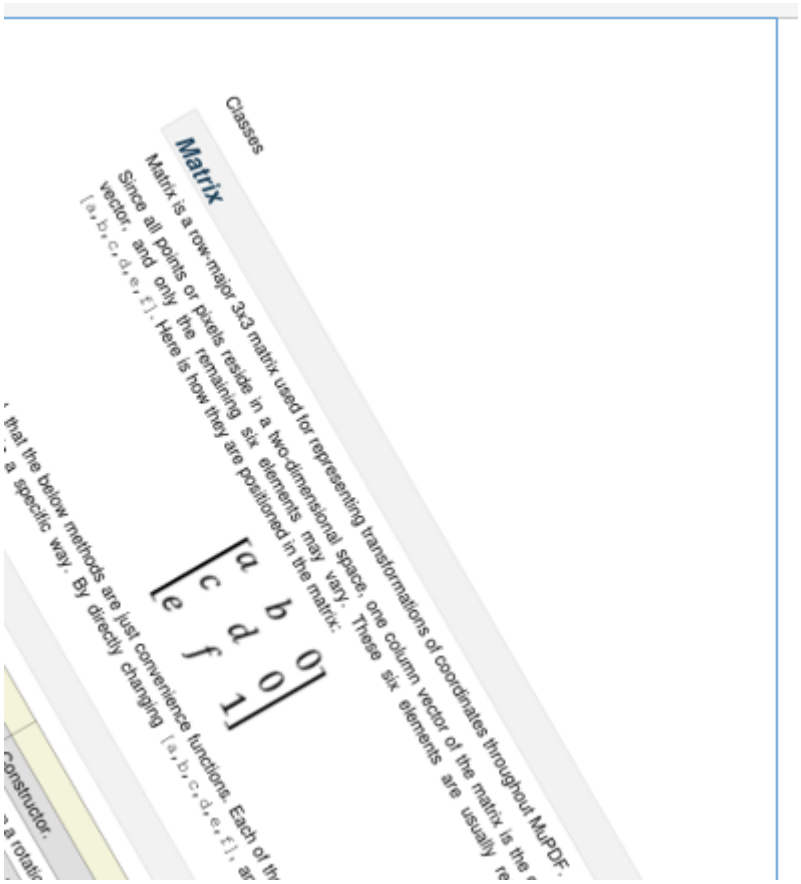
First a shear in Y direction (`b = 0.5`)

Second a shear in X direction (`c = 0.5`)



Rotating

Finally a rotation by 60 degrees


Classes
Matrix
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a b 0
c d 0
e f 1
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a rotati

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