
pyautocad Documentation

Release 0.2.0

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May 05, 2016

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pyautocad - library aimed to simplify writing [ActiveX Automation](#) scripts for [AutoCAD](#) with Python

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1.1 Getting started

1.1.1 Installation

If you have `pip` or `easy_install`, you can just:

```
pip install --upgrade pyautocad
```

or:

```
easy_install -U pyautocad
```

Also, you can download Windows installer from PyPI `pyautocad` page.

1.1.2 Requirements

- `comtypes`

Note: If you are using `pip` or `easy_install`, then it will be installed automatically. Otherwise you should install `comtypes` package manually.

- Optional: `xlrd` and `tablib` for working with tables

1.1.3 Retrieving AutoCAD ActiveX documentation

A copy of the AutoCAD ActiveX guide and reference can be found in the `help` directory of your AutoCAD install.

- `acad_aag.chm` - ActiveX and VBA Developer's Guide
- `acadauto.chm` - ActiveX and VBA Reference

Reference can also be found in `C:\Program Files\Common Files\Autodesk Shared\acadauto.chm`

1.1.4 What's next?

Read the [Usage](#) section, or look for real applications in [examples](#) folder of source distribution.

Note: Applications in [examples](#) are Russian engineering specific, but anyway I hope you'll find something interesting in that code.

For more info on features see [API](#) documentation and [sources](#).

1.2 Usage

1.2.1 Main interface and types

For our first example, we will use *Autocad* (main Automation object) and *pyautocad.types.APoint* for operations with coordinates

```
from pyautocad import Autocad, APoint
```

Let's create AutoCAD application or connect to already running application:

```
acad = Autocad(create_if_not_exists=True)
acad.prompt("Hello, Autocad from Python\n")
print acad.doc.Name
```

To work with AutoCAD documents and objects we can use ActiveX interface, *Autocad* (from pyautocad) contains some methods to simplify common Automation tasks, such as object iteration and searching, getting objects from user's selection, printing messages.

There are shortcuts for current ActiveDocument - *Autocad.doc* and ActiveDocument.ModelSpace - *Autocad.model*

Let's add some objects to document:

```
p1 = APoint(0, 0)
p2 = APoint(50, 25)
for i in range(5):
    text = acad.model.AddText(u'Hi %s!' % i, p1, 2.5)
    acad.model.AddLine(p1, p2)
    acad.model.AddCircle(p1, 10)
    p1.y += 10
```

Now our document contains some Texts, Lines and Circles, let's iterate them all:

```
for obj in acad.iter_objects():
    print obj.ObjectName
```

We can also iterate objects of concrete type:

```
for text in acad.iter_objects('Text'):
    print text.TextString, text.InsertionPoint
```

Note: Object name can be partial and case insensitive, e.g. `acad.iter_objects('tex')` will return `AcDbText` and `AcDbMText` objects

Or multiple types:

```
for obj in acad.iter_objects(['Text', 'Line']):
    print obj.ObjectName
```

Also we can find first object with some conditions. For example, let's find first text item which contains 3:

```
def text_contains_3(text_obj):
    return '3' in text_obj.TextString

text = acad.find_one('Text', predicate=text_contains_3)
print text.TextString
```

To modify objects in document, we need to find interesting objects and change its properties. Some properties are described with constants, e.g. text alignment. These constants can be accessed through [ACAD](#). Let's change all text objects text alignment:

```
from pyautocad import ACAD

for text in acad.iter_objects('Text'):
    old_insertion_point = APoint(text.InsertionPoint)
    text.Alignment = ACAD.acAlignmentRight
    text.TextAlignmentPoint = old_insertion_point
```

In previous code we have converted `text.InsertionPoint` to `APoint` because we can't just use default tuple when setting another properties such as `text.TextAlignmentPoint`.

If we need to change position of some object, we should use `APoint`, for example let's change lines end position:

```
for line in acad.iter_objects('Line'):
    p1 = APoint(line.StartPoint)
    line.EndPoint = p1 - APoint(20, 0)
```

1.2.2 Working with tables

Note: To work with tables, `xlrd` and `tablib` should be installed.

To simplify importing and exporting data there is `Table` class exist. It allows you to read and write tabular data in popular formats:

- csv
- xls
- xlsx (write only)
- json

Let's try to solve some basic task. We need to save text and position from all text objects to Excel file, and then load it back.

First we need to add some objects to AutoCAD:

```
from pyautocad import Autocad, APoint
from pyautocad.contrib.tables import Table

acad = Autocad()
p1 = APoint(0, 0)
for i in range(5):
```

```
obj = acad.model.AddText(u'Hi %s!' % i, p1, 2.5)
p1.y += 10
```

Now we can iterate this objects and save them to Excel table:

```
table = Table()
for obj in acad.iter_objects('Text'):
    x, y, z = obj.InsertionPoint
    table.writerow([obj.TextString, x, y, z])
table.save('data.xls', 'xls')
```

After saving this data to ‘data.xls’ and probably changing it with some table processor software (e.g. Microsoft Office Excel) we can retrieve our data from file:

```
data = Table.data_from_file('data.xls')
```

data will contain:

```
[['Hi 0!', 0.0, 0.0, 0.0],
 ['Hi 1!', 0.0, 10.0, 0.0],
 ['Hi 2!', 0.0, 20.0, 0.0],
 ['Hi 3!', 0.0, 30.0, 0.0],
 ['Hi 4!', 0.0, 40.0, 0.0]]
```

See also:

Example of working with AutoCAD table objects at [examples/dev_get_table_info.py](#)

1.2.3 Improve speed

- ActiveX technology is quite slow. When you are accessing object attributes like position, text, etc, every time call is passed to AutoCAD. It can slowdown execution time. For example if you have program, which combines single line text based on its relative positions, you probably need to get each text position several times. To speed this up, you can cache objects attributes using the `pyautocad.cache.Cached` proxy (see example in class documentation)
- To improve speed of AutoCAD table manipulations, you can use `Table.RegenerateTableSuppressed = True` or handy context manager `suppressed_regeneration_of(table)`:

```
table = acad.model.AddTable(pos, rows, columns, row_height, col_width)
with suppressed_regeneration_of(table):
    table.SetAlignment(ACAD.acDataRow, ACAD.acMiddleCenter)
    for row in range(rows):
        for col in range(columns):
            table.SetText(row, col, '%s %s' % (row, col))
```

1.2.4 Utility functions

There is also some utility functions for work with AutoCAD text objects and more. See `pyautocad.utils` documentation.

1.3 API

This part of the documentation covers all the interfaces of *pyautocad*

1.3.1 api - Main Autocad interface

class `pyautocad.api.Autocad` (*create_if_not_exists=False, visible=True*)

Main AutoCAD Automation object

Parameters

- **create_if_not_exists** – if AutoCAD doesn't run, then new instance will be created
- **visible** – new AutoCAD instance will be visible if True (default)

app

Returns active `Autocad.Application`

if `Autocad` was created with `create_if_not_exists=True`, it will create `Autocad.Application` if there is no active one

doc

Returns *ActiveDocument* of current *Application*

ActiveDocument

Same as *doc*

Application

Same as *app*

model

ModelSpace from active document

iter_layouts (*doc=None, skip_model=True*)

Iterate layouts from *doc*

Parameters

- **doc** – document to iterate layouts from if *doc=None* (default), *ActiveDocument* is used
- **skip_model** – don't include *ModelSpace* if *True*

iter_objects (*object_name_or_list=None, block=None, limit=None, dont_cast=False*)

Iterate objects from *block*

Parameters

- **object_name_or_list** – part of object type name, or list of it
- **block** – Autocad block, default - `ActiveDocument.ActiveLayout.Block`
- **limit** – max number of objects to return, default infinite
- **dont_cast** – don't retrieve best interface for object, may speedup iteration. Returned objects should be casted by caller

iter_objects_fast (*object_name_or_list=None, container=None, limit=None*)

Shortcut for `iter_objects(dont_cast=True)`

Shouldn't be used in normal situations

find_one (*object_name_or_list, container=None, predicate=None*)

Returns first occurrence of object which match *predicate*

Parameters

- **object_name_or_list** – like in `iter_objects()`
- **container** – like in `iter_objects()`

- **predicate** – callable, which accepts object as argument and returns *True* or *False*

Returns Object if found, else *None*

best_interface (*obj*)

Retrieve best interface for object

prompt (*text*)

Prints text in console and in *AutoCAD* prompt

get_selection (*text*=*'Select objects'*)

Asks user to select objects

Parameters **text** – prompt for selection

static aDouble (**seq*)

shortcut for `pyautocad.types.aDouble()`

static aInt (**seq*)

shortcut for `pyautocad.types.aInt()`

static aShort (**seq*)

shortcut for `pyautocad.types.aShort()`

`pyautocad.api.ACAD`

Constants from AutoCAD type library, for example:

<code>text.Alignment = ACAD.acAlignmentRight</code>

1.3.2 types - 3D Point and other AutoCAD data types

class `pyautocad.types.APoint`

3D point with basic geometric operations and support for passing as a parameter for *AutoCAD* Automation functions

Usage:

<pre>>>> p1 = APoint(10, 10) >>> p2 = APoint(20, 20) >>> p1 + p2 APoint(30.00, 30.00, 0.00)</pre>
--

Also it supports iterable as parameter:

<pre>>>> APoint([10, 20, 30]) APoint(10.00, 20.00, 30.00) >>> APoint(range(3)) APoint(0.00, 1.00, 2.00)</pre>

Supported math operations: `+`, `-`, `*`, `/`, `+=`, `-=`, `*=`, `/=`:

<pre>>>> p = APoint(10, 10) >>> p + p APoint(20.00, 20.00, 0.00) >>> p + 10 APoint(20.00, 20.00, 10.00) >>> p * 2 APoint(20.00, 20.00, 0.00) >>> p -= 1</pre>
--

```
>>> p
APoint(9.00, 9.00, -1.00)
```

It can be converted to *tuple* or *list*:

```
>>> tuple(APoint(1, 1, 1))
(1.0, 1.0, 1.0)
```

x

x coordinate of 3D point

y

y coordinate of 3D point

z

z coordinate of 3D point

distance_to(*other*)

Returns distance to *other* point

Parameters *other* – *APoint* instance or any sequence of 3 coordinates

`pyautocad.types.distance`(*p1*, *p2*)

Returns distance between two points *p1* and *p2*

`pyautocad.types.aDouble`(**seq*)

Returns `array.array` of doubles ('d' code) for passing to AutoCAD

For 3D points use *APoint* instead.

`pyautocad.types.aInt`(**seq*)

Returns `array.array` of ints ('i' code) for passing to AutoCAD

`pyautocad.types.aShort`(**seq*)

Returns `array.array` of shorts ('h' code) for passing to AutoCAD

1.3.3 utils - Utility functions

`pyautocad.utils.timing`(*message*)

Context manager for timing execution

Parameters *message* – message to print

Usage:

```
with timing('some operation'):
    do_some_actions()
```

Will print:

```
some operation: 1.000 s # where 1.000 is actual execution time
```

`pyautocad.utils.suppressed_regeneration_of`(*table*)

New in version 0.1.2.

Context manager. Suppresses table regeneration to dramatically speedup table operations

Parameters *table* – table object

```
with suppressed_regeneration_of(table):  
    populate(table)  # or change its properties
```

`pyautocad.utils.unformat_mtext(s, exclude_list=('P', 'S'))`

Returns string with removed format information

Parameters

- **s** – string with multitext
- **exclude_list** – don't touch tags from this list. Default ('P', 'S') for newline and fractions

```
>>> text = ur'\fGOST type A|b0|i0|c204|p34;TEST\fGOST type A|b0|i0|c0|p34;123}'  
>>> unformat_mtext(text)  
u'TEST123'
```

`pyautocad.utils.mtext_to_string(s)`

Returns string with removed format information as `unformat_mtext()` and *P* (paragraphs) replaced with newlines

```
>>> text = ur'\fGOST type A|b0|i0|c204|p34;TEST\fGOST type A|b0|i0|c0|p34;123}\Ptest321'  
>>> mtext_to_string(text)  
u'TEST123\ntest321'
```

`pyautocad.utils.string_to_mtext(s)`

Returns string in Autocad multitext format

Replaces newlines `\n` with `\P`, etc.

`pyautocad.utils.text_width(text_item)`

Returns width of Autocad *Text* or *MultiText* object

`pyautocad.utils.dynamic_print(text)`

Prints text dynamically in one line

Used for printing something like animations, or progress

1.3.4 contrib.tables - Import and export tabular data from popular formats

class `pyautocad.contrib.tables.Table`

Represents table with ability to import and export data to following formats:

- csv
- xls
- xlsx (write only)
- json

When you need to store some data, it can be done as follows:

```
table = Table()  
for i in range(5):  
    table.writerow([i, i, i])  
  
table.save('data.xls', 'xls')
```

To import data from file, use `data_from_file()`:

```
data = Table.data_from_file('data.xls')
```

writerow (*row*)

Add *row* to table

Parameters *row* (*list* or *tuple*) – row to add

append (*row*)

Synonym for `writerow()`

clear ()

Clear current table

save (*filename*, *fmt*, *encoding*='cp1251')

Save data to file

Parameters

- **filename** – path to file
- **fmt** – data format (one of supported, e.g. 'xls', 'csv')
- **encoding** – encoding for 'csv' format

convert (*fmt*)

Return data, converted to format

Parameters **fmt** – desirable format of data

Note: to convert to *csv* format, use `to_csv()`

See also `available_write_formats()`

to_csv (*stream*, *encoding*='cp1251', *delimiter*=';', ***kwargs*)

Writes data in *csv* format to stream

Parameters

- **stream** – stream to write data to
- **encoding** – output encoding
- **delimiter** – *csv* delimiter
- **kwargs** – additional parameters for `csv.writer`

static data_from_file (*filename*, *fmt*=None, *csv_encoding*='cp1251', *csv_delimiter*=';')

Returns data in desired format from file

Parameters

- **filename** – path to file with data
- **fmt** – format of file, if it's *None*, then it tries to guess format from *filename* extension
- **csv_encoding** – encoding for *csv* data
- **csv_delimiter** – delimiter for *csv* data

Format should be in `available_read_formats()`

1.3.5 cache - Cache all object's attributes

New in version 0.1.2.

class `pyautocad.cache.Cached` (*instance*)

Proxy for caching object attributes.

Consider external class *Foo* with expensive property (we can't change its code):

```
class Foo(object):
    @property
    def x(self):
        print 'consuming time'
        time.sleep(1)
        return 42
```

Cache all attributes and test access:

```
foo = Foo()
cached_foo = Cached(foo)
for i in range(10):
    print cached_foo.x
```

Output:

```
consuming time
42
42
42
42
42
42
```

It's possible to switch caching off with `switch_caching()` and retrieve original instance with `get_original()`

get_original()

Returns original instance

switch_caching (*is_enabled*)

Switch caching on or off

Parameters **is_enabled** (*bool*) – caching status *True* or *False*

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