
pyexcel Documentation

Release 0.3.3

Onni Software Ltd.

November 07, 2016

1	Introduction	3
2	Installation	5
3	Usage	7
4	Design	9
4.1	Introduction	9
4.2	Signature functions	11
5	Tutorial	15
5.1	Work with excel files	15
5.2	Work with excel files in memory	18
5.3	Sheet: Data conversion	19
5.4	Dot notation for data source	25
5.5	Work with big data sheet	29
5.6	Sheet: Data Access	31
5.7	Sheet: Data manipulation	37
5.8	Sheet: Data filtering	40
5.9	Sheet: Formatting	43
5.10	Book: Sheet operations	45
5.11	How to log pyexcel	46
5.12	Migrate from 0.2.x to 0.3.0	47
5.13	Migrate from 0.2.1 to 0.2.2+	48
5.14	Migrate from 0.1.x to 0.2.x	49
6	Cook book	51
6.1	Recipes	51
6.2	Loading from other sources	55
7	Real world cases	57
7.1	Questions and Answers	57
8	API documentation	59
8.1	API Reference	59
8.2	Internal API reference	97
9	Developer's guide	101
9.1	Developer's guide	101

10 Change log	105
10.1 Change log	105
11 Indices and tables	109

Author C.W.

Source code <http://github.com/pyexcel/pyexcel.git>

Issues <http://github.com/pyexcel/pyexcel/issues>

License New BSD License

Development 0.3.3

Released 0.3.2

Generated November 07, 2016

Introduction

pyexcel provides **one** application programming interface to read, manipulate and write data in different excel formats. This library makes information processing involving excel files an enjoyable task. The data in excel files can be turned into *array or dict* with least code, vice versa. This library focuses on data processing using excel files as storage media hence fonts, colors and charts were not and will not be considered.

The idea originated from the common usability problem when developing an excel file driven web applications for non-technical office workers: such as office assistant, human resource administrator. The fact is that not all people know the difference among various excel formats: csv, xls, xlsx. Instead of training those people about file formats, this library helps web developers to handle most of the excel file formats by providing a common programming interface. To add a specific excel file format to you application, all you need is to install an extra pyexcel plugin. No code change to your application. Looking at the community, this library and its associated ones try to become a small and easy to install alternative to Pandas.

Note: Since version *0.2.2*, no longer a plugin should be explicitly imported. They are imported if they are installed. Please use pip to manage the plugins.

Installation

You can install it via pip:

```
$ pip install pyexcel
```

or clone it and install it:

```
$ git clone http://github.com/pyexcel/pyexcel.git
$ cd pyexcel
$ python setup.py install
```

For individual excel file formats, please install them as you wish:

Table 2.1: A list of file formats supported by external plugins

Package name	Supported file formats	Dependencies	Python versions
pyexcel-io	csv, csvz ¹ , tsv, tsvz ²		2.6, 2.7, 3.3, 3.4, 3.5, pypy, pypy3
pyexcel-xls	xls, xlsx(read only), xlsx(read only)	xlrd, xlwt	same as above
pyexcel-xlsx	xlsx	openpyxl	same as above
pyexcel-xlsxw	xlsx(write only)	XlsxWriter	same as above
pyexcel-ods3	ods	ezodf, lxml	2.6, 2.7, 3.3, 3.4 3.5
pyexcel-ods	ods	odfpy	same as above
pyexcel-text	(write only)json, rst, mediawiki, html, latex, grid, pipe, orgtbl, plain simple	tabulate	2.6, 2.7, 3.3, 3.4 3.5, pypy, pypy3

For compatibility tables of pyexcel-io plugins, please click [here](#)

Table 2.2: Plugin compatibility table

pyexcel	pyexcel-io	pyexcel-text
0.3.0	0.2.3	0.2.4(dev)
0.2.2+	0.2.0+	0.2.1+
0.2.1	0.1.0	0.2.0
0.2.0	0.1.0	0.1.0+

¹zipped csv file

²zipped tsv file

Usage

Suppose you want to process the following excel data :

Name	Age
Adam	28
Beatrice	29
Ceri	30
Dean	26

Here are the example usages:

```
>>> import pyexcel as pe
>>> records = pe.iget_records(file_name="your_file.xls")
>>> for record in records:
...     print("%s is aged at %d" % (record['Name'], record['Age']))
Adam is aged at 28
Beatrice is aged at 29
Ceri is aged at 30
Dean is aged at 26
```


4.1 Introduction

This section introduces Excel data models, its representing data structures and provides an overview of formatting, transformation, manipulation supported by **pyexcel**

4.1.1 Data models and data structures

When dealing with excel files, there are three primary objects: **cell**, **sheet** and **book**. A book contains one or more sheets and a sheet is consisted of a sheet name and a two dimensional array of cells. Although a sheet can contain charts and a cell can have formula, styling properties, this library ignores them and pay attention to the data in the cell and its data type. So, in the context of this library, the definition of those three concepts are:

concept	definition	pyexcel data model
a cell	is a data unit	a Python data type
a sheet	is a named two dimensional array of data units	<i>Sheet</i>
a book	is a dictionary of two dimensional array of data units.	<i>Book</i>

4.1.2 Data source

The most popular data source is an excel file. Libre Office/Microsoft Excel could easily generate an new excel file of desired format. Besides a physical file, this library recognizes additional three additional sources:

1. Excel files in computer memory. For example when a file was uploaded to a Python server for information processing, if it is relatively small, it will be stored in memory.
2. Database tables. For example, a client would like to have a snapshot of some database table in an excel file and ask it to be sent to him.
3. Python structures. For example, a developer may have scrapped a site and hence stored data in Python array or dictionary. He may want to save those information as a file.

4.1.3 Data format

This library and its plugins support most of the frequently used excel file formats.

file format	definition
csv	comma separated values
tsv	tab separated values
csvz	a zip file that contains one or many csv files
tsvz	a zip file that contains one or many tsv files
xls	a spreadsheet file format created by MS-Excel 97-2003 ¹
xlsx	MS-Excel Extensions to the Office Open XML SpreadsheetML File Format. ²
xlsm	an MS-Excel Macro-Enabled Workbook file
ods	open document spreadsheet
json	java script object notation
html	html table of the data structure
simple	<i>simple</i> presentation
rst	rStructured Text presentation of the data
mediawiki	media wiki table

See also *A list of file formats supported by external plugins.*

4.1.4 Data transformation

Quite often, a developer would like to have the excel data in a Python data structures. This library supports the *conversions from* previous three data source to the following list of data structures, and *vice versa*.

Table 4.1: A list of supported data structures

Pseudo name	Python name	Related model
two dimensional array	a list of lists	<i>Sheet</i>
a dictionary of one dimensional arrays	a dictionary of lists	<i>Sheet</i>
a list of dictionaries	a list of dictionaries	<i>Sheet</i>
a dictionary of two dimensional arrays	a dictionary of lists of lists	<i>Book</i>

Examples:

```
>>> two_dimensional_list = [
...     [1, 2, 3, 4],
...     [5, 6, 7, 8],
...     [9, 10, 11, 12],
... ]
>>> a_dictionary_of_one_dimensional_arrays = {
...     "Column 1": [1, 2, 3, 4],
...     "Column 2": [5, 6, 7, 8],
...     "Column 3": [9, 10, 11, 12],
... }
>>> a_list_of_dictionaries = [
...     {
...         "Name": 'Adam',
...         "Age": 28
...     },
...     {
...         "Name": 'Beatrice',
...         "Age": 29
...     },
...     {
...         "Name": 'Ceri',
...         "Age": 30
...     }
... ]
```

¹quoted from whatis.com. Technical details can be found at MSDN XLS

²xlsx is used by MS-Excel 2007, more information can be found at MSDN XLSX

```
...     },
...     {
...         "Name": 'Dean',
...         "Age": 26
...     }
... ]
>>> a_dictionary_of_two_dimensional_arrays = {
...     'Sheet 1':
...         [
...             [1.0, 2.0, 3.0],
...             [4.0, 5.0, 6.0],
...             [7.0, 8.0, 9.0]
...         ],
...     'Sheet 2':
...         [
...             ['X', 'Y', 'Z'],
...             [1.0, 2.0, 3.0],
...             [4.0, 5.0, 6.0]
...         ],
...     'Sheet 3':
...         [
...             ['O', 'P', 'Q'],
...             [3.0, 2.0, 1.0],
...             [4.0, 3.0, 2.0]
...         ]
... }
```

4.1.5 Data manipulations

The main operation on a cell involves *cell access*, *formatting* and *cleansing*. The main operation on a sheet involves the group access to a row or a column, data filtering and data transformation. The main operation in a book is obtain access to individual sheets.

4.1.6 Data transcoding

For various reasons, the data in one format is to be transcoded into another format. This library provides the transcoding tunnel for data transcoding in between supported file formats.

4.2 Signature functions

4.2.1 Import data into Python

This library provides one application programming interface to read data from one of the following data sources:

- physical file
- memory file
- SQLAlchemy table
- Django Model
- Python data structures: dictionary, records and array

and to transform them into one of the data structures:

- two dimensional array
- a dictionary of one dimensional arrays
- a list of dictionaries
- a dictionary of two dimensional arrays
- a *Sheet*
- a *Book*

Four data access functions

It is believed that once a Python developer could easily operate on list, dictionary and various mixture of both. This library provides four module level functions to help you obtain excel data in those formats. Please refer to “A list of module level functions”, the first three functions operates on any one sheet from an excel book and the fourth one returns all data in all sheets in an excel book.

Table 4.2: A list of module level functions

Functions	Name	Python name
<code>get_array()</code>	two dimensional array	a list of lists
<code>get_dict()</code>	a dictionary of one dimensional arrays	an ordered dictionary of lists
<code>get_records()</code>	a list of dictionaries	a list of dictionaries
<code>get_book_dict()</code>	a dictionary of two dimensional arrays	a dictionary of lists of lists

See also:

- *How to get an array from an excel sheet*
- *How to get a dictionary from an excel sheet*
- *How to obtain records from an excel sheet*
- *How to obtain a dictionary from a multiple sheet book*

The following two variants of the data access function use generator and should work well with big data files

Table 4.3: A list of variant functions

Functions	Name	Python name
<code>iget_array()</code>	a memory efficient two dimensional array	a generator of a list of lists
<code>iget_records()</code>	a memory efficient list list of dictionaries	a generator of a list of dictionaries

Two native functions

In cases where the excel data needs custom manipulations, a pyexcel user got a few choices: one is to use *Sheet* and *Book*, the other is to look for more sophisticated ones:

- Pandas, for numerical analysis
- Do-it-yourself

Functions	Returns
<code>get_sheet()</code>	<i>Sheet</i>
<code>get_book()</code>	<i>Book</i>

For all six functions, you can pass on the same command parameters while the return value is what the function says.

4.2.2 Export data from Python

This library provides one application programming interface to transform them into one of the data structures:

- two dimensional array
- a (ordered) dictionary of one dimensional arrays
- a list of dictionaries
- a dictionary of two dimensional arrays
- a *Sheet*
- a *Book*

and write to one of the following data sources:

- physical file
- memory file
- SQLAlchemy table
- Django Model
- Python data structures: dictionary, records and array

Here are the two functions:

Functions	Description
<code>save_as()</code>	Works well with single sheet file
<code>isave_as()</code>	Works well with big data files
<code>save_book_as()</code>	Works with multiple sheet file and big data files

If you would only use these two functions to do format transcoding, you may enjoy a speed boost using `isave_as()` and `save_book_as()`, because they use *yield* keyword and minize memory footprint. `save_as()` uses *Sheet*, which reads all data into memory.

See also:

- *How to save an python array as an excel file*
- *How to save a dictionary of two dimensional array as an excel file*
- *How to save an python array as a csv file with special delimiter*

4.2.3 Data transportation/transcoding

Based the capability of this library, it is capable of transporting your data in between any of these data sources:

- physical file
- memory file
- SQLAlchemy table
- Django Model
- Python data structures: dictionary, records and array

See also:

- *How to an excel sheet to a database using SQLAlchemy*
- *How to open an xls file and save it as xlsx*
- *How to open an xls file and save it as csv*

5.1 Work with excel files

Warning: The pyexcel DOES NOT consider Fonts, Styles, Formulas and Charts at all. When you load a stylish excel and update it, you definitely will lose all those.

5.1.1 Add a new row to an existing file

Suppose you have one data file as the following:

example.xls

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

And you want to add a new row:

12, 11, 10

Here is the code:

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="example.xls")
>>> sheet.row += [12, 11, 10]
>>> sheet.save_as("new_example.xls")
>>> pe.get_sheet(file_name="new_example.xls")
pyexcel_sheet1:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1        | 4        | 7        |
+-----+-----+-----+
| 2        | 5        | 8        |
+-----+-----+-----+
| 3        | 6        | 9        |
+-----+-----+-----+
| 12       | 11       | 10       |
+-----+-----+-----+
```

5.1.2 Update an existing row to an existing file

Suppose you want to update the last row of the example file as:

```
['N/A', 'N/A', 'N/A']
```

Here is the sample code:

```
.. code-block:: python
```

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="example.xls")
>>> sheet.row[3] = ['N/A', 'N/A', 'N/A']
>>> sheet.save_as("new_example1.xls")
>>> pe.get_sheet(file_name="new_example1.xls")
pyexcel_sheet1:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1        | 4        | 7        |
+-----+-----+-----+
| 2        | 5        | 8        |
+-----+-----+-----+
| N/A     | N/A     | N/A     |
+-----+-----+-----+
```

5.1.3 Add a new column to an existing file

And you want to add a column instead:

```
["Column 4", 10, 11, 12]
```

Here is the code:

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="example.xls")
>>> sheet.column += ["Column 4", 10, 11, 12]
>>> sheet.save_as("new_example2.xls")
>>> pe.get_sheet(file_name="new_example2.xls")
pyexcel_sheet1:
+-----+-----+-----+-----+
| Column 1 | Column 2 | Column 3 | Column 4 |
+-----+-----+-----+-----+
| 1        | 4        | 7        | 10       |
+-----+-----+-----+-----+
| 2        | 5        | 8        | 11       |
+-----+-----+-----+-----+
| 3        | 6        | 9        | 12       |
+-----+-----+-----+-----+
```

5.1.4 Update an existing column to an existing file

Again let's update "Column 3" with:

```
[100, 200, 300]
```

Here is the sample code:

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="example.xls")
>>> sheet.column[2] = ["Column 3", 100, 200, 300]
>>> sheet.save_as("new_example3.xls")
>>> pe.get_sheet(file_name="new_example3.xls")
pyexcel_sheet1:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1        | 4        | 100      |
+-----+-----+-----+
| 2        | 5        | 200      |
+-----+-----+-----+
| 3        | 6        | 300      |
+-----+-----+-----+
```

Alternatively, you could have done like this:

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="example.xls", name_columns_by_row=0)
>>> sheet.column["Column 3"] = [100, 200, 300]
>>> sheet.save_as("new_example4.xls")
>>> pe.get_sheet(file_name="new_example4.xls")
pyexcel_sheet1:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1        | 4        | 100      |
+-----+-----+-----+
| 2        | 5        | 200      |
+-----+-----+-----+
| 3        | 6        | 300      |
+-----+-----+-----+
```

How about the same alternative solution to previous row based example? Well, you'd better to have the following kind of data

row_example.xls

Row 1	1	2	3
Row 2	4	5	6
Row 3	7	8	9

And then you want to update "Row 3" with for example:

```
[100, 200, 300]
```

These code would do the job:

```
>>> import pyexcel as pe
>>> sheet = pe.get_sheet(file_name="row_example.xls", name_rows_by_column=0)
>>> sheet.row["Row 3"] = [100, 200, 300]
>>> sheet.save_as("new_example5.xls")
>>> pe.get_sheet(file_name="new_example5.xls")
pyexcel_sheet1:
+-----+-----+-----+
| Row 1 | 1    | 2    | 3    |
+-----+-----+-----+
| Row 2 | 4    | 5    | 6    |
+-----+-----+-----+
```

```
| Row 3 | 100 | 200 | 300 |  
+-----+-----+-----+-----+
```

5.2 Work with excel files in memory

Excel files in memory can be manipulated directly without saving it to physical disk and vice versa. This is useful in excel file handling at file upload or in excel file download. For example:

```
>>> import pyexcel  
>>> content = "1,2,3\n3,4,5"  
>>> sheet = pyexcel.get_sheet(file_type="csv", file_content=content)  
>>> sheet.csv  
'1,2,3\r\n3,4,5\r\n'
```

5.2.1 file type as its attributes

Since version 0.3.0, each supported file types became an attribute of the Sheet and Book class. What it means is that:

1. Read the content in memory
2. Set the content in memory

For example, after you have your Sheet and Book instance, you could access its content in a support file type by using its dot notation. The code in previous section could be rewritten as:

```
>>> import pyexcel  
>>> content = "1,2,3\n3,4,5"  
>>> sheet = pyexcel.Sheet()  
>>> sheet.csv = content  
>>> sheet.array  
[[1, 2, 3], [3, 4, 5]]
```

5.2.2 Read any supported excel and respond its content in json

You can find a real world example in `examples/memoryfile/` directory: `pyexcel_server.py`. Here is the example snippet

```
1 def upload():  
2     if request.method == 'POST' and 'excel' in request.files:  
3         # handle file upload  
4         filename = request.files['excel'].filename  
5         extension = filename.split(".")[1]  
6         # Obtain the file extension and content  
7         # pass a tuple instead of a file name  
8         content = request.files['excel'].read()  
9         if sys.version_info[0] > 2:  
10            # in order to support python 3  
11            # have to decode bytes to str  
12            content = content.decode('utf-8')  
13            sheet = pe.get_sheet(file_type=extension, file_content=content)  
14            # then use it as usual  
15            sheet.name_columns_by_row(0)  
16            # respond with a json  
17            return jsonify({"result": sheet.dict})  
18     return render_template('upload.html')
```

`request.files['excel']` in line 4 holds the file object. line 5 finds out the file extension. line 13 obtains a sheet instance. line 15 uses the first row as data header. line 17 sends the json representation of the excel file back to client browser.

5.2.3 Write to memory and respond to download

```

1 data = [
2     [...],
3     ...
4 ]
5
6 @app.route('/download')
7 def download():
8     sheet = pe.Sheet(data)
9     output = make_response(sheet.csv)
10    output.headers["Content-Disposition"] = "attachment; filename=export.csv"
11    output.headers["Content-type"] = "text/csv"
12    return output

```

`make_response` is a Flask utility to make a memory content as http response.

Note: You can find the corresponding source code at [examples/memoryfile](#)

Relevant packages

Readily made plugins have been made on top of this example. Here is a list of them:

framework	plugin/middleware/extension
Flask	Flask-Excel
Django	django-excel
Pyramid	pyramid-excel

And you may make your own by using [pyexcel-webio](#)

5.3 Sheet: Data conversion

5.3.1 How to obtain records from an excel sheet

Suppose you want to process the following excel data :

Name	Age
Adam	28
Beatrice	29
Ceri	30
Dean	26

Here are the example code:

```

>>> import pyexcel as pe
>>> records = pe.get_records(file_name="your_file.xls")
>>> for record in records:
...     print("%s is aged at %d" % (record['Name'], record['Age']))
Adam is aged at 28

```

```
Beatrice is aged at 29
Ceri is aged at 30
Dean is aged at 26
```

5.3.2 How to get an array from an excel sheet

Suppose you have a csv, xls, xlsx file as the following:

1	2	3
4	5	6
7	8	9

The following code will give you the data in json:

```
>>> import pyexcel
>>> # "example.csv", "example.xlsx", "example.xlsm"
>>> my_array = pyexcel.get_array(file_name="example.xls")
>>> my_array
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

5.3.3 How to save an python array as an excel file

Suppose you have the following array:

```
>>> data = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

And here is the code to save it as an excel file

```
>>> import pyexcel
>>> pyexcel.save_as(array=data, dest_file_name="example.xls")
```

Let's verify it:

```
>>> pyexcel.get_sheet(file_name="example.xls")
pyexcel_sheet1:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
```

5.3.4 How to save an python array as a csv file with special delimiter

Suppose you have the following array:

```
>>> data = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

And here is the code to save it as an excel file

```
>>> import pyexcel
>>> pyexcel.save_as(array=data,
...                 dest_file_name="example.csv",
...                 dest_delimiter=':')
```


Let's verify it:

```
>>> with open("example.csv") as f:
...     for line in f.readlines():
...         print(line.rstrip())
...
1:2:3
4:5:6
7:8:9
```

5.3.5 How to get a dictionary from an excel sheet

Suppose you have a csv, xls, xlsx file as the following:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

The following code will give you data series in a dictionary:

```
>>> import pyexcel
>>> from pyexcel._compact import OrderedDict
>>> my_dict = pyexcel.get_dict(file_name="example_series.xls", name_columns_by_row=0)
>>> isinstance(my_dict, OrderedDict)
True
>>> for key, values in my_dict.items():
...     print({str(key): values})
{'Column 1': [1, 4, 7]}
{'Column 2': [2, 5, 8]}
{'Column 3': [3, 6, 9]}
```

Please note that my_dict is an OrderedDict.

5.3.6 How to obtain a dictionary from a multiple sheet book

Suppose you have a multiple sheet book as the following:

Table 5.1:
Sheet 1

1	2	3
4	5	6
7	8	9

Table 5.2:
Sheet 2

X	Y	Z
1	2	3
4	5	6

Table 5.3:
Sheet 3

O	P	Q
3	2	1
4	3	2

Here is the code to obtain those sheets as a single dictionary:

```
>>> import pyexcel
>>> import json
>>> book_dict = pyexcel.get_book_dict(file_name="book.xls")
>>> isinstance(book_dict, OrderedDict)
True
>>> for key, item in book_dict.items():
...     print(json.dumps({key: item}))
{"Sheet 1": [[1, 2, 3], [4, 5, 6], [7, 8, 9]]}
{"Sheet 2": [{"X", "Y", "Z"}, [1, 2, 3], [4, 5, 6]]}
{"Sheet 3": [{"O", "P", "Q"}, [3, 2, 1], [4, 3, 2]]}
```

5.3.7 How to save a dictionary of two dimensional array as an excel file

Suppose you want to save the below dictionary to an excel file

```
>>> a_dictionary_of_two_dimensional_arrays = {
...     'Sheet 1':
...     [
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0],
...         [7.0, 8.0, 9.0]
...     ],
...     'Sheet 2':
...     [
...         ['X', 'Y', 'Z'],
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0]
...     ],
...     'Sheet 3':
...     [
...         ['O', 'P', 'Q'],
...         [3.0, 2.0, 1.0],
...         [4.0, 3.0, 2.0]
...     ]
... }
```

Here is the code:

```
>>> pyexcel.save_book_as(
...     bookdict=a_dictionary_of_two_dimensional_arrays,
...     dest_file_name="book.xls"
... )
```

If you want to preserve the order of sheets in your dictionary, you have to pass on an ordered dictionary to the function itself. For example:

```
>>> data = OrderedDict()
>>> data.update({"Sheet 2": a_dictionary_of_two_dimensional_arrays['Sheet 2']})
>>> data.update({"Sheet 1": a_dictionary_of_two_dimensional_arrays['Sheet 1']})
>>> data.update({"Sheet 3": a_dictionary_of_two_dimensional_arrays['Sheet 3']})
>>> pyexcel.save_book_as(bookdict=data, dest_file_name="book.xls")
```

Let's verify its order:

```
>>> book_dict = pyexcel.get_book_dict(file_name="book.xls")
>>> for key, item in book_dict.items():
```

```
...     print(json.dumps({key: item}))
{"Sheet 2": [["X", "Y", "Z"], [1, 2, 3], [4, 5, 6]]}
{"Sheet 1": [[1, 2, 3], [4, 5, 6], [7, 8, 9]]}
{"Sheet 3": [["O", "P", "Q"], [3, 2, 1], [4, 3, 2]]}
```

Please notice that “Sheet 2” is the first item in the *book_dict*, meaning the order of sheets are preserved.

5.3.8 How to an excel sheet to a database using SQLAlchemy

Note: You can find the complete code of this example in examples folder on github

Before going ahead, let’s import the needed components and initialize sql engine and table base:

```
>>> from sqlalchemy import create_engine
>>> from sqlalchemy.ext.declarative import declarative_base
>>> from sqlalchemy import Column, Integer, String, Float, Date
>>> from sqlalchemy.orm import sessionmaker
>>> engine = create_engine("sqlite:///birth.db")
>>> Base = declarative_base()
>>> Session = sessionmaker(bind=engine)
```

Let’s suppose we have the following database model:

```
>>> class BirthRegister(Base):
...     __tablename__='birth'
...     id=Column(Integer, primary_key=True)
...     name=Column(String)
...     weight=Column(Float)
...     birth=Column(Date)
```

Let’s create the table:

```
>>> Base.metadata.create_all(engine)
```

Now here is a sample excel file to be saved to the table:

name	weight	birth
Adam	3.4	2015-02-03
Smith	4.2	2014-11-12

Here is the code to import it:

```
>>> session = Session() # obtain a sql session
>>> pyexcel.save_as(file_name="birth.xls", name_columns_by_row=0, dest_session=session, dest_table=B
```

Done it. It is that simple. Let’s verify what has been imported to make sure.

```
>>> sheet = pyexcel.get_sheet(session=session, table=BirthRegister)
>>> sheet
birth:
+-----+-----+-----+-----+
| birth   | id  | name  | weight |
+-----+-----+-----+-----+
| 2015-02-03 | 1  | Adam  | 3.4    |
+-----+-----+-----+-----+
| 2014-11-12 | 2  | Smith | 4.2    |
+-----+-----+-----+-----+
```

5.3.9 How to open an xls file and save it as csv

Suppose we want to save previous used example 'birth.xls' as a csv file

```
>>> import pyexcel
>>> pyexcel.save_as(file_name="birth.xls", dest_file_name="birth.csv")
```

Again it is really simple. Let's verify what we have gotten:

```
>>> sheet = pyexcel.get_sheet(file_name="birth.csv")
>>> sheet
birth.csv:
+-----+-----+-----+
| name  | weight | birth  |
+-----+-----+-----+
| Adam  | 3.4    | 03/02/15 |
+-----+-----+-----+
| Smith | 4.2    | 12/11/14 |
+-----+-----+-----+
```

Note: Please note that csv(comma separate value) file is pure text file. Formula, charts, images and formatting in xls file will disappear no matter which transcoding tool you use. Hence, pyexcel is a quick alternative for this transcoding job.

5.3.10 How to open an xls file and save it as xlsx

Warning: Formula, charts, images and formatting in xls file will disappear as pyexcel does not support Formula, charts, images and formatting.

Let use previous example and save it as ods instead

```
>>> import pyexcel
>>> pyexcel.save_as(file_name="birth.xls",
...                 dest_file_name="birth.xlsx") # change the file extension
```

Again let's verify what we have gotten:

```
>>> sheet = pyexcel.get_sheet(file_name="birth.xlsx")
>>> sheet
pyexcel_sheet1:
+-----+-----+-----+
| name  | weight | birth  |
+-----+-----+-----+
| Adam  | 3.4    | 03/02/15 |
+-----+-----+-----+
| Smith | 4.2    | 12/11/14 |
+-----+-----+-----+
```

5.3.11 How to open a xls multiple sheet excel book and save it as csv

Well, you write similar codes as before but you will need to use `:meth:~pyexcel.save_book_as` function.

5.4 Dot notation for data source

Since version 0.3.0, the data source becomes an attribute of the pyexcel native classes. All support data format is a dot notation away.

5.4.1 For sheet

Get content

```
>>> import pyexcel
>>> content = "1,2,3\n3,4,5"
>>> sheet = pyexcel.get_sheet(file_type="csv", file_content=content)
>>> sheet.tsv
'1\t2\t3\r\n3\t4\t5\r\n'
>>> print(sheet.simple)
csv:
- - -
1 2 3
3 4 5
- - -
```

What's more, you could as well set value to an attribute, for example:

```
>>> import pyexcel
>>> content = "1,2,3\n3,4,5"
>>> sheet = pyexcel.Sheet()
>>> sheet.csv = content
>>> sheet.array
[[1, 2, 3], [3, 4, 5]]
```

Set content

What you could further do is to set a memory stream of any supported file format to a sheet. For example:

```
>>> another_sheet = pyexcel.Sheet()
>>> another_sheet.xls = sheet.xls
>>> another_sheet.content
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 3 | 4 | 5 |
+---+---+---+
```

Yet, it is possible assign a absolute url to an online excel file to an instance of *pyexcel.Sheet*.

```
>>> another_sheet.url = "https://github.com/pyexcel/pyexcel/raw/master/examples/basics/multiple-sheet
>>> another_sheet.content
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
```

5.4.2 For book

The same dot notation is available to `pyexcel.Book` as well.

Get content

```
>>> book_dict = {
...     'Sheet 2':
...     [
...         ['X', 'Y', 'Z'],
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0]
...     ],
...     'Sheet 3':
...     [
...         ['O', 'P', 'Q'],
...         [3.0, 2.0, 1.0],
...         [4.0, 3.0, 2.0]
...     ],
...     'Sheet 1':
...     [
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0],
...         [7.0, 8.0, 9.0]
...     ]
... }
>>> book = pyexcel.get_book(bookdict=book_dict)
>>> book
Sheet 1:
+-----+-----+-----+
| 1.0 | 2.0 | 3.0 |
+-----+-----+-----+
| 4.0 | 5.0 | 6.0 |
+-----+-----+-----+
| 7.0 | 8.0 | 9.0 |
+-----+-----+-----+
Sheet 2:
+-----+-----+-----+
| X   | Y   | Z   |
+-----+-----+-----+
| 1.0 | 2.0 | 3.0 |
+-----+-----+-----+
| 4.0 | 5.0 | 6.0 |
+-----+-----+-----+
Sheet 3:
+-----+-----+-----+
| O   | P   | Q   |
+-----+-----+-----+
| 3.0 | 2.0 | 1.0 |
+-----+-----+-----+
| 4.0 | 3.0 | 2.0 |
+-----+-----+-----+
>>> print(book.rst)
Sheet 1:
= = =
1 2 3
4 5 6
```

```

7  8  9
=  =  =
Sheet 2:
====  ====  ====
X      Y      Z
1.0    2.0    3.0
4.0    5.0    6.0
====  ====  ====
Sheet 3:
====  ====  ====
O      P      Q
3.0    2.0    1.0
4.0    3.0    2.0
====  ====  ====

```

Set content

Surely, you could set content to an instance of `pyexcel.Book`.

```

>>> other_book = pyexcel.Book()
>>> other_book.bookdict = book_dict
>>> print(other_book.plain)
Sheet 1:
1  2  3
4  5  6
7  8  9
Sheet 2:
X      Y      Z
1.0    2.0    3.0
4.0    5.0    6.0
Sheet 3:
O      P      Q
3.0    2.0    1.0
4.0    3.0    2.0

```

You can set via 'xls' attribute too.

```

>>> another_book = pyexcel.Book()
>>> another_book.xls = other_book.xls
>>> print(another_book.mediawiki)
Sheet 1:
{| class="wikitable" style="text-align: left;"
|+ <!-- caption -->
|-
| align="right"| 1 || align="right"| 2 || align="right"| 3
|-
| align="right"| 4 || align="right"| 5 || align="right"| 6
|-
| align="right"| 7 || align="right"| 8 || align="right"| 9
|}
Sheet 2:
{| class="wikitable" style="text-align: left;"
|+ <!-- caption -->
|-
| X || Y || Z
|-
| 1 || 2 || 3
|-

```

```
| 4 || 5 || 6
|}
Sheet 3:
{| class="wikitable" style="text-align: left;"
|+ <!-- caption -->
|-
| O || P || Q
|-
| 3 || 2 || 1
|-
| 4 || 3 || 2
|}
```

How about setting content via a url?

```
>>> another_book.url = "https://github.com/pyexcel/pyexcel/raw/master/examples/basics/multiple-sheets"
>>> another_book
Sheet 1:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
Sheet 2:
+---+---+---+
| X | Y | Z |
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
Sheet 3:
+---+---+---+
| O | P | Q |
+---+---+---+
| 3 | 2 | 1 |
+---+---+---+
| 4 | 3 | 2 |
+---+---+---+
```

5.4.3 Getters and Setters

You can pass on source specific parameters to getter and setter functions.

```
>>> content = "1-2-3\n3-4-5"
>>> sheet = pyexcel.Sheet()
>>> sheet.set_csv(content, delimiter="-")
>>> sheet.csv
'1,2,3\r\n3,4,5\r\n'
>>> sheet.get_csv(delimiter="|")
'1|2|3\r\n3|4|5\r\n'
```


5.5 Work with big data sheet

5.5.1 Pagination

When you are dealing with huge amount of data, e.g. 64GB, obviously you would not like to fill up your memory with those data. Hence pagination feature is developed to read partial data into memory for processing. You can paginate by row, by column and by both.

Let's assume the following file is a huge csv file:

```
>>> import datetime
>>> import pyexcel as pe
>>> data = [
...     [1, 21, 31],
...     [2, 22, 32],
...     [3, 23, 33],
...     [4, 24, 34],
...     [5, 25, 35],
...     [6, 26, 36]
... ]
>>> pe.save_as(array=data, dest_file_name="your_file.csv")
```

And let's pretend to read partial data:

```
>>> pe.get_sheet(file_name="your_file.csv", start_row=2, row_limit=3)
your_file.csv:
+---+---+---+
| 3 | 23 | 33 |
+---+---+---+
| 4 | 24 | 34 |
+---+---+---+
| 5 | 25 | 35 |
+---+---+---+
```

And you could as well do the same for columns:

```
>>> pe.get_sheet(file_name="your_file.csv", start_column=1, column_limit=2)
your_file.csv:
+---+---+
| 21 | 31 |
+---+---+
| 22 | 32 |
+---+---+
| 23 | 33 |
+---+---+
| 24 | 34 |
+---+---+
| 25 | 35 |
+---+---+
| 26 | 36 |
+---+---+
```

Obvious, you could do both at the same time:

```
>>> pe.get_sheet(file_name="your_file.csv",
...     start_row=2, row_limit=3,
...     start_column=1, column_limit=2)
your_file.csv:
+---+---+
```

```
| 23 | 33 |  
+---+---+  
| 24 | 34 |  
+---+---+  
| 25 | 35 |  
+---+---+
```

The pagination support is available across all pyexcel plugins.

Note: No column pagination support for query sets as data source.

5.5.2 Formatting while transcoding a big data file

If you are transcoding a big data set, conventional formatting method would not help unless a on-demand free RAM is available. However, there is a way to minimize the memory footprint of pyexcel while the formatting is performed.

Let's continue from previous example. Suppose we want to transcode "your_file.csv" to "your_file.xls" but increase each element by 1.

What we can do is to define a row renderer function as the following:

```
>>> def increment_by_one(row):  
...     for element in row:  
...         yield element + 1
```

Then pass it onto save_as function:

```
>>> pe.isave_as(file_name="your_file.csv",  
...             dest_file_name="your_file.xlsx",  
...             row_renderer=increment_by_one)
```

Note: If the data content is from a generator, isave_as has to be used.

We can verify if it was done correctly:

```
>>> pe.get_sheet(file_name="your_file.xlsx")  
your_file.csv:  
+---+---+---+  
| 2 | 22 | 32 |  
+---+---+---+  
| 3 | 23 | 33 |  
+---+---+---+  
| 4 | 24 | 34 |  
+---+---+---+  
| 5 | 25 | 35 |  
+---+---+---+  
| 6 | 26 | 36 |  
+---+---+---+  
| 7 | 27 | 37 |  
+---+---+---+
```

5.6 Sheet: Data Access

5.6.1 Random access to individual cell

To randomly access a cell of *Sheet* instance, two syntax are available:

```
sheet[row, column]
```

or:

```
sheet['A1']
```

The former syntax is handy when you know the row and column numbers. The latter syntax is introduced to help you convert the excel column header such as “AX” to integer numbers.

Suppose you have the following data, you can get value 5 by reader[2, 2].

Example	X	Y	Z
a	1	2	3
b	4	5	6
c	7	8	9

Here is the example code showing how you can randomly access a cell:

```
>>> import pyexcel
```

```
>>> sheet = pyexcel.get_sheet(file_name="example.xls")
>>> sheet.content
+-----+-----+-----+
| Example | X | Y | Z |
+-----+-----+-----+
| a       | 1 | 2 | 3 |
+-----+-----+-----+
| b       | 4 | 5 | 6 |
+-----+-----+-----+
| c       | 7 | 8 | 9 |
+-----+-----+-----+
>>> print(sheet[2, 2])
5
>>> print(sheet["C3"])
5
>>> sheet[3, 3] = 10
>>> print(sheet[3, 3])
10
```

Note: In order to set a value to a cell, please use `sheet[row_index, column_index] = new_value`

5.6.2 Random access to rows and columns

Continue with previous excel file, you can access row and column separately:

```
>>> sheet.row[1]
['a', 1, 2, 3]
>>> sheet.column[2]
['Y', 2, 5, 8]
```

5.6.3 Use custom names instead of index

Alternatively, it is possible to use the first row to refer to each columns:

```
>>> sheet.name_columns_by_row(0)
>>> print(sheet[1, "Y"])
5
    >>> sheet[1, "Y"] = 100
>>> print(sheet[1, "Y"])
100
```

You have noticed the row index has been changed. It is because first row is taken as the column names, hence all rows after the first row are shifted. Now accessing the columns are changed too:

```
>>> sheet.column['Y']
[2, 100, 8]
```

Hence access the same cell, this statement also works:

```
>>> sheet.column['Y'][1]
100
```

Further more, it is possible to use first column to refer to each rows:

```
>>> sheet.name_rows_by_column(0)
```

To access the same cell, we can use this line:

```
>>> sheet.row["b"][1]
100
```

For the same reason, the row index has been reduced by 1. Since we have named columns and rows, it is possible to access the same cell like this:

```
>>> print(sheet["b", "Y"])
100
>>> sheet["b", "Y"] = 200
>>> print(sheet["b", "Y"])
200
```

Note: When you have named your rows and columns, in order to set a value to a cell, please use `sheet[row_name, column_name] = new_value`

For multiple sheet file, you can regard it as three dimensional array if you use *Book*. So, you access each cell via this syntax:

```
book[sheet_index][row, column]
```

or:

```
book["sheet_name"][row, column]
```

Suppose you have the following sheets:

Table 5.4:
Sheet 1

1	2	3
4	5	6
7	8	9

Table 5.5:
Sheet 2

X	Y	Z
1	2	3
4	5	6

Table 5.6:
Sheet 3

O	P	Q
3	2	1
4	3	2

And you can randomly access a cell in a sheet:

```
>>> book = pyexcel.get_book(file_name="example.xls")
>>> print(book["Sheet 1"][0,0])
1
>>> print(book[0][0,0]) # the same cell
1
```

Tip: With pyexcel, you can regard single sheet reader as an two dimensional array and multi-sheet excel book reader as a ordered dictionary of two dimensional arrays.

5.6.4 Reading a single sheet excel file

Suppose you have a csv, xls, xlsx file as the following:

1	2	3
4	5	6
7	8	9

The following code will give you the data in json:

```
>>> import json
>>> # "example.csv", "example.xlsx", "example.xlsm"
>>> sheet = pyexcel.get_sheet(file_name="example.xls")
>>> print(json.dumps(sheet.to_array()))
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

Read the sheet as a dictionary

Suppose you have a csv, xls, xlsx file as the following:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

The following code will give you data series in a dictionary:

```
>>> # "example.xls", "example.xlsx", "example.xlsm"
>>> sheet = pyexcel.get_sheet(file_name="example_series.xls", name_columns_by_row=0)
```

```
>>> sheet.to_dict()
OrderedDict([('Column 1', [1, 4, 7]), ('Column 2', [2, 5, 8]), ('Column 3', [3, 6, 9])])
```

Can I get an array of dictionaries per each row?

Suppose you have the following data:

X	Y	Z
1	2	3
4	5	6
7	8	9

The following code will produce what you want:

```
>>> # "example.csv", "example.xlsx", "example.xlsm"
>>> sheet = pyexcel.get_sheet(file_name="example.xls", name_columns_by_row=0)
>>> records = sheet.to_records()
>>> for record in records:
...     keys = sorted(record.keys())
...     print("{")
...     for key in keys:
...         print("'s':%d" % (key, record[key]))
...     print("}")
{
'X':1
'Y':2
'Z':3
}
{
'X':4
'Y':5
'Z':6
}
{
'X':7
'Y':8
'Z':9
}
>>> print(records[0]["X"]) # access first row and first item
1
```

5.6.5 Writing a single sheet excel file

Suppose you have an array as the following:

1	2	3
4	5	6
7	8	9

The following code will write it as an excel file of your choice:

```
.. testcode::
```

```
>>> array = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
>>> # "output.xls" "output.xlsx" "output.ods" "output.xlsm"
>>> sheet = pyexcel.Sheet(array)
>>> sheet.save_as("output.csv")
```

Suppose you have a dictionary as the following:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

The following code will write it as an excel file of your choice:

```
>>> example_dict = {"Column 1": [1, 2, 3], "Column 2": [4, 5, 6], "Column 3": [7, 8, 9]}
>>> # "output.xls" "output.xlsx" "output.ods" "output.xlsm"
>>> sheet = pyexcel.get_sheet(adict=example_dict)
>>> sheet.save_as("output.csv")
```

5.6.6 Write multiple sheet excel file

Suppose you have previous data as a dictionary and you want to save it as multiple sheet excel file:

```
>>> content = {
...     'Sheet 1':
...     [
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0],
...         [7.0, 8.0, 9.0]
...     ],
...     'Sheet 2':
...     [
...         ['X', 'Y', 'Z'],
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0]
...     ],
...     'Sheet 3':
...     [
...         ['O', 'P', 'Q'],
...         [3.0, 2.0, 1.0],
...         [4.0, 3.0, 2.0]
...     ]
... }
>>> book = pyexcel.get_book(bookdict=content)
>>> book.save_as("output.xls")
```

You shall get a xls file

5.6.7 Read multiple sheet excel file

Let's read the previous file back:

```
>>> book = pyexcel.get_book(file_name="output.xls")
>>> sheets = book.to_dict()
>>> for name in sheets.keys():
...     print(name)
Sheet 1
Sheet 2
Sheet 3
```

5.6.8 Work with data series in a single sheet

Suppose you have the following data in any of the supported excel formats again:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

```
>>> sheet = pyexcel.get_sheet(file_name="example_series.xls", name_columns_by_row=0)
```

Play with data

You can get headers:

```
>>> print(list(sheet.colnames))
['Column 1', 'Column 2', 'Column 3']
```

You can use a utility function to get all in a dictionary:

```
>>> sheet.to_dict()
OrderedDict([('Column 1', [1, 4, 7]), ('Column 2', [2, 5, 8]), ('Column 3', [3, 6, 9])])
```

Maybe you want to get only the data without the column headers. You can call `rows()` instead:

```
>>> list(sheet.rows())
[[1, 2, 3], [4, 5, 6], [7, 8, 9]]
```

You can get data from the bottom to the top one by calling `rrows()` instead:

```
>>> list(sheet.rrows())
[[7, 8, 9], [4, 5, 6], [1, 2, 3]]
```

You might want the data arranged vertically. You can call `columns()` instead:

```
>>> list(sheet.columns())
[[1, 4, 7], [2, 5, 8], [3, 6, 9]]
```

You can get columns in reverse sequence as well by calling `rcolumns()` instead:

```
>>> list(sheet.rcolumns())
[[3, 6, 9], [2, 5, 8], [1, 4, 7]]
```

Do you want to flatten the data? You can get the content in one dimensional array. If you are interested in playing with one dimensional enumeration, you can check out these functions `enumerate()`, `reverse()`, `vertical()`, and `rvertical()`:

```
>>> list(sheet.enumerate())
[1, 2, 3, 4, 5, 6, 7, 8, 9]
>>> list(sheet.reverse())
[9, 8, 7, 6, 5, 4, 3, 2, 1]
>>> list(sheet.vertical())
[1, 4, 7, 2, 5, 8, 3, 6, 9]
>>> list(sheet.rvertical())
[9, 6, 3, 8, 5, 2, 7, 4, 1]
```


5.7 Sheet: Data manipulation

The data in a sheet is represented by *Sheet* which maintains the data as a list of lists. You can regard *Sheet* as a two dimensional array with additional iterators. Random access to individual column and row is exposed by `Column` and `Row`

5.7.1 Column manipulation

Suppose have one data file as the following:

```
>>> sheet = pyexcel.get_sheet(file_name="example.xls", name_columns_by_row=0)
>>> sheet
pyexcel sheet:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1         | 4         | 7         |
+-----+-----+-----+
| 2         | 5         | 8         |
+-----+-----+-----+
| 3         | 6         | 9         |
+-----+-----+-----+
```

And you want to update Column 2 with these data: [11, 12, 13]

```
>>> sheet.column["Column 2"] = [11, 12, 13]
>>> sheet.column[1]
[11, 12, 13]
>>> sheet
pyexcel sheet:
+-----+-----+-----+
| Column 1 | Column 2 | Column 3 |
+-----+-----+-----+
| 1         | 11        | 7         |
+-----+-----+-----+
| 2         | 12        | 8         |
+-----+-----+-----+
| 3         | 13        | 9         |
+-----+-----+-----+
```

Remove one column of a data file

If you want to remove Column 2, you can just call:

```
>>> del sheet.column["Column 2"]
>>> sheet.column["Column 3"]
[7, 8, 9]
```

The sheet content will become:

```
>>> sheet
pyexcel sheet:
+-----+-----+
| Column 1 | Column 3 |
+-----+-----+
| 1         | 7         |
```

```

+-----+-----+
| 2      | 8      |
+-----+-----+
| 3      | 9      |
+-----+-----+

```

5.7.2 Append more columns to a data file

Continue from previous example. Suppose you want add two more columns to the data file

Column 4	Column 5
10	13
11	14
12	15

Here is the example code to append two extra columns:

```

>>> extra_data = [
...     ["Column 4", "Column 5"],
...     [10, 13],
...     [11, 14],
...     [12, 15]
... ]
>>> sheet2 = pyexcel.Sheet(extra_data)
>>> sheet.column += sheet2
>>> sheet.column["Column 4"]
[10, 11, 12]
>>> sheet.column["Column 5"]
[13, 14, 15]

```

Here is what you will get:

```

>>> sheet
pyexcel sheet:
+-----+-----+-----+-----+
| Column 1 | Column 3 | Column 4 | Column 5 |
+-----+-----+-----+-----+
| 1      | 7      | 10     | 13     |
+-----+-----+-----+-----+
| 2      | 8      | 11     | 14     |
+-----+-----+-----+-----+
| 3      | 9      | 12     | 15     |
+-----+-----+-----+-----+

```

Cherry pick some columns to be removed

Suppose you have the following data:

```

>>> data = [
...     ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h'],
...     [1,2,3,4,5,6,7,9],
... ]
>>> sheet = pyexcel.Sheet(data, name_columns_by_row=0)
>>> sheet
pyexcel sheet:
+---+---+---+---+---+---+---+
| a | b | c | d | e | f | g | h |

```

```

=====+
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 9 |
+-----+

```

And you want to remove columns named as: 'a', 'c', 'e', 'h'. This is how you do it:

```

>>> del sheet.column['a', 'c', 'e', 'h']
>>> sheet
pyexcel sheet:
+-----+
| b | d | f | g |
+-----+
| 2 | 4 | 6 | 7 |
+-----+

```

5.7.3 What if the headers are in a different row

Suppose you have the following data:

```

>>> sheet
pyexcel sheet:
+-----+
| 1          | 2          | 3          |
+-----+
| Column 1 | Column 2 | Column 3 |
+-----+
| 4          | 5          | 6          |
+-----+

```

The way to name your columns is to use index 1:

```

>>> sheet.name_columns_by_row(1)

```

Here is what you get:

```

>>> sheet
pyexcel sheet:
+-----+
| Column 1 | Column 2 | Column 3 |
+-----+
| 1          | 2          | 3          |
+-----+
| 4          | 5          | 6          |
+-----+

```

5.7.4 Row manipulation

Suppose you have the following data:

```

>>> sheet
pyexcel sheet:
+-----+
| a | b | c | Row 1 |
+-----+
| e | f | g | Row 2 |
+-----+

```

```
| 1 | 2 | 3 | Row 3 |
+---+---+---+-----+
```

You can name your rows by column index at 3:

```
>>> sheet.name_rows_by_column(3)
>>> sheet
pyexcel sheet:
+-----+---+---+---+
| Row 1 | a | b | c |
+-----+---+---+---+
| Row 2 | e | f | g |
+-----+---+---+---+
| Row 3 | 1 | 2 | 3 |
+-----+---+---+---+
```

Then you can access rows by its name:

```
>>> sheet.row["Row 1"]
['a', 'b', 'c']
```

5.8 Sheet: Data filtering

use *filter()* function to apply a filter immediately. The content is modified.

Suppose you have the following data in any of the supported excel formats:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

```
>>> import pyexcel
```

```
>>> sheet = pyexcel.get_sheet(file_name="example_series.xls", name_columns_by_row=0)
>>> sheet.content
+-----+---+---+---+
| Column 1 | Column 2 | Column 3 |
+-----+---+---+---+
| 1         | 2         | 3         |
+-----+---+---+---+
| 4         | 5         | 6         |
+-----+---+---+---+
| 7         | 8         | 9         |
+-----+---+---+---+
```

5.8.1 Filter out some data

You may want to filter odd rows and print them in an array of dictionaries:

```
>>> sheet.filter(row_indices=[0, 2])
>>> sheet.content
+-----+---+---+---+
| Column 1 | Column 2 | Column 3 |
+-----+---+---+---+
```

```
| 4          | 5          | 6          |
+-----+-----+-----+
```

Let's try to further filter out even columns:

```
>>> sheet.filter(column_indices=[1])
>>> sheet.content
+-----+-----+
| Column 1 | Column 3 |
+=====+=====+
| 4          | 6          |
+-----+-----+
```

Save the data

Let's save the previous filtered data:

```
>>> sheet.save_as("example_series_filter.xls")
```

When you open *example_series_filter.xls*, you will find these data

Column 1	Column 3
2	8

How to filter out empty rows in my sheet?

Suppose you have the following data in a sheet and you want to remove those rows with blanks:

```
>>> import pyexcel as pe
>>> sheet = pe.Sheet([[1,2,3], ['', '', ''], ['', '', ''], [1,2,3]])
```

You can use `pyexcel.filters.RowValueFilter`, which examines each row, return *True* if the row should be filtered out. So, let's define a filter function:

```
>>> def filter_row(row_index, row):
...     result = [element for element in row if element != '']
...     return len(result)==0
```

And then apply the filter on the sheet:

```
>>> del sheet.row[filter_row]
>>> sheet
pyexcel sheet:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
```

5.8.2 Work with multi-sheet file

How do I read a book, process it and save to a new book

Yes, you can do that. The code looks like this:

```
import pyexcel

book = pyexcel.get_book(file_name="yourfile.xls")
for sheet in book:
    # do you processing with sheet
    # do filtering?
    pass
book.save_as("output.xls")
```

What would happen if I save a multi sheet book into “csv” file

Well, you will get one csv file per each sheet. Suppose you have these code:

```
>>> content = {
...     'Sheet 1':
...     [
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0],
...         [7.0, 8.0, 9.0]
...     ],
...     'Sheet 2':
...     [
...         ['X', 'Y', 'Z'],
...         [1.0, 2.0, 3.0],
...         [4.0, 5.0, 6.0]
...     ],
...     'Sheet 3':
...     [
...         ['O', 'P', 'Q'],
...         [3.0, 2.0, 1.0],
...         [4.0, 3.0, 2.0]
...     ]
... }
>>> book = pyexcel.Book(content)
>>> book.save_as("myfile.csv")
```

You will end up with three csv files:

```
>>> import glob
>>> outputfiles = glob.glob("myfile_*.csv")
>>> for file in sorted(outputfiles):
...     print(file)
...
myfile__Sheet 1__0.csv
myfile__Sheet 2__1.csv
myfile__Sheet 3__2.csv
```

and their content is the value of the dictionary at the corresponding key

After I have saved my multiple sheet book in csv format, how do I get them back in pyexcel

First of all, you can read them back individual as csv file using *meth:~pyexcel.get_sheet* method. Secondly, the pyexcel can do the magic to load all of them back into a book. You will just need to provide the common name before the separator “_”:

```

>>> book2 = pyexcel.get_book(file_name="myfile.csv")
>>> book2
Sheet 1:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
Sheet 2:
+---+---+---+
| X | Y | Z |
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
Sheet 3:
+---+---+---+
| O | P | Q |
+---+---+---+
| 3 | 2 | 1 |
+---+---+---+
| 4 | 3 | 2 |
+---+---+---+

```

5.9 Sheet: Formatting

Previous section has assumed the data is in the format that you want. In reality, you have to manipulate the data types a bit to suit your needs. Hence, formatters comes into the scene. use `format()` to apply formatter immediately.

Note: `int`, `float` and `datetime` values are automatically detected in `csv` files since `pyexcel` version 0.2.2

5.9.1 Convert a column of numbers to strings

Suppose you have the following data:

```

>>> import pyexcel
>>> data = [
...     ["userid", "name"],
...     [10120, "Adam"],
...     [10121, "Bella"],
...     [10122, "Cedar"]
... ]
>>> sheet = pyexcel.Sheet(data)
>>> sheet.name_columns_by_row(0)
>>> sheet.column["userid"]
[10120, 10121, 10122]

```

As you can see, `userid` column is of `int` type. Next, let's convert the column to string format:

```
>>> sheet.column.format("userid", str)
>>> sheet.column["userid"]
['10120', '10121', '10122']
```

5.9.2 Cleanse the cells in a spread sheet

Sometimes, the data in a spreadsheet may have unwanted strings in all or some cells. Let's take an example. Suppose we have a spread sheet that contains all strings but it as random spaces before and after the text values. Some field had weird characters, such as " ":

```
>>> data = [
...     ["      Version", "      Comments", "      Author &nbsp;  "],
...     [" v0.0.1      ", " Release versions", "      &nbsp;  Eda"],
...     ["&nbsp;   v0.0.2  ", "Useful updates &nbsp;   &nbsp;  ", " &nbsp;  Freud"]
... ]
>>> sheet = pyexcel.Sheet(data)
>>> sheet.content
+-----+-----+-----+
|      Version |      Comments      |      Author &nbsp;   |
+-----+-----+-----+
| v0.0.1      | Release versions  |      &nbsp;  Eda |
+-----+-----+-----+
| &nbsp;   v0.0.2  | Useful updates &nbsp;   &nbsp;   | &nbsp;  Freud      |
+-----+-----+-----+
```

Now try to create a custom cleanse function:

```
.. code-block:: python
```

```
>>> def cleanse_func(v):
...     v = v.replace("&nbsp;  ", "")
...     v = v.rstrip().strip()
...     return v
...
... 
```

Then let's create a SheetFormatter and apply it:

```
.. code-block:: python
```

```
>>> sheet.map(cleanse_func)
```

So in the end, you get this:

```
>>> sheet.content
+-----+-----+-----+
| Version | Comments      | Author |
+-----+-----+-----+
| v0.0.1  | Release versions | Eda    |
+-----+-----+-----+
| v0.0.2  | Useful updates  | Freud  |
+-----+-----+-----+
```


5.10 Book: Sheet operations

5.10.1 Access to individual sheets

You can access individual sheet of a book via attribute:

```
>>> book = pyexcel.get_book(file_name="book.xls")
>>> book.sheet3
sheet3:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
```

or via array notations:

```
>>> book["sheet 1"] # there is a space in the sheet name
sheet 1:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
```

5.10.2 Merge excel books

Suppose you have two excel books and each had three sheets. You can merge them and get a new book:

You also can merge individual sheets:

```
>>> book1 = pyexcel.get_book(file_name="book1.xls")
>>> book2 = pyexcel.get_book(file_name="book2.xlsx")
>>> merged_book = book1 + book2
>>> merged_book = book1["Sheet 1"] + book2["Sheet 2"]
>>> merged_book = book1["Sheet 1"] + book2
>>> merged_book = book1 + book2["Sheet 2"]
```

5.10.3 Manipulate individual sheets

merge sheets into a single sheet

Suppose you want to merge many csv files row by row into a new sheet.

```
>>> import pyexcel as pe
>>> import glob
>>> merged = pyexcel.Sheet()
>>> for file in glob.glob("*.csv"):
...     merged.row += pe.get_sheet(file_name=file)
>>> merged.save_as("merged.csv")
```

5.11 How to log pyexcel

When developing source plugins, it becomes necessary to have log trace available. It helps find out what goes wrong quickly.

The basic step would be to set up logging before pyexcel import statement.

```
import logging
import logging.config
logging.basicConfig(format='%(asctime)s - %(name)s - %(levelname)s - %(message)s',
                    level=logging.DEBUG)

import pyexcel
```

And if you would use a complex configuration, you can use the following code.

```
import logging
import logging.config
logging.config.fileConfig('log.conf')

import pyexcel
```

And then save the following content as log.conf in your directory:

```
[loggers]
keys=root, sources, renderers

[handlers]
keys=consoleHandler

[formatters]
keys=custom

[logger_root]
level=INFO
handlers=consoleHandler

[logger_sources]
level=DEBUG
handlers=consoleHandler
qualname=pyexcel.sources.factory
propagate=0

[logger_renderers]
level=DEBUG
handlers=consoleHandler
qualname=pyexcel.renderers.factory
propagate=0

[handler_consoleHandler]
class=StreamHandler
level=DEBUG
formatter=custom
args=(sys.stdout,)

[formatter_custom]
format=%(asctime)s - %(name)s - %(levelname)s - %(message)s
datefmt=
```

5.12 Migrate from 0.2.x to 0.3.0

Filtering and formatting behavior of `pyexcel.Sheet` are simplified. Soft filter and soft formatter are removed. Extra classes such as iterator, formatter, filter are removed.

Most of formatting tasks could be achieved using `format()` and `map()`. and Filtering with `filter()`. Formatting and filtering on row and/or column can be found with `row()` and `column()`

5.12.1 1. Updated filter function

There is no alternative to replace the following code:

```
sheet.filter(pe.OddRowFilter())
```

You will need to remove odd rows by yourself:

```
>>> import pyexcel as pe
>>> data = [
...     ['1'],
...     ['2'],
...     ['3'],
... ]
>>> sheet = pe.Sheet(data)
>>> to_remove = []
>>> for index in sheet.row_range():
...     if index % 2 == 0:
...         to_remove.append(index)
>>> sheet.filter(row_indices=to_remove)
>>> sheet
pyexcel sheet:
+----+
| 2 |
+----+
```

Or, you could do this:

```
>>> data = [
...     ['1'],
...     ['2'],
...     ['3'],
... ]
>>> sheet = pe.Sheet(data)
>>> def odd_filter(row_index, _):
...     return row_index % 2 == 0
>>> del sheet.row[odd_filter]
>>> sheet
pyexcel sheet:
+----+
| 2 |
+----+
```

And the same applies to `EvenRowFilter`, `OddColumnFilter`, `EvenColumnFilter`.

5.12.2 2. Updated format function

2.1 Replacement of sheetformatter

The following formatting code:

```
sheet.apply_formatter(pe.sheets.formatters.SheetFormatter(int))
```

can be replaced by:

```
sheet.format(int)
```

2.2 Replacement of row formatters

The following code:

```
row_formatter = pe.sheets.formatters.RowFormatter([1, 2], str)
sheet.add_formatter(row_formatter)
```

can be replaced by:

```
sheet.row.format([1, 2], str)
```

2.3 Replacement of column formatters

The following code:

```
f = NamedColumnFormatter(["Column 1", "Column 3"], str)
sheet.apply_formatter(f)
```

can be replaced by:

```
sheet.column.format(["Column 1", "Column 3"], str)
```

5.13 Migrate from 0.2.1 to 0.2.2+

5.13.1 1. Explicit imports, no longer needed

Please forget about these statements:

```
import pyexcel.ext.xls
import pyexcel.ext.ods
import pyexcel.ext.xlsx
```

They are no longer needed. As long as you have pip-installed them, they will be auto-loaded. However, if you do not want some of the plugins, please use *pip* to uninstall them.

What if you have your code as it is? No harm but a few warnings shown:

```
Deprecated usage since v0.2.2! Explicit import is no longer required. pyexcel.ext.ods is auto imported
```

5.13.2 2. Invalid environment marker: platform_python_implementation=="PyPy"

Yes, it is a surprise. Please upgrade setuptools in your environment:

```
pip install --upgrade setuptools
```

At the time of writing, setuptools (18.0.1) or setuptools-21.0.0-py2.py3-none-any.whl is installed on author's computer and worked.

5.13.3 3. How to keep both pyexcel-xls and pyexcel-xlsx

As in [Issue 20](#), pyexcel-xls was used for xls and pyexcel-xlsx had to be used for xlsx. Both must co-exist due to requirements. The workaround would failed when auto-import are enabled in v0.2.2. Hence, user of pyexcel in this situation shall use 'library' parameter to all signature functions, to instruct pyexcel to use a named library for each function call.

5.13.4 4. pyexcel.get_io is no longer exposed

pyexcel.get_io was passed on from pyexcel-io. However, it is no longer exposed. Please use pyexcel_io.manager.RWManager.get_io if you have to.

You are likely to use pyexcel.get_io when you do `pyexcel.Sheet.save_to_memory()` or `pyexcel.Book.save_to_memory()` where you need to put in a io stream. But actually, with latest code, you could put in a *None*.

5.14 Migrate from 0.1.x to 0.2.x

5.14.1 1. "Writer" is gone, Please use save_as.

Here is a piece of legacy code:

```
w = pyexcel.Writer("afile.csv")
data=[['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 1.1, 1]]
w.write_array(table)
w.close()
```

The new code is:

```
>>> data=[['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 1.1, 1]]
>>> pyexcel.save_as(array=data, dest_file_name="afile.csv")
```

Here is another piece of legacy code:

```
content = {
    "X": [1,2,3,4,5],
    "Y": [6,7,8,9,10],
    "Z": [11,12,13,14,15],
}
w = pyexcel.Writer("afile.csv")
w.write_dict(self.content)
w.close()
```

The new code is:

```
>>> content = {
...     "X": [1,2,3,4,5],
...     "Y": [6,7,8,9,10],
...     "Z": [11,12,13,14,15],
... }
>>> pyexcel.save_as(adict=content, dest_file_name="afile.csv")
```

Here is yet another piece of legacy code:

```
data = [
    [1, 2, 3],
    [4, 5, 6]
]
io = StringIO()
w = pyexcel.Writer(("csv",io))
w.write_rows(data)
w.close()
```

The new code is:

```
>>> data = [
...     [1, 2, 3],
...     [4, 5, 6]
... ]
>>> io = pyexcel.save_as(dest_file_type='csv', array=data)
>>> for line in io.readlines():
...     print(line.rstrip())
1,2,3
4,5,6
```

5.14.2 2. “BookWriter” is gone. Please use save_book_as.

Here is a piece of legacy code:

```
import pyexcel
content = {
    "Sheet1": [[1, 1, 1, 1], [2, 2, 2, 2], [3, 3, 3, 3]],
    "Sheet2": [[4, 4, 4, 4], [5, 5, 5, 5], [6, 6, 6, 6]],
    "Sheet3": [[u'X', u'Y', u'Z'], [1, 4, 7], [2, 5, 8], [3, 6, 9]]
}
w = pyexcel.BookWriter("afile.csv")
w.write_book_from_dict(content)
w.close()
```

The replacement code is:

```
>>> import pyexcel
>>> content = {
...     "Sheet1": [[1, 1, 1, 1], [2, 2, 2, 2], [3, 3, 3, 3]],
...     "Sheet2": [[4, 4, 4, 4], [5, 5, 5, 5], [6, 6, 6, 6]],
...     "Sheet3": [[u'X', u'Y', u'Z'], [1, 4, 7], [2, 5, 8], [3, 6, 9]]
... }
>>> pyexcel.save_book_as(bookdict=content, dest_file_name="afile.csv")
```

6.1 Recipes

Warning: The pyexcel DOES NOT consider Fonts, Styles and Charts at all. In the resulting excel files, fonts, styles and charts will not be transferred.

These recipes give a one-stop utility functions for known use cases. Similar functionality can be achieved using other application interfaces.

6.1.1 Update one column of a data file

Suppose you have one data file as the following:

example.xls

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

And you want to update Column 2 with these data: [11, 12, 13]

Here is the code:

```
>>> from pyexcel.cookbook import update_columns
>>> custom_column = {"Column 2": [11, 12, 13]}
>>> update_columns("example.xls", custom_column, "output.xls")
```

Your output.xls will have these data:

Column 1	Column 2	Column 3
1	11	7
2	12	8
3	13	9

6.1.2 Update one row of a data file

Suppose you have the same data file:

example.xls

Row 1	1	2	3
Row 2	4	5	6
Row 3	7	8	9

And you want to update the second row with these data: [7, 4, 1]

Here is the code:

```
>>> from pyexcel.cookbook import update_rows
>>> custom_row = {"Row 1": [11, 12, 13]}
>>> update_rows("example.xls", custom_row, "output.xls")
```

Your output.xls will have these data:

Column 1	Column 2	Column 3
7	4	1
2	5	8
3	6	9

6.1.3 Merge two files into one

Suppose you want to merge the following two data files:

example.csv

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

example.xls

Column 4	Column 5
10	12
11	13

The following code will merge the tow into one file, say “output.xls”:

```
>>> from pyexcel.cookbook import merge_two_files
>>> merge_two_files("example.csv", "example.xls", "output.xls")
```

The output.xls would have the following data:

Column 1	Column 2	Column 3	Column 4	Column 5
1	4	7	10	12
2	5	8	11	13
3	6	9		

6.1.4 Select candidate columns of two files and form a new one

Suppose you have these two files:

example.ods

Column 1	Column 2	Column 3	Column 4	Column 5
1	4	7	10	13
2	5	8	11	14
3	6	9	12	15

example.xls

Column 6	Column 7	Column 8	Column 9	Column 10
16	17	18	19	20

```
>>> data = [
...     ["Column 1", "Column 2", "Column 3", "Column 4", "Column 5"],
...     [1, 4, 7, 10, 13],
...     [2, 5, 8, 11, 14],
...     [3, 6, 9, 12, 15]
... ]
>>> s = pyexcel.Sheet(data)
>>> s.save_as("example.csv")
>>> data = [
...     ["Column 6", "Column 7", "Column 8", "Column 9", "Column 10"],
...     [16, 17, 18, 19, 20]
... ]
>>> s = pyexcel.Sheet(data)
>>> s.save_as("example.xls")
```

And you want to filter out column 2 and 4 from example.ods, filter out column 6 and 7 and merge them:

Column 1	Column 3	Column 5	Column 8	Column 9	Column 10
1	7	13	18	19	20
2	8	14			
3	9	15			

The following code will do the job:

```
>>> from pyexcel.cookbook import merge_two_readers
>>> sheet1 = pyexcel.get_sheet(file_name="example.csv", name_columns_by_row=0)
>>> sheet2 = pyexcel.get_sheet(file_name="example.xls", name_columns_by_row=0)
>>> del sheet1.column[1, 3, 5]
>>> del sheet2.column[0, 1]
>>> merge_two_readers(sheet1, sheet2, "output.xls")
```

6.1.5 Merge two files into a book where each file become a sheet

Suppose you want to merge the following two data files:

example.csv

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

example.xls

Column 4	Column 5
10	12
11	13

```
>>> data = [
...     ["Column 1", "Column 2", "Column 3"],
...     [1, 2, 3],
...     [4, 5, 6],
...     [7, 8, 9]
... ]
```

```
>>> s = pyexcel.Sheet(data)
>>> s.save_as("example.csv")
>>> data = [
...     ["Column 4", "Column 5"],
...     [10, 12],
...     [11, 13]
... ]
>>> s = pyexcel.Sheet(data)
>>> s.save_as("example.xls")
```

The following code will merge the tow into one file, say “output.xls”:

```
>>> from pyexcel.cookbook import merge_all_to_a_book
>>> merge_all_to_a_book(["example.csv", "example.xls"], "output.xls")
```

The output.xls would have the following data:

example.csv as sheet name and inside the sheet, you have:

Column 1	Column 2	Column 3
1	4	7
2	5	8
3	6	9

example.ods as sheet name and inside the sheet, you have:

Column 4	Column 5
10	12
11	13

6.1.6 Merge all excel files in directory into a book where each file become a sheet

The following code will merge every excel files into one file, say “output.xls”:

```
from pyexcel.cookbook import merge_all_to_a_book
import glob

merge_all_to_a_book(glob.glob("your_csv_directory\*.csv"), "output.xls")
```

You can mix and match with other excel formats: xls, xlsx and ods. For example, if you are sure you have only xls, xlsx, ods and csv files in *your_excel_file_directory*, you can do the following:

```
from pyexcel.cookbook import merge_all_to_a_book
import glob

merge_all_to_a_book(glob.glob("your_excel_file_directory\*..*"), "output.xls")
```

6.1.7 Split a book into single sheet files

Suppose you have many sheets in a work book and you would like to separate each into a single sheet excel file. You can easily do this:

```
>>> from pyexcel.cookbook import split_a_book
>>> split_a_book("megabook.xls", "output.xls")
>>> import glob
```

```
>>> outputfiles = glob.glob("*_output.xls")
>>> for file in sorted(outputfiles):
...     print(file)
...
Sheet 1_output.xls
Sheet 2_output.xls
Sheet 3_output.xls
```

for the output file, you can specify any of the supported formats

6.1.8 Extract just one sheet from a book

Suppose you just want to extract one sheet from many sheets that exists in a work book and you would like to separate it into a single sheet excel file. You can easily do this:

```
>>> from pyexcel.cookbook import extract_a_sheet_from_a_book
>>> extract_a_sheet_from_a_book("megabook.xls", "Sheet 1", "output.xls")
>>> if os.path.exists("Sheet 1_output.xls"):
...     print("Sheet 1_output.xls exists")
...
Sheet 1_output.xls exists
```

for the output file, you can specify any of the supported formats

6.2 Loading from other sources

6.2.1 How to load a sheet from a url

Suppose you have excel file somewhere hosted:

```
>>> sheet = pe.get_sheet(url='http://yourdomain.com/test.csv')
>>> sheet
csv:
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
```

Real world cases

7.1 Questions and Answers

1. Python flask writing to a csv file and reading it
2. PyQt: Import .xls file and populate QTableWidgetItem?
3. How do I write data to csv file in columns and rows from a list in python?
4. How to write dictionary values to a csv file using Python
5. Python convert csv to xlsx
6. How to read data from excel and set data type
7. Remove or keep specific columns in csv file
8. How can I put a CSV file in an array?

API documentation

8.1 API Reference

This is intended for users of pyexcel.

8.1.1 Signature functions

Obtaining data from excel file

<code>get_array(**keywords)</code>	Obtain an array from an excel source
<code>get_dict([name_columns_by_row])</code>	Obtain a dictionary from an excel source
<code>get_records([name_columns_by_row])</code>	Obtain a list of records from an excel source
<code>get_book_dict(**keywords)</code>	Obtain a dictionary of two dimensional arrays
<code>get_book(**keywords)</code>	Get an instance of <i>Book</i> from an excel source
<code>get_sheet(**keywords)</code>	Get an instance of <i>Sheet</i> from an excel source
<code>iget_array(**keywords)</code>	Obtain a generator of an two dimensional array from an excel source
<code>iget_records(**keywords)</code>	Obtain a generator of a list of records from an excel source

pyexcel.get_array

`pyexcel.get_array(**keywords)`

Obtain an array from an excel source

Parameters `keywords` – see `get_sheet()`

pyexcel.get_dict

`pyexcel.get_dict(name_columns_by_row=0, **keywords)`

Obtain a dictionary from an excel source

Parameters

- **name_columns_by_row** – specify a row to be a dictionary key. It is default to 0 or first row.
- **keywords** – see `get_sheet()`

If you would use a column index 0 instead, you should do:

```
get_dict(name_columns_by_row=-1, name_rows_by_column=0)
```

pyexcel.get_records

`pyexcel.get_records` (*name_columns_by_row=0, **keywords*)

Obtain a list of records from an excel source

Parameters

- **name_columns_by_row** – specify a row to be a dictionary key. It is default to 0 or first row.
- **keywords** – see *get_sheet ()*

If you would use a column index 0 instead, you should do:

```
get_records(name_columns_by_row=-1, name_rows_by_column=0)
```

pyexcel.get_book_dict

`pyexcel.get_book_dict` (***keywords*)

Obtain a dictionary of two dimensional arrays

Parameters **keywords** – see *get_book ()*

pyexcel.get_book

`pyexcel.get_book` (***keywords*)

Get an instance of *Book* from an excel source

Parameters

- **file_name** – a file with supported file extension
- **file_content** – the file content
- **file_stream** – the file stream
- **file_type** – the file type in *content*
- **session** – database session
- **tables** – a list of database table
- **models** – a list of django models
- **bookdict** – a dictionary of two dimensional arrays
- **url** – a download http url for your excel file

see also *A list of supported data structures*

Here is a table of parameters:

source	parameters
loading from file	file_name, keywords
loading from memory	file_type, content, keywords
loading from sql	session, tables
loading from django models	models
loading from dictionary	bookdict
loading from an url	url

Where the dictionary should have text as keys and two dimensional array as values.

pyexcel.get_sheet

pyexcel.get_sheet (**keywords)

Get an instance of *Sheet* from an excel source

Parameters

- **file_name** – a file with supported file extension
- **file_content** – the file content
- **file_stream** – the file stream
- **file_type** – the file type in *content*
- **session** – database session
- **table** – database table
- **model** – a django model
- **adict** – a dictionary of one dimensional arrays
- **url** – a download http url for your excel file
- **with_keys** – load with previous dictionary's keys, default is True
- **records** – a list of dictionaries that have the same keys
- **array** – a two dimensional array, a list of lists
- **keywords** – additional parameters, see *Sheet.__init__()*
- **sheet_name** – sheet name. if sheet_name is not given, the default sheet at index 0 is loaded

Not all parameters are needed. Here is a table

source	parameters
loading from file	file_name, sheet_name, keywords
loading from memory	file_type, content, sheet_name, keywords
loading from sql	session, table
loading from sql in django	model
loading from query sets	any query sets(sqlalchemy or django)
loading from dictionary	adict, with_keys
loading from records	records
loading from array	array
loading from an url	url

see also *A list of supported data structures*

pyexcel.iget_array

`pyexcel.iget_array(**keywords)`

Obtain a generator of an two dimensional array from an excel source

It is similiar to `pyexcel.get_array()` but it has less memory footprint.

pyexcel.iget_records

`pyexcel.iget_records(**keywords)`

Obtain a generator of a list of records from an excel source

It is similiar to `pyexcel.get_records()` but it has less memory footprint but requires the headers to be in the first row. And the data matrix should be of equal length. It should consume less memory and should work well with large files.

Saving data to excel file

<code>save_as(**keywords)</code>	Save a sheet from a data source to another one
<code>isave_as(**keywords)</code>	Save a sheet from a data source to another one with less memory
<code>save_book_as(**keywords)</code>	Save a book from a data source to another one

pyexcel.save_as

`pyexcel.save_as(**keywords)`

Save a sheet from a data source to another one

It accepts two sets of keywords. Why two sets? one set is source, the other set is destination. In order to distinguish the two sets, source set will be exactly the same as the ones for `pyexcel.get_sheet()`; destination set are exactly the same as the ones for `pyexcel.Sheet.save_as` but require a 'dest' prefix.

param keywords additional keywords can be found at `pyexcel.get_sheet()`

param dest_file_name another file name. **out_file** is deprecated though is still accepted.

param dest_file_type this is needed if you want to save to memory

param dest_session the target database session

param dest_table the target destination table

param dest_model the target django model

param dest_mapdict a mapping dictionary, see `pyexcel.Sheet.save_to_memory()`

param dest_initializer a custom initializer function for table or model

param dest_mapdict nominate headers

param dest_batch_size object creation batch size. it is Django specific

if csv file is destination format, python csv `fmtparams` are accepted

for example: `dest_lineterminator` will replace default ‘

‘ to the one you specified :returns: IO stream if saving to memory. None otherwise

Saving to source	parameters
file	dest_file_name, dest_sheet_name, keywords with prefix 'dest'
memory	dest_file_type, dest_content, dest_sheet_name, keywords with prefix 'dest'
sql	dest_session, table, dest_initializer, dest_mapdict
django model	dest_model, dest_initializer, dest_mapdict, dest_batch_size

In addition, this function use `pyexcel.Sheet` to render the data which could have performance penalty. In exchange, parameters for `pyexcel.Sheet` can be passed on, e.g. `name_columns_by_row`.

pyexcel.isave_as

`pyexcel.isave_as(**keywords)`

Save a sheet from a data source to another one with less memory

It is simliar to `pyexcel.save_as()` except that it does not accept parameters for `pyexcel.Sheet`. And it read when it writes.

pyexcel.save_book_as

`pyexcel.save_book_as(**keywords)`

Save a book from a data source to another one

Parameters

- **dest_file_name** – another file name. **out_file** is deprecated though is still accepted.
- **dest_file_type** – this is needed if you want to save to memory
- **dest_session** – the target database session
- **dest_tables** – the list of target destination tables
- **dest_models** – the list of target destination django models
- **dest_mapdicts** – a list of mapping dictionaries
- **dest_initializers** – table initialization functions
- **dest_mapdicts** – to nominate a model or table fields. Optional
- **dest_batch_size** – batch creation size. Optional
- **keywords** – additional keywords can be found at `pyexcel.get_book()`

Returns IO stream if saving to memory. None otherwise

Saving to source	parameters
file	dest_file_name, dest_sheet_name, keywords with prefix 'dest'
memory	dest_file_type, dest_content, dest_sheet_name, keywords with prefix 'dest'
sql	dest_session, dest_tables, dest_table_init_func, dest_mapdict
django model	dest_models, dest_initializers, dest_mapdict, dest_batch_size

These flags can be passed on all signature functions:

auto_detect_int

Automatically convert float values to integers if the float number has no decimal values(e.g. 1.00). By default, it does the detection. Setting it to False will turn on this behavior

It has no effect on pyexcel-xlsx because it does that by default.

auto_detect_float

Automatically convert text to float values if possible. This applies only pyexcel-io where csv, tsv, csvz and tsvz formats are supported. By default, it does the detection. Setting it to False will turn on this behavior

auto_detect_datetime

Automatically convert text to python datetime if possible. This applies only pyexcel-io where csv, tsv, csvz and tsvz formats are supported. By default, it does the detection. Setting it to False will turn on this behavior

library

Name a pyexcel plugin to handle a file format. In the situation where multiple plugins were pip installed, it is confusing for pyexcel on which plugin to handle the file format. For example, both pyexcel-xlsx and pyexcel-xls reads xlsx format. Now since version 0.2.2, you can pass on *library="pyexcel-xls"* to handle xlsx in a specific function call.

It is better to uninstall the unwanted pyexcel plugin using pip if two plugins for the same file type are not absolutely necessary.

8.1.2 Cookbook

<code>merge_csv_to_a_book(filelist[, outfilename])</code>	merge a list of csv files into a excel book
<code>merge_all_to_a_book(filelist[, outfilename])</code>	merge a list of excel files into a excel book
<code>split_a_book(file_name[, outfilename])</code>	Split a file into separate sheets
<code>extract_a_sheet_from_a_book(file_name, sheetname)</code>	Extract a sheet from a excel book

pyexcel.merge_csv_to_a_book

`pyexcel.merge_csv_to_a_book(filelist, outfilename='merged.xls')`
merge a list of csv files into a excel book

Parameters

- **filelist** (*list*) – a list of accessible file path
- **outfilename** (*str*) – save the sheet as

pyexcel.merge_all_to_a_book

`pyexcel.merge_all_to_a_book(filelist, outfilename='merged.xls')`
merge a list of excel files into a excel book

Parameters

- **filelist** (*list*) – a list of accessible file path
- **outfilename** (*str*) – save the sheet as

pyexcel.split_a_book

`pyexcel.split_a_book(file_name, outfilename=None)`
Split a file into separate sheets

Parameters

- **file_name** (*str*) – an accessible file name
- **outfilename** (*str*) – save the sheets with file suffix

pyexcel.extract_a_sheet_from_a_book

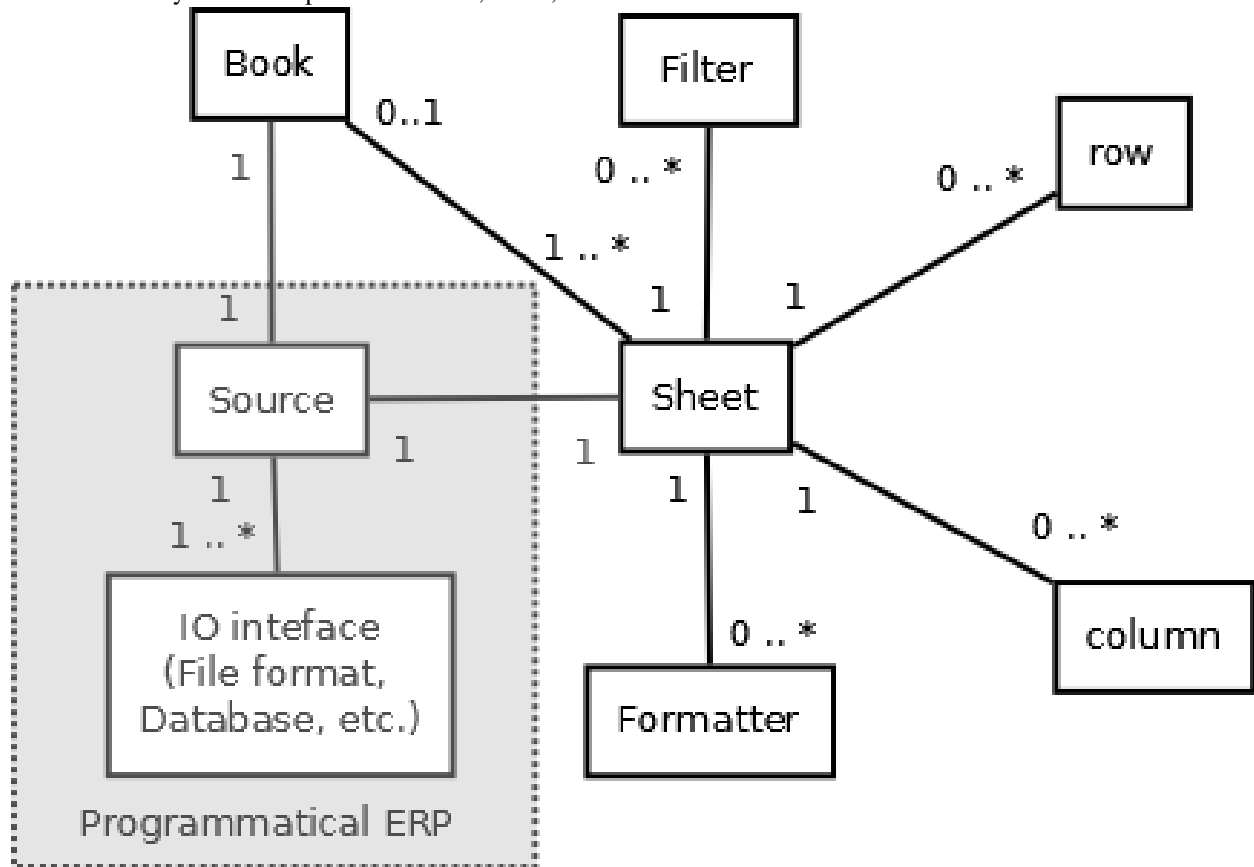
`pyexcel.extract_a_sheet_from_a_book` (*file_name, sheetname, outfilename=None*)
 Extract a sheet from a excel book

Parameters

- **file_name** (*str*) – an accessible file name
- **sheetname** (*str*) – a valid sheet name
- **outfilename** (*str*) – save the sheet as

8.1.3 Book

Here’s the entity relationship between Book, Sheet, Row and Column



Constructor

Book([sheets, filename, path]) Read an excel book that has one or more sheets

pyexcel.Book

class pyexcel.**Book** (*sheets=None, filename='memory', path=None*)

Read an excel book that has one or more sheets

For csv file, there will be just one sheet

__init__ (*sheets=None, filename='memory', path=None*)

Book constructor

Selecting a specific book according to filename extension :param OrderedDict/dict sheets: a dictionary of data :param str filename: the physical file :param str path: the relative path or absolute path :param set keywords: additional parameters to be passed on

Methods

<code>__init__([sheets, filename, path])</code>	Book constructor
<code>get_array(**keywords)</code>	Get data in array format
<code>get_bookdict(**keywords)</code>	Get data in bookdict format
<code>get_csv(**keywords)</code>	Get data in csv format
<code>get_csvz(**keywords)</code>	Get data in csvz format
<code>get_dict(**keywords)</code>	Get data in dict format
<code>get_grid(**keywords)</code>	Get data in grid format
<code>get_html(**keywords)</code>	Get data in html format
<code>get_json(**keywords)</code>	Get data in json format
<code>get_latex(**keywords)</code>	Get data in latex format
<code>get_latex_booktabs(**keywords)</code>	Get data in latex_booktabs format
<code>get_mediawiki(**keywords)</code>	Get data in mediawiki format
<code>get_ods(**keywords)</code>	Get data in ods format
<code>get_orgtbl(**keywords)</code>	Get data in orgtbl format
<code>get_pipe(**keywords)</code>	Get data in pipe format
<code>get_plain(**keywords)</code>	Get data in plain format
<code>get_records(**keywords)</code>	Get data in records format
<code>get_rst(**keywords)</code>	Get data in rst format
<code>get_simple(**keywords)</code>	Get data in simple format
<code>get_texttable(**keywords)</code>	Get data in texttable format
<code>get_tsv(**keywords)</code>	Get data in tsv format
<code>get_tsvz(**keywords)</code>	Get data in tsvz format
<code>get_url(**keywords)</code>	url getter is not defined.
<code>get_xls(**keywords)</code>	Get data in xls format
<code>get_xlsm(**keywords)</code>	Get data in xlsm format
<code>get_xlsx(**keywords)</code>	Get data in xlsx format
<code>init([sheets, filename, path])</code>	
<code>load_from_sheets(sheets)</code>	Load content from existing sheets
<code>number_of_sheets()</code>	Return the number of sheets
<code>register_book_input(file_type)</code>	partial(func, *args, **keywords) - new function with partial application
<code>register_io(file_type)</code>	partial(func, *args, **keywords) - new function with partial application
<code>register_presentation(file_type[, ...])</code>	partial(func, *args, **keywords) - new function with partial application
<code>remove_sheet(sheet)</code>	Remove a sheet
<code>save_as(filename)</code>	Save the content to a new file
<code>save_to_database(session, tables[, ...])</code>	Save data in sheets to database tables

Continued on next page

Table 8.5 – continued from previous page

<code>save_to_django_models(models[, ...])</code>	Save to database table through django model
<code>save_to_memory(file_type[, stream])</code>	Save the content to a memory stream
<code>set_array(content, **keywords)</code>	Set data in array format
<code>set_bookdict(content, **keywords)</code>	Set data in bookdict format
<code>set_csv(content, **keywords)</code>	Set data in csv format
<code>set_csvz(content, **keywords)</code>	Set data in csvz format
<code>set_dict(content, **keywords)</code>	Set data in dict format
<code>set_grid(content, **keywords)</code>	grid setter is not defined.
<code>set_html(content, **keywords)</code>	html setter is not defined.
<code>set_json(content, **keywords)</code>	json setter is not defined.
<code>set_latex(content, **keywords)</code>	latex setter is not defined.
<code>set_latex_booktabs(content, **keywords)</code>	latex_booktabs setter is not defined.
<code>set_mediawiki(content, **keywords)</code>	mediawiki setter is not defined.
<code>set_ods(content, **keywords)</code>	Set data in ods format
<code>set_orgtbl(content, **keywords)</code>	orgtbl setter is not defined.
<code>set_pipe(content, **keywords)</code>	pipe setter is not defined.
<code>set_plain(content, **keywords)</code>	plain setter is not defined.
<code>set_records(content, **keywords)</code>	Set data in records format
<code>set_rst(content, **keywords)</code>	rst setter is not defined.
<code>set_simple(content, **keywords)</code>	simple setter is not defined.
<code>set_texttable(content, **keywords)</code>	texttable setter is not defined.
<code>set_tsv(content, **keywords)</code>	Set data in tsv format
<code>set_tsvz(content, **keywords)</code>	Set data in tsvz format
<code>set_url(content, **keywords)</code>	Set data in url format
<code>set_xls(content, **keywords)</code>	Set data in xls format
<code>set_xlsm(content, **keywords)</code>	Set data in xlsm format
<code>set_xlsx(content, **keywords)</code>	Set data in xlsx format
<code>sheet_by_index(index)</code>	Get the sheet with the specified index
<code>sheet_by_name(name)</code>	Get the sheet with the specified name
<code>sheet_names()</code>	Return all sheet names
<code>to_dict()</code>	Convert the book to a dictionary

Attributes

<code>array</code>	Get/Set data in/from array format
<code>bookdict</code>	Get/Set data in/from bookdict format
<code>csv</code>	Get/Set data in/from csv format
<code>csvz</code>	Get/Set data in/from csvz format
<code>dict</code>	Get/Set data in/from dict format
<code>grid</code>	Get data in grid format
<code>html</code>	Get data in html format
<code>json</code>	Get data in json format
<code>latex</code>	Get data in latex format
<code>latex_booktabs</code>	Get data in latex_booktabs format
<code>mediawiki</code>	Get data in mediawiki format
<code>ods</code>	Get/Set data in/from ods format
<code>orgtbl</code>	Get data in orgtbl format
<code>pipe</code>	Get data in pipe format
<code>plain</code>	Get data in plain format

Continued on next page

Table 8.6 – continued from previous page

<code>records</code>	Get/Set data in/from records format
<code>rst</code>	Get data in rst format
<code>simple</code>	Get data in simple format
<code>texttable</code>	Get data in texttable format
<code>tsv</code>	Get/Set data in/from tsv format
<code>tsvz</code>	Get/Set data in/from tsvz format
<code>url</code>	Set data in url format
<code>xls</code>	Get/Set data in/from xls format
<code>xlsm</code>	Get/Set data in/from xlsm format
<code>xlsx</code>	Get/Set data in/from xlsx format

Attribute

<code>Book.number_of_sheets()</code>	Return the number of sheets
<code>Book.sheet_names()</code>	Return all sheet names

pyexcel.Book.number_of_sheets

`Book.number_of_sheets()`
Return the number of sheets

pyexcel.Book.sheet_names

`Book.sheet_names()`
Return all sheet names

Conversions

<code>Book.bookdict</code>	Get/Set data in/from bookdict format
<code>Book.url</code>	Set data in url format
<code>Book.csv</code>	Get/Set data in/from csv format
<code>Book.tsv</code>	Get/Set data in/from tsv format
<code>Book.csvz</code>	Get/Set data in/from csvz format
<code>Book.tsvz</code>	Get/Set data in/from tsvz format
<code>Book.xls</code>	Get/Set data in/from xls format
<code>Book.xlsx</code>	Get/Set data in/from xlsx format
<code>Book.ods</code>	Get/Set data in/from ods format
<code>Book.plain</code>	Get data in plain format
<code>Book.simple</code>	Get data in simple format
<code>Book.grid</code>	Get data in grid format
<code>Book.pipe</code>	Get data in pipe format
<code>Book.orgtbl</code>	Get data in orgtbl format
<code>Book.rst</code>	Get data in rst format
<code>Book.mediawiki</code>	Get data in mediawiki format
<code>Book.latex</code>	Get data in latex format
<code>Book.latex_booktabs</code>	Get data in latex_booktabs format

Continued on next page

Table 8.8 – continued from previous page

<i>Book.json</i>	Get data in json format
<i>Book.html</i>	Get data in html format

pyexcel.Book.bookdict**Book.bookdict**

Get/Set data in/from bookdict format

You could obtain content in bookdict format by dot notation:

```
Book.bookdict
```

And you could as well set content by dot notation:

```
Book.bookdict = the_io_stream_in_bookdict_format
```

if you need to pass on more parameters, you could use:

```
Book.get_bookdict(**keywords)
Book.set_bookdict(the_io_stream_in_bookdict_format, **keywords)
```

pyexcel.Book.url**Book.url**

Set data in url format

You could set content in url format by dot notation:

```
Book.url
```

if you need to pass on more parameters, you could use:

```
Book.set_url(the_io_stream_in_url_format, **keywords)
```

pyexcel.Book.csv**Book.csv**

Get/Set data in/from csv format

You could obtain content in csv format by dot notation:

```
Book.csv
```

And you could as well set content by dot notation:

```
Book.csv = the_io_stream_in_csv_format
```

if you need to pass on more parameters, you could use:

```
Book.get_csv(**keywords)
Book.set_csv(the_io_stream_in_csv_format, **keywords)
```

pyexcel.Book.tsv

Book .tsv

Get/Set data in/from tsv format

You could obtain content in tsv format by dot notation:

```
Book.tsv
```

And you could as well set content by dot notation:

```
Book.tsv = the_io_stream_in_tsv_format
```

if you need to pass on more parameters, you could use:

```
Book.get_tsv(**keywords)
Book.set_tsv(the_io_stream_in_tsv_format, **keywords)
```

pyexcel.Book.csvz

Book .csvz

Get/Set data in/from csvz format

You could obtain content in csvz format by dot notation:

```
Book.csvz
```

And you could as well set content by dot notation:

```
Book.csvz = the_io_stream_in_csvz_format
```

if you need to pass on more parameters, you could use:

```
Book.get_csvz(**keywords)
Book.set_csvz(the_io_stream_in_csvz_format, **keywords)
```

pyexcel.Book.tsvz

Book .tsvz

Get/Set data in/from tsvz format

You could obtain content in tsvz format by dot notation:

```
Book.tsvz
```

And you could as well set content by dot notation:

```
Book.tsvz = the_io_stream_in_tsvz_format
```

if you need to pass on more parameters, you could use:

```
Book.get_tsvz(**keywords)
Book.set_tsvz(the_io_stream_in_tsvz_format, **keywords)
```

pyexcel.Book.xls

Book.xls

Get/Set data in/from xls format

You could obtain content in xls format by dot notation:

```
Book.xls
```

And you could as well set content by dot notation:

```
Book.xls = the_io_stream_in_xls_format
```

if you need to pass on more parameters, you could use:

```
Book.get_xls(**keywords)
Book.set_xls(the_io_stream_in_xls_format, **keywords)
```

pyexcel.Book.xlsx

Book.xlsx

Get/Set data in/from xlsx format

You could obtain content in xlsx format by dot notation:

```
Book.xlsx
```

And you could as well set content by dot notation:

```
Book.xlsx = the_io_stream_in_xlsx_format
```

if you need to pass on more parameters, you could use:

```
Book.get_xlsx(**keywords)
Book.set_xlsx(the_io_stream_in_xlsx_format, **keywords)
```

pyexcel.Book.ods

Book.ods

Get/Set data in/from ods format

You could obtain content in ods format by dot notation:

```
Book.ods
```

And you could as well set content by dot notation:

```
Book.ods = the_io_stream_in_ods_format
```

if you need to pass on more parameters, you could use:

```
Book.get_ods(**keywords)
Book.set_ods(the_io_stream_in_ods_format, **keywords)
```

pyexcel.Book.plain

Book.plain

Get data in plain format

You could obtain content in plain format by dot notation:

```
Book.plain
```

if you need to pass on more parameters, you could use:

```
Book.get_plain(**keywords)
```

pyexcel.Book.simple

Book.simple

Get data in simple format

You could obtain content in simple format by dot notation:

```
Book.simple
```

if you need to pass on more parameters, you could use:

```
Book.get_simple(**keywords)
```

pyexcel.Book.grid

Book.grid

Get data in grid format

You could obtain content in grid format by dot notation:

```
Book.grid
```

if you need to pass on more parameters, you could use:

```
Book.get_grid(**keywords)
```

pyexcel.Book.pipe

Book.pipe

Get data in pipe format

You could obtain content in pipe format by dot notation:

```
Book.pipe
```

if you need to pass on more parameters, you could use:

```
Book.get_pipe(**keywords)
```

pyexcel.Book.orgtbl

Book.orgtbl

Get data in orgtbl format

You could obtain content in orgtbl format by dot notation:

```
Book.orgtbl
```

if you need to pass on more parameters, you could use:

```
Book.get_orgtbl(**keywords)
```

pyexcel.Book.rst

Book.rst

Get data in rst format

You could obtain content in rst format by dot notation:

```
Book.rst
```

if you need to pass on more parameters, you could use:

```
Book.get_rst(**keywords)
```

pyexcel.Book.mediawiki

Book.mediawiki

Get data in mediawiki format

You could obtain content in mediawiki format by dot notation:

```
Book.mediawiki
```

if you need to pass on more parameters, you could use:

```
Book.get_mediawiki(**keywords)
```

pyexcel.Book.latex

Book.latex

Get data in latex format

You could obtain content in latex format by dot notation:

```
Book.latex
```

if you need to pass on more parameters, you could use:

```
Book.get_latex(**keywords)
```

pyexcel.Book.latex_booktabs

Book.latex_booktabs

Get data in latex_booktabs format

You could obtain content in latex_booktabs format by dot notation:

```
Book.latex_booktabs
```

if you need to pass on more parameters, you could use:

```
Book.get_latex_booktabs(**keywords)
```

pyexcel.Book.json

Book.json

Get data in json format

You could obtain content in json format by dot notation:

```
Book.json
```

if you need to pass on more parameters, you could use:

```
Book.get_json(**keywords)
```

pyexcel.Book.html

Book.html

Get data in html format

You could obtain content in html format by dot notation:

```
Book.html
```

if you need to pass on more parameters, you could use:

```
Book.get_html(**keywords)
```

Save changes

<i>Book.save_as</i> (filename)	Save the content to a new file
<i>Book.save_to_memory</i> (file_type[, stream])	Save the content to a memory stream
<i>Book.save_to_database</i> (session, tables[, ...])	Save data in sheets to database tables

pyexcel.Book.save_as

Book.save_as (filename)

Save the content to a new file

Parameters **filename** (*str*) – a file path

pyexcel.Book.save_to_memory

Book.**save_to_memory** (*file_type*, *stream=None*, ***keywords*)

Save the content to a memory stream

Parameters

- **file_type** – what format the stream is in
- **stream** – a memory stream. Note in Python 3, for csv and tsv format, please pass an instance of StringIO. For xls,xlsx, and ods, an instance of BytesIO.

pyexcel.Book.save_to_database

Book.**save_to_database** (*session*, *tables*, *initializers=None*, *mapdicts=None*, *auto_commit=True*)

Save data in sheets to database tables

Parameters

- **session** – database session
- **tables** – a list of database tables, that is accepted by `Sheet.save_to_database()`. The sequence of tables matters when there is dependencies in between the tables. For example, **Car** is made by **Car Maker**. **Car Maker** table should be specified before **Car** table.
- **initializers** – a list of initialization functions for your tables and the sequence should match tables,
- **mapdicts** – custom map dictionary for your data columns and the sequence should match tables
- **auto_commit** – by default, data is committed.

8.1.4 Sheet

Constructor

`Sheet`([*sheet*, *name*, *name_columns_by_row*, ...]) Two dimensional data container for filtering, formatting and iteration

pyexcel.Sheet

```
class pyexcel.Sheet (sheet=None, name='pyexcel sheet', name_columns_by_row=-1,
                    name_rows_by_column=-1, colnames=None, rownames=None, trans-
                    pose_before=False, transpose_after=False)
```

Two dimensional data container for filtering, formatting and iteration

`Sheet` is a container for a two dimensional array, where individual cell can be any Python types. Other than numbers, value of these types: string, date, time and boolean can be mixed in the array. This differs from Numpy's matrix where each cell are of the same number type.

In order to prepare two dimensional data for your computation, formatting functions help convert array cells to required types. Formatting can be

applied not only to the whole sheet but also to selected rows or columns. Custom conversion function can be passed to these formatting functions. For example, to remove extra spaces surrounding the content of a cell, a custom function is required.

Filtering functions are used to reduce the information contained in the array.

`__init__` (*sheet=None, name='pyexcel sheet', name_columns_by_row=-1, name_rows_by_column=-1, colnames=None, rownames=None, transpose_before=False, transpose_after=False*)
 Constructor

Parameters

- **sheet** – two dimensional array
- **name** – this becomes the sheet name.
- **name_columns_by_row** – use a row to name all columns
- **name_rows_by_column** – use a column to name all rows
- **colnames** – use an external list of strings to name the columns
- **rownames** – use an external list of strings to name the rows

Methods

<code>__init__</code> ([sheet, name, name_columns_by_row, ...])	Constructor
<code>add_filter</code> (<i>afilter</i>)	Apply a filter
<code>add_formatter</code> (<i>aformatter</i>)	Add a lazy formatter.
<code>apply_formatter</code> (<i>aformatter</i>)	Apply the formatter immediately
<code>cell_value</code> (<i>row, column[, new_value]</i>)	Random access to table cells
<code>clear_filters</code> ()	Clears all filters
<code>clear_formatters</code> ()	Clear all formatters
<code>column_at</code> (<i>index</i>)	Gets the data at the specified column
<code>column_range</code> ()	Utility function to get column range
<code>columns</code> ()	Returns a left to right column iterator
<code>contains</code> (<i>predicate</i>)	Has something in the table
<code>cut</code> (<i>topleft_corner, bottomright_corner</i>)	Get a rectangle shaped data out and clear them in position
<code>delete_columns</code> (<i>column_indices</i>)	Delete one or more columns
<code>delete_named_column_at</code> (<i>name</i>)	Works only after you named columns by a row
<code>delete_named_row_at</code> (<i>name</i>)	Take the first column as row names
<code>delete_rows</code> (<i>row_indices</i>)	Delete one or more rows
<code>enumerate</code> ()	Iterate cell by cell from top to bottom and from left to right
<code>extend_columns</code> (<i>columns</i>)	Take ordereddict to extend named columns
<code>extend_columns_with_rows</code> (<i>rows</i>)	Put rows on the right most side of the data
<code>extend_rows</code> (<i>rows</i>)	Take ordereddict to extend named rows
<code>filter</code> ([<i>column_indices, row_indices</i>])	Apply the filter with immediate effect
<code>format</code> (<i>formatter</i>)	Apply a formatting action for the whole sheet
<code>freeze_filters</code> ()	Apply all filters and delete them
<code>freeze_formatters</code> ()	Apply all added formatters and clear them
<code>get_array</code> (** <i>keywords</i>)	Get data in array format
<code>get_csv</code> (** <i>keywords</i>)	Get data in csv format
<code>get_csvz</code> (** <i>keywords</i>)	Get data in csvz format
<code>get_dict</code> (** <i>keywords</i>)	Get data in dict format
<code>get_grid</code> (** <i>keywords</i>)	Get data in grid format
<code>get_html</code> (** <i>keywords</i>)	Get data in html format
<code>get_json</code> (** <i>keywords</i>)	Get data in json format
<code>get_latex</code> (** <i>keywords</i>)	Get data in latex format

Continued on next page

Table 8.11 – continued from previous page

<code>get_latex_booktabs(**keywords)</code>	Get data in latex_booktabs format
<code>get_mediawiki(**keywords)</code>	Get data in mediawiki format
<code>get_ods(**keywords)</code>	Get data in ods format
<code>get_orgtbl(**keywords)</code>	Get data in orgtbl format
<code>get_pipe(**keywords)</code>	Get data in pipe format
<code>get_plain(**keywords)</code>	Get data in plain format
<code>get_records(**keywords)</code>	Get data in records format
<code>get_rst(**keywords)</code>	Get data in rst format
<code>get_simple(**keywords)</code>	Get data in simple format
<code>get_texttable(**keywords)</code>	Get data in texttable format
<code>get_tsv(**keywords)</code>	Get data in tsv format
<code>get_tsvz(**keywords)</code>	Get data in tsvz format
<code>get_url(**keywords)</code>	url getter is not defined.
<code>get_xls(**keywords)</code>	Get data in xls format
<code>get_xlsm(**keywords)</code>	Get data in xlsm format
<code>get_xlsx(**keywords)</code>	Get data in xlsx format
<code>init([sheet, name, name_columns_by_row, ...])</code>	custom initialization functions
<code>map(custom_function)</code>	Execute a function across all cells of the sheet
<code>name_columns_by_row(row_index)</code>	Use the elements of a specified row to represent individual columns
<code>name_rows_by_column(column_index)</code>	Use the elements of a specified column to represent individual rows
<code>named_column_at(name)</code>	Get a column by its name
<code>named_columns()</code>	
<code>named_row_at(name)</code>	Get a row by its name
<code>named_rows()</code>	
<code>number_of_columns()</code>	The number of columns
<code>number_of_rows()</code>	The number of rows
<code>paste(topleft_corner[, rows, columns])</code>	Paste a rectangle shaped data after a position
<code>rcolumns()</code>	Returns a right to left column iterator
<code>region(topleft_corner, bottomright_corner)</code>	Get a rectangle shaped data out
<code>register_input(file_type[, instance_name])</code>	partial(func, *args, **keywords) - new function with partial application
<code>register_io(file_type[, presenter_func, ...])</code>	partial(func, *args, **keywords) - new function with partial application
<code>register_presentation(file_type[, ...])</code>	
<code>remove_filter(afilter)</code>	Remove a named filter
<code>remove_formatter(aformatter)</code>	Remove a formatter
<code>reverse()</code>	Opposite to enumerate
<code>row_at(index)</code>	Gets the data at the specified row
<code>row_range()</code>	Utility function to get row range
<code>rows()</code>	Returns a top to bottom row iterator
<code>rrows()</code>	Returns a bottom to top row iterator
<code>rvertical()</code>	Default iterator to go through each cell one by one from rightmost
<code>save_as(filename, **keywords)</code>	Save the content to a named file
<code>save_to_database(session, table[, ...])</code>	Save data in sheet to database table
<code>save_to_django_model(model[, initializer, ...])</code>	Save to database table through django model
<code>save_to_memory(file_type[, stream])</code>	Save the content to memory
<code>set_array(content, **keywords)</code>	Set data in array format
<code>set_column_at(column_index, data_array[, ...])</code>	Updates a column data range
<code>set_csv(content, **keywords)</code>	Set data in csv format
<code>set_csvz(content, **keywords)</code>	Set data in csvz format
<code>set_dict(content, **keywords)</code>	Set data in dict format
<code>set_grid(content, **keywords)</code>	grid setter is not defined.

Continued on next page

Table 8.11 – continued from previous page

<code>set_html(content, **keywords)</code>	html setter is not defined.
<code>set_json(content, **keywords)</code>	json setter is not defined.
<code>set_latex(content, **keywords)</code>	latex setter is not defined.
<code>set_latex_booktabs(content, **keywords)</code>	latex_booktabs setter is not defined.
<code>set_mediawiki(content, **keywords)</code>	mediawiki setter is not defined.
<code>set_named_column_at(name, column_array)</code>	Take the first row as column names
<code>set_named_row_at(name, row_array)</code>	Take the first column as row names
<code>set_ods(content, **keywords)</code>	Set data in ods format
<code>set Orgtbl(content, **keywords)</code>	Orgtbl setter is not defined.
<code>set_pipe(content, **keywords)</code>	pipe setter is not defined.
<code>set_plain(content, **keywords)</code>	plain setter is not defined.
<code>set_records(content, **keywords)</code>	Set data in records format
<code>set_row_at(row_index, data_array)</code>	Update a row data range
<code>set_rst(content, **keywords)</code>	rst setter is not defined.
<code>set_simple(content, **keywords)</code>	simple setter is not defined.
<code>set_texttable(content, **keywords)</code>	texttable setter is not defined.
<code>set_tsv(content, **keywords)</code>	Set data in tsv format
<code>set_tsvz(content, **keywords)</code>	Set data in tsvz format
<code>set_url(content, **keywords)</code>	Set data in url format
<code>set_xls(content, **keywords)</code>	Set data in xls format
<code>set_xlsm(content, **keywords)</code>	Set data in xlsm format
<code>set_xlsx(content, **keywords)</code>	Set data in xlsx format
<code>to_array()</code>	Returns an array after filtering
<code>to_dict([row])</code>	Returns a dictionary
<code>to_records([custom_headers])</code>	Make an array of dictionaries
<code>transpose()</code>	Rotate the data table by 90 degrees
<code>validate_filters()</code>	Re-apply filters
<code>vertical()</code>	Default iterator to go through each cell one by one from

Attributes

<code>array</code>	Get/Set data in/from array format
<code>colnames</code>	Return column names
<code>content</code>	Plain representation without headers
<code>csv</code>	Get/Set data in/from csv format
<code>csvz</code>	Get/Set data in/from csvz format
<code>dict</code>	Get/Set data in/from dict format
<code>grid</code>	Get data in grid format
<code>html</code>	Get data in html format
<code>json</code>	Get data in json format
<code>latex</code>	Get data in latex format
<code>latex_booktabs</code>	Get data in latex_booktabs format
<code>mediawiki</code>	Get data in mediawiki format
<code>ods</code>	Get/Set data in/from ods format
<code>Orgtbl</code>	Get data in Orgtbl format
<code>pipe</code>	Get data in pipe format
<code>plain</code>	Get data in plain format
<code>records</code>	Get/Set data in/from records format
<code>rownames</code>	Return row names

Continued on next page

Table 8.12 – continued from previous page

<i>rst</i>	Get data in rst format
<i>simple</i>	Get data in simple format
<i>texttable</i>	Get data in texttable format
<i>tsv</i>	Get/Set data in/from tsv format
<i>tsvz</i>	Get/Set data in/from tsvz format
<i>url</i>	Set data in url format
<i>xls</i>	Get/Set data in/from xls format
<i>xlsm</i>	Get/Set data in/from xlsm format
<i>xlsx</i>	Get/Set data in/from xlsx format

Attributes

<i>Sheet.content</i>	Plain representation without headers
<i>Sheet.number_of_rows()</i>	The number of rows
<i>Sheet.number_of_columns()</i>	The number of columns
<i>Sheet.row_range()</i>	Utility function to get row range
<i>Sheet.column_range()</i>	Utility function to get column range

pyexcel.Sheet.content

Sheet.content

Plain representation without headers

pyexcel.Sheet.number_of_rows

Sheet.number_of_rows()

The number of rows

pyexcel.Sheet.number_of_columns

Sheet.number_of_columns()

The number of columns

pyexcel.Sheet.row_range

Sheet.row_range()

Utility function to get row range

pyexcel.Sheet.column_range

Sheet.column_range()

Utility function to get column range

Iteration

<code>Sheet.rows()</code>	Returns a top to bottom row iterator
<code>Sheet.rrows()</code>	Returns a bottom to top row iterator
<code>Sheet.columns()</code>	Returns a left to right column iterator
<code>Sheet.rcolumns()</code>	Returns a right to left column iterator
<code>Sheet.enumerate()</code>	Iterate cell by cell from top to bottom and from left to right
<code>Sheet.reverse()</code>	Opposite to enumerate
<code>Sheet.vertical()</code>	Default iterator to go through each cell one by one from
<code>Sheet.rvertical()</code>	Default iterator to go through each cell one by one from rightmost

pyexcel.Sheet.rows

`Sheet.rows()`

Returns a top to bottom row iterator

example:

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(pe.utils.to_array(m.rows()))
```

output:

```
[[1, 2, 3, 4], [5, 6, 7, 8], [9, 10, 11, 12]]
```

More details see `RowIterator`

pyexcel.Sheet.rrows

`Sheet.rrows()`

Returns a bottom to top row iterator

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(pe.utils.to_array(m.rrows()))
```

```
[[9, 10, 11, 12], [5, 6, 7, 8], [1, 2, 3, 4]]
```

More details see `RowReverseIterator`

pyexcel.Sheet.columns

`Sheet.columns()`

Returns a left to right column iterator

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(list(m.columns()))
```

```
[[1, 5, 9], [2, 6, 10], [3, 7, 11], [4, 8, 12]]
```

More details see `ColumnIterator`

pyexcel.Sheet.rcolumns

Sheet.`rcolumns`()

Returns a right to left column iterator

example:

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(pe.utils.to_array(m.rcolumns()))
```

output:

```
[[4, 8, 12], [3, 7, 11], [2, 6, 10], [1, 5, 9]]
```

More details see `ColumnReverseIterator`

pyexcel.Sheet.enumerate

Sheet.`enumerate`()

Iterate cell by cell from top to bottom and from left to right

```
>>> import pyexcel as pe
>>> data = [
...     [1, 2, 3, 4],
...     [5, 6, 7, 8],
...     [9, 10, 11, 12]
... ]
>>> m = pe.sheets.Matrix(data)
>>> print(list(m.enumerate()))
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]
```

More details see `HTLBRIterator`

pyexcel.Sheet.reverse

Sheet.`reverse`()

Opposite to `enumerate`

each cell one by one from bottom row to top row and from right to left example:

```
>>> import pyexcel as pe
>>> data = [
...     [1, 2, 3, 4],
...     [5, 6, 7, 8],
...     [9, 10, 11, 12]
... ]
>>> m = pe.sheets.Matrix(data)
>>> print(list(m.reverse()))
[12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
```

More details see `HBRTLIterator`

`pyexcel.Sheet.vertical`

`Sheet.vertical()`

Default iterator to go through each cell one by one from leftmost column to rightmost row and from top to bottom example:

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(list(m.vertical()))
```

output:

```
[1, 5, 9, 2, 6, 10, 3, 7, 11, 4, 8, 12]
```

More details see `VTLBRIterator`

`pyexcel.Sheet.rvertical`

`Sheet.rvertical()`

Default iterator to go through each cell one by one from rightmost column to leftmost row and from bottom to top example:

```
import pyexcel as pe
data = [
    [1, 2, 3, 4],
    [5, 6, 7, 8],
    [9, 10, 11, 12]
]
m = pe.Matrix(data)
print(pe.utils.to_array(m.rvertical()))
```

output:

```
[12, 8, 4, 11, 7, 3, 10, 6, 2, 9, 5, 1]
```

More details see `VBRTLIterator`

Cell access

<code>Sheet.cell_value(row, column[, new_value])</code>	Random access to table cells
<code>Sheet.__getitem__(aset)</code>	

pyexcel.Sheet.cell_value

`Sheet.cell_value` (*row*, *column*, *new_value=None*)
Random access to table cells

Parameters

- **row** (*int*) – row index which starts from 0
- **column** (*int*) – column index which starts from 0
- **new_value** (*any*) – new value if this is to set the value

pyexcel.Sheet.__getitem__

`Sheet.__getitem__` (*aset*)

Row access

<code>Sheet.row_at(index)</code>	Gets the data at the specified row
<code>Sheet.set_row_at(row_index, data_array)</code>	Update a row data range
<code>Sheet.delete_rows(row_indices)</code>	Delete one or more rows
<code>Sheet.extend_rows(rows)</code>	Take ordereddict to extend named rows

pyexcel.Sheet.row_at

`Sheet.row_at` (*index*)
Gets the data at the specified row

pyexcel.Sheet.set_row_at

`Sheet.set_row_at` (*row_index*, *data_array*)
Update a row data range

pyexcel.Sheet.delete_rows

`Sheet.delete_rows` (*row_indices*)
Delete one or more rows

Parameters `row_indices` (*list*) – a list of row indices

pyexcel.Sheet.extend_rows

Sheet.**extend_rows** (*rows*)

Take ordereddict to extend named rows

Parameters *rows* (*ordereddict/list*) – a list of rows.

Column access

<i>Sheet.column_at</i> (<i>index</i>)	Gets the data at the specified column
<i>Sheet.set_column_at</i> (<i>column_index</i> , <i>data_array</i>)	Updates a column data range
<i>Sheet.delete_columns</i> (<i>column_indices</i>)	Delete one or more columns
<i>Sheet.extend_columns</i> (<i>columns</i>)	Take ordereddict to extend named columns

pyexcel.Sheet.column_at

Sheet.**column_at** (*index*)

Gets the data at the specified column

pyexcel.Sheet.set_column_at

Sheet.**set_column_at** (*column_index*, *data_array*, *starting=0*)

Updates a column data range

It works like this if the call is: `set_column_at(2, ['N','N', 'N'], 1)`:

```

+--> column_index = 2
|
A B C
1 3 N <- starting = 1
2 4 N
    
```

This function will not set element outside the current table range

Parameters

- **column_index** (*int*) – which column to be modified
- **data_array** (*list*) – one dimensional array
- **starting** (*int*) – from which index, the update happens

Raises **IndexError** – if *column_index* exceeds column range or *starting* exceeds row range

pyexcel.Sheet.delete_columns

Sheet.**delete_columns** (*column_indices*)

Delete one or more columns

Parameters **column_indices** (*list*) – a list of column indices

pyexcel.Sheet.extend_columns

Sheet.**extend_columns** (*columns*)

Take ordereddict to extend named columns

Parameters *columns* (*orderreddist/list*) – a list of columns

Data series

Any column as row name

<i>Sheet.name_columns_by_row</i> (row_index)	Use the elements of a specified row to represent individual columns
<i>Sheet.rownames</i>	Return row names
<i>Sheet.named_column_at</i> (name)	Get a column by its name
<i>Sheet.set_named_column_at</i> (name, column_array)	Take the first row as column names
<i>Sheet.delete_named_column_at</i> (name)	Works only after you named columns by a row

pyexcel.Sheet.name_columns_by_row

Sheet.**name_columns_by_row** (*row_index*)

Use the elements of a specified row to represent individual columns

The specified row will be deleted from the data :param int row_index: the index of the row that has the column names

pyexcel.Sheet.rownames

Sheet.**rownames**

Return row names

pyexcel.Sheet.named_column_at

Sheet.**named_column_at** (*name*)

Get a column by its name

pyexcel.Sheet.set_named_column_at

Sheet.**set_named_column_at** (*name, column_array*)

Take the first row as column names

Given name to identify the column index, set the column to the given array except the column name.

pyexcel.Sheet.delete_named_column_at

Sheet.**delete_named_column_at** (*name*)

Works only after you named columns by a row

Given name to identify the column index, set the column to the given array except the column name. :param str name: a column name

Any row as column name

<i>Sheet.name_rows_by_column</i> (column_index)	Use the elements of a specified column to represent individual rows
---	---

Continued on next page

Table 8.19 – continued from previous page

<i>Sheet.colnames</i>	Return column names
<i>Sheet.named_row_at</i> (name)	Get a row by its name
<i>Sheet.set_named_row_at</i> (name, row_array)	Take the first column as row names
<i>Sheet.delete_named_row_at</i> (name)	Take the first column as row names

pyexcel.Sheet.name_rows_by_column

Sheet.**name_rows_by_column** (*column_index*)

Use the elements of a specified column to represent individual rows

The specified column will be deleted from the data :param int column_index: the index of the column that has the row names

pyexcel.Sheet.colnames

Sheet.**colnames**

Return column names

pyexcel.Sheet.named_row_at

Sheet.**named_row_at** (*name*)

Get a row by its name

pyexcel.Sheet.set_named_row_at

Sheet.**set_named_row_at** (*name, row_array*)

Take the first column as row names

Given name to identify the row index, set the row to the given array except the row name.

pyexcel.Sheet.delete_named_row_at

Sheet.**delete_named_row_at** (*name*)

Take the first column as row names

Given name to identify the row index, set the row to the given array except the row name.

Conversion

<i>Sheet.array</i>	Get/Set data in/from array format
<i>Sheet.records</i>	Get/Set data in/from records format
<i>Sheet.dict</i>	Get/Set data in/from dict format
<i>Sheet.url</i>	Set data in url format
<i>Sheet.csv</i>	Get/Set data in/from csv format
<i>Sheet.tsv</i>	Get/Set data in/from tsv format
<i>Sheet.csvz</i>	Get/Set data in/from csvz format
<i>Sheet.tsvz</i>	Get/Set data in/from tszv format
<i>Sheet.xls</i>	Get/Set data in/from xls format
<i>Sheet.xlsx</i>	Get/Set data in/from xlsx format
<i>Sheet.ods</i>	Get/Set data in/from ods format
<i>Sheet.plain</i>	Get data in plain format
<i>Sheet.simple</i>	Get data in simple format
<i>Sheet.grid</i>	Get data in grid format

Continued on next page

Table 8.20 – continued from previous page

<i>Sheet.pipe</i>	Get data in pipe format
<i>Sheet.orgtbl</i>	Get data in orgtbl format
<i>Sheet.rst</i>	Get data in rst format
<i>Sheet.mediawiki</i>	Get data in mediawiki format
<i>Sheet.latex</i>	Get data in latex format
<i>Sheet.latex_booktabs</i>	Get data in latex_booktabs format
<i>Sheet.json</i>	Get data in json format
<i>Sheet.html</i>	Get data in html format

pyexcel.Sheet.array**Sheet.array**

Get/Set data in/from array format

You could obtain content in array format by dot notation:

```
Sheet.array
```

And you could as well set content by dot notation:

```
Sheet.array = the_io_stream_in_array_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_array(**keywords)
Sheet.set_array(the_io_stream_in_array_format, **keywords)
```

pyexcel.Sheet.records**Sheet.records**

Get/Set data in/from records format

You could obtain content in records format by dot notation:

```
Sheet.records
```

And you could as well set content by dot notation:

```
Sheet.records = the_io_stream_in_records_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_records(**keywords)
Sheet.set_records(the_io_stream_in_records_format, **keywords)
```

pyexcel.Sheet.dict**Sheet.dict**

Get/Set data in/from dict format

You could obtain content in dict format by dot notation:

```
Sheet.dict
```

And you could as well set content by dot notation:

```
Sheet.dict = the_io_stream_in_dict_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_dict(**keywords)
Sheet.set_dict(the_io_stream_in_dict_format, **keywords)
```

pyexcel.Sheet.url

Sheet.**.url**

Set data in url format

You could set content in url format by dot notation:

```
Sheet.url
```

if you need to pass on more parameters, you could use:

```
Sheet.set_url(the_io_stream_in_url_format, **keywords)
```

pyexcel.Sheet.csv

Sheet.**.csv**

Get/Set data in/from csv format

You could obtain content in csv format by dot notation:

```
Sheet.csv
```

And you could as well set content by dot notation:

```
Sheet.csv = the_io_stream_in_csv_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_csv(**keywords)
Sheet.set_csv(the_io_stream_in_csv_format, **keywords)
```

pyexcel.Sheet.tsv

Sheet.**.tsv**

Get/Set data in/from tsv format

You could obtain content in tsv format by dot notation:

```
Sheet.tsv
```

And you could as well set content by dot notation:

```
Sheet.tsv = the_io_stream_in_tsv_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_tsv(**keywords)
Sheet.set_tsv(the_io_stream_in_tsv_format, **keywords)
```

pyexcel.Sheet.csvz

Sheet.csvz

Get/Set data in/from csvz format

You could obtain content in csvz format by dot notation:

```
Sheet.csvz
```

And you could as well set content by dot notation:

```
Sheet.csvz = the_io_stream_in_csvz_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_csvz(**keywords)
Sheet.set_csvz(the_io_stream_in_csvz_format, **keywords)
```

pyexcel.Sheet.tsvz

Sheet.tsvz

Get/Set data in/from tsvz format

You could obtain content in tsvz format by dot notation:

```
Sheet.tsvz
```

And you could as well set content by dot notation:

```
Sheet.tsvz = the_io_stream_in_tsvz_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_tsvz(**keywords)
Sheet.set_tsvz(the_io_stream_in_tsvz_format, **keywords)
```

pyexcel.Sheet.xls

Sheet.xls

Get/Set data in/from xls format

You could obtain content in xls format by dot notation:

```
Sheet.xls
```

And you could as well set content by dot notation:

```
Sheet.xls = the_io_stream_in_xls_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_xls(**keywords)
Sheet.set_xls(the_io_stream_in_xls_format, **keywords)
```

pyexcel.Sheet.xlsx

Sheet.xlsx

Get/Set data in/from xlsx format

You could obtain content in xlsx format by dot notation:

```
Sheet.xlsx
```

And you could as well set content by dot notation:

```
Sheet.xlsx = the_io_stream_in_xlsx_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_xlsx(**keywords)
Sheet.set_xlsx(the_io_stream_in_xlsx_format, **keywords)
```

pyexcel.Sheet.ods

Sheet.ods

Get/Set data in/from ods format

You could obtain content in ods format by dot notation:

```
Sheet.ods
```

And you could as well set content by dot notation:

```
Sheet.ods = the_io_stream_in_ods_format
```

if you need to pass on more parameters, you could use:

```
Sheet.get_ods(**keywords)
Sheet.set_ods(the_io_stream_in_ods_format, **keywords)
```

pyexcel.Sheet.plain

Sheet.plain

Get data in plain format

You could obtain content in plain format by dot notation:

```
Sheet.plain
```

if you need to pass on more parameters, you could use:

```
Sheet.get_plain(**keywords)
```

pyexcel.Sheet.simple

Sheet.simple

Get data in simple format

You could obtain content in simple format by dot notation:

```
Sheet.simple
```

if you need to pass on more parameters, you could use:

```
Sheet.get_simple(**keywords)
```

pyexcel.Sheet.grid

Sheet.**grid**

Get data in grid format

You could obtain content in grid format by dot notation:

```
Sheet.grid
```

if you need to pass on more parameters, you could use:

```
Sheet.get_grid(**keywords)
```

pyexcel.Sheet.pipe

Sheet.**pipe**

Get data in pipe format

You could obtain content in pipe format by dot notation:

```
Sheet.pipe
```

if you need to pass on more parameters, you could use:

```
Sheet.get_pipe(**keywords)
```

pyexcel.Sheet.orgtbl

Sheet.**orgtbl**

Get data in orgtbl format

You could obtain content in orgtbl format by dot notation:

```
Sheet.orgtbl
```

if you need to pass on more parameters, you could use:

```
Sheet.get_orgtbl(**keywords)
```

pyexcel.Sheet.rst

Sheet.**rst**

Get data in rst format

You could obtain content in rst format by dot notation:

```
Sheet.rst
```

if you need to pass on more parameters, you could use:

```
Sheet.get_rst(**keywords)
```

pyexcel.Sheet.mediawiki

Sheet.mediawiki

Get data in mediawiki format

You could obtain content in mediawiki format by dot notation:

```
Sheet.mediawiki
```

if you need to pass on more parameters, you could use:

```
Sheet.get_mediawiki(**keywords)
```

pyexcel.Sheet.latex

Sheet.latex

Get data in latex format

You could obtain content in latex format by dot notation:

```
Sheet.latex
```

if you need to pass on more parameters, you could use:

```
Sheet.get_latex(**keywords)
```

pyexcel.Sheet.latex_booktabs

Sheet.latex_booktabs

Get data in latex_booktabs format

You could obtain content in latex_booktabs format by dot notation:

```
Sheet.latex_booktabs
```

if you need to pass on more parameters, you could use:

```
Sheet.get_latex_booktabs(**keywords)
```

pyexcel.Sheet.json

Sheet.json

Get data in json format

You could obtain content in json format by dot notation:

```
Sheet.json
```

if you need to pass on more parameters, you could use:

```
Sheet.get_json(**keywords)
```


pyexcel.Sheet.html**Sheet.html**

Get data in html format

You could obtain content in html format by dot notation:

```
Sheet.html
```

if you need to pass on more parameters, you could use:

```
Sheet.get_html(**keywords)
```

Formatting

<i>Sheet.format</i> (formatter)	Apply a formatting action for the whole sheet
<i>Sheet.apply_formatter</i> (aformatter)	Apply the formatter immediately

pyexcel.Sheet.format**Sheet.format** (formatter)

Apply a formatting action for the whole sheet

Example:

```
>>> import pyexcel as pe
>>> # Given a dictionary as the following
>>> data = {
...     "1": [1, 2, 3, 4, 5, 6, 7, 8],
...     "3": [1.25, 2.2, 3.3, 4.4, 5.5, 6.6, 7.7, 8.8],
...     "5": [2, 3, 4, 5, 6, 7, 8, 9],
...     "7": [1, '', ]
...     }
>>> sheet = pe.get_sheet(adict=data)
>>> sheet.row[1]
[1, 1.25, 2, 1]
>>> sheet.format(str)
>>> sheet.row[1]
['1', '1.25', '2', '1']
>>> sheet.format(int)
>>> sheet.row[1]
[1, 1, 2, 1]
```

pyexcel.Sheet.apply_formatter**Sheet.apply_formatter** (aformatter)

Apply the formatter immediately

Filtering

<i>Sheet.filter</i> ([column_indices, row_indices])	Apply the filter with immediate effect
---	--

pyexcel.Sheet.filter

Sheet.**filter** (*column_indices=None, row_indices=None*)
 Apply the filter with immediate effect

Transformation

<code>Sheet.transpose()</code>	Rotate the data table by 90 degrees
<code>Sheet.map(custom_function)</code>	Execute a function across all cells of the sheet
<code>Sheet.region(topleft_corner, bottomright_corner)</code>	Get a rectangle shaped data out
<code>Sheet.cut(topleft_corner, bottomright_corner)</code>	Get a rectangle shaped data out and clear them in position
<code>Sheet.paste(topleft_corner[, rows, columns])</code>	Paste a rectangle shaped data after a position

pyexcel.Sheet.transpose

Sheet.**transpose** ()
 Rotate the data table by 90 degrees
 Reference `transpose()`

pyexcel.Sheet.map

Sheet.**map** (*custom_function*)
 Execute a function across all cells of the sheet

Example:

```
>>> import pyexcel as pe
>>> # Given a dictionary as the following
>>> data = {
...     "1": [1, 2, 3, 4, 5, 6, 7, 8],
...     "3": [1.25, 2.2, 3.3, 4.4, 5.5, 6.6, 7.7, 8.8],
...     "5": [2, 3, 4, 5, 6, 7, 8, 9],
...     "7": [1, '', ]
... }
>>> sheet = pe.get_sheet(adict=data)
>>> sheet.row[1]
[1, 1.25, 2, 1]
>>> inc = lambda value: (float(value) if value != '' else 0)+1
>>> sheet.map(inc)
>>> sheet.row[1]
[2.0, 2.25, 3.0, 2.0]
```

pyexcel.Sheet.region

Sheet.**region** (*topleft_corner, bottomright_corner*)
 Get a rectangle shaped data out

Parameters

- **topleft_corner** (*slice*) – the top left corner of the rectangle
- **bottomright_corner** (*slice*) – the bottom right corner of the rectangle

pyexcel.Sheet.cutSheet **.cut** (*topleft_corner*, *bottomright_corner*)

Get a rectangle shaped data out and clear them in position

Parameters

- **topleft_corner** (*slice*) – the top left corner of the rectangle
- **bottomright_corner** (*slice*) – the bottom right corner of the rectangle

pyexcel.Sheet.pasteSheet **.paste** (*topleft_corner*, *rows=None*, *columns=None*)

Paste a rectangle shaped data after a position

Parameters **topleft_corner** (*slice*) – the top left corner of the rectangle

example:

```

>>> import pyexcel as pe
>>> data = [
...     # 0 1 2 3 4 5 6
...     [1, 2, 3, 4, 5, 6, 7], # 0
...     [21, 22, 23, 24, 25, 26, 27],
...     [31, 32, 33, 34, 35, 36, 37],
...     [41, 42, 43, 44, 45, 46, 47],
...     [51, 52, 53, 54, 55, 56, 57] # 4
... ]
>>> s = pe.Sheet(data)
>>> # cut 1<= row < 4, 1<= column < 5
>>> data = s.cut([1, 1], [4, 5])
>>> s.paste([4,6], rows=data)
>>> s
pyexcel sheet:
+---+---+---+---+---+---+---+---+---+---+
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 21 |   |   |   |   | 26 | 27 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 31 |   |   |   |   | 36 | 37 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 41 |   |   |   |   | 46 | 47 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 51 | 52 | 53 | 54 | 55 | 56 | 22 | 23 | 24 | 25 |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   | 32 | 33 | 34 | 35 |
+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   | 42 | 43 | 44 | 45 |
+---+---+---+---+---+---+---+---+---+---+
>>> s.paste([6,9], columns=data)
>>> s
pyexcel sheet:
+---+---+---+---+---+---+---+---+---+---+
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 21 |   |   |   |   | 26 | 27 |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+
| 31 |   |   |   |   | 36 | 37 |   |   |   |   |

```

41					46	47						
51	52	53	54	55	56	22	23	24	25			
						32	33	34	35			
						42	43	44	22	32	42	
									23	33	43	
									24	34	44	
									25	35	45	

Save changes

<code>Sheet.save_as(filename, **keywords)</code>	Save the content to a named file
<code>Sheet.save_to_memory(file_type[, stream])</code>	Save the content to memory
<code>Sheet.save_to_database(session, table[, ...])</code>	Save data in sheet to database table

pyexcel.Sheet.save_as

`Sheet.save_as(filename, **keywords)`

Save the content to a named file

Keywords may vary depending on your file type, because the associated file type employs different library.

for csv, `fmtparams` are accepted

for xls, 'auto_detect_int', 'encoding' and 'style_compression' are supported

for ods, 'auto_detect_int' is supported

pyexcel.Sheet.save_to_memory

`Sheet.save_to_memory(file_type, stream=None, **keywords)`

Save the content to memory

Parameters

- **file_type** (*str*) – any value of 'csv', 'tsv', 'csvz', 'tsvz', 'xls', 'xlsm', 'xlsm', 'ods'
- **stream** (*iostream*) – the memory stream to be written to. Note in Python 3, for csv and tsv format, please pass an instance of StringIO. For xls, xlsx, and ods, an instance of BytesIO.

pyexcel.Sheet.save_to_database

`Sheet.save_to_database(session, table, initializer=None, mapdict=None, auto_commit=True)`

Save data in sheet to database table

Parameters

- **session** – database session
- **table** – a database table
- **initializer** – a initialization functions for your table
- **mapdict** – custom map dictionary for your data columns
- **auto_commit** – by default, data is committed.

8.2 Internal API reference

This is intended for developers and hackers of pyexcel.

8.2.1 Data sheet representation

In inheritance order from parent to child

Matrix(array) The internal representation of a sheet data.

pyexcel.sheets.Matrix

class pyexcel.sheets.**Matrix** (array)

The internal representation of a sheet data. Each element can be of any python types

__init__ (array)
 Constructor

The reason a deep copy was not made here is because the data sheet could be huge. It could be costly to copy every cell to a new memory area :param list array: a list of arrays

Methods

<code>__init__(array)</code>	Constructor
<code>add_filter(afilter)</code>	Apply a filter
<code>add_formatter(aformatter)</code>	Add a lazy formatter.
<code>apply_formatter(aformatter)</code>	Apply the formatter immediately
<code>cell_value(row, column[, new_value])</code>	Random access to table cells
<code>clear_filters()</code>	Clears all filters
<code>clear_formatters()</code>	Clear all formatters
<code>column_at(index)</code>	Gets the data at the specified column
<code>column_range()</code>	Utility function to get column range
<code>columns()</code>	Returns a left to right column iterator
<code>contains(predicate)</code>	Has something in the table
<code>cut(topleft_corner, bottomright_corner)</code>	Get a rectangle shaped data out and clear them in position
<code>delete_columns(column_indices)</code>	Delete columns by specified list of indices
<code>delete_rows(row_indices)</code>	Deletes specified row indices
<code>enumerate()</code>	Iterate cell by cell from top to bottom and from left to right
<code>extend_columns(columns)</code>	Inserts two dimensional data after the rightmost column
<code>extend_columns_with_rows(rows)</code>	Rows were appended to the rightmost side

Continued on next page

Table 8.26 – continued from previous page

<code>extend_rows(rows)</code>	Inserts two dimensional data after the bottom row
<code>filter([column_indices, row_indices])</code>	Apply the filter with immediate effect
<code>format(formatter)</code>	Apply a formatting action for the whole sheet
<code>freeze_filters()</code>	Apply all filters and delete them
<code>freeze_formatters()</code>	Apply all added formatters and clear them
<code>map(custom_function)</code>	Execute a function across all cells of the sheet
<code>number_of_columns()</code>	The number of columns
<code>number_of_rows()</code>	The number of rows
<code>paste(topleft_corner[, rows, columns])</code>	Paste a rectangle shaped data after a position
<code>rcolumns()</code>	Returns a right to left column iterator
<code>region(topleft_corner, bottomright_corner)</code>	Get a rectangle shaped data out
<code>remove_filter(afilter)</code>	Remove a named filter
<code>remove_formatter(aformatter)</code>	Remove a formatter
<code>reverse()</code>	Opposite to enumerate
<code>row_at(index)</code>	Gets the data at the specified row
<code>row_range()</code>	Utility function to get row range
<code>rows()</code>	Returns a top to bottom row iterator
<code>rrows()</code>	Returns a bottom to top row iterator
<code>rvertical()</code>	Default iterator to go through each cell one by one from rightmost
<code>set_column_at(column_index, data_array[, ...])</code>	Updates a column data range
<code>set_row_at(row_index, data_array)</code>	Update a row data range
<code>to_array()</code>	Get an array out
<code>transpose()</code>	Rotate the data table by 90 degrees
<code>validate_filters()</code>	Re-apply filters
<code>vertical()</code>	Default iterator to go through each cell one by one from

<code>SheetStream(name, payload)</code>	Memory efficient sheet representation
<code>BookStream([sheets, filename, path])</code>	Memory efficient book representation

pyexcel.generators.SheetStream

class `pyexcel.generators.SheetStream` (*name, payload*)

Memory efficient sheet representation

This class wraps around the data read from pyexcel-io. Comparing with `pyexcel.Sheet`, the instance of this class does not load all data into memory. Hence it performs better when dealing with big data.

If you would like to do custom rendering for each row of the two dimensional data, you would need to pass a row formatting/rendering function to the parameter “renderer” of pyexcel’s signature functions.

`__init__` (*name, payload*)

Methods

<code>__init__</code> (<i>name, payload</i>)	
<code>to_array</code> ()	Simply return the generator

pyexcel.generators.BookStream

class `pyexcel.generators.BookStream` (*sheets=None, filename='memory', path=None*)
Memory efficient book representation

Comparing with `pyexcel.Book`, the instance of this class uses `pyexcel.generators.SheetStream` as its internal representation of sheet objects. Because `SheetStream` does not read data into memory, it is memory efficient.

`__init__` (*sheets=None, filename='memory', path=None*)
Book constructor

Selecting a specific book according to filename extension :param OrderedDict/dict sheets: a dictionary of data :param str filename: the physical file :param str path: the relative path or absolute path :param set keywords: additional parameters to be passed on

Methods

<code>__init__</code> ([sheets, filename, path])	Book constructor
<code>load_from_sheets</code> (sheets)	Load content from existing sheets
<code>number_of_sheets</code> ()	Return the number of sheets
<code>to_dict</code> ()	Get book data structure as a dictionary

8.2.2 Row representation

<code>Row</code> (matrix)	Represent row of a matrix
---------------------------	---------------------------

pyexcel.sheets.Row

class `pyexcel.sheets.Row` (*matrix*)
Represent row of a matrix

Table 8.31:
“example.csv”

1	2	3
4	5	6
7	8	9

Above column manipulation can be performed on rows similarly. This section will not repeat the same example but show some advance usages.

```
>>> import pyexcel as pe
>>> data = [[1,2,3], [4,5,6], [7,8,9]]
>>> m = pe.sheets.Matrix(data)
>>> m.row[0:2]
[[1, 2, 3], [4, 5, 6]]
>>> m.row[0:3] = [0, 0, 0]
>>> m.row[2]
[0, 0, 0]
>>> del m.row[0:2]
>>> m.row[0]
[0, 0, 0]
```

`__init__(matrix)`

Methods

<code>__init__(matrix)</code>	
<code>format([row_index, formatter, format_specs])</code>	Format a row
<code>select(indices)</code>	Delete row indices other than specified

8.2.3 Column representation

<code>Column(matrix)</code>	Represent columns of a matrix
-----------------------------	-------------------------------

pyexcel.sheets.Column

`class pyexcel.sheets.Column(matrix)`
 Represent columns of a matrix

Table 8.34:
 “example.csv”

1	2	3
4	5	6
7	8	9

Let us manipulate the data columns on the above data matrix:

```
>>> import pyexcel as pe
>>> data = [[1,2,3], [4,5,6], [7,8,9]]
>>> m = pe.sheets.Matrix(data)
>>> m.column[0]
[1, 4, 7]
>>> m.column[2] = [0, 0, 0]
>>> m.column[2]
[0, 0, 0]
>>> del m.column[1]
>>> m.column[1]
[0, 0, 0]
>>> m.column[2]
Traceback (most recent call last):
...
IndexError
```

`__init__(matrix)`

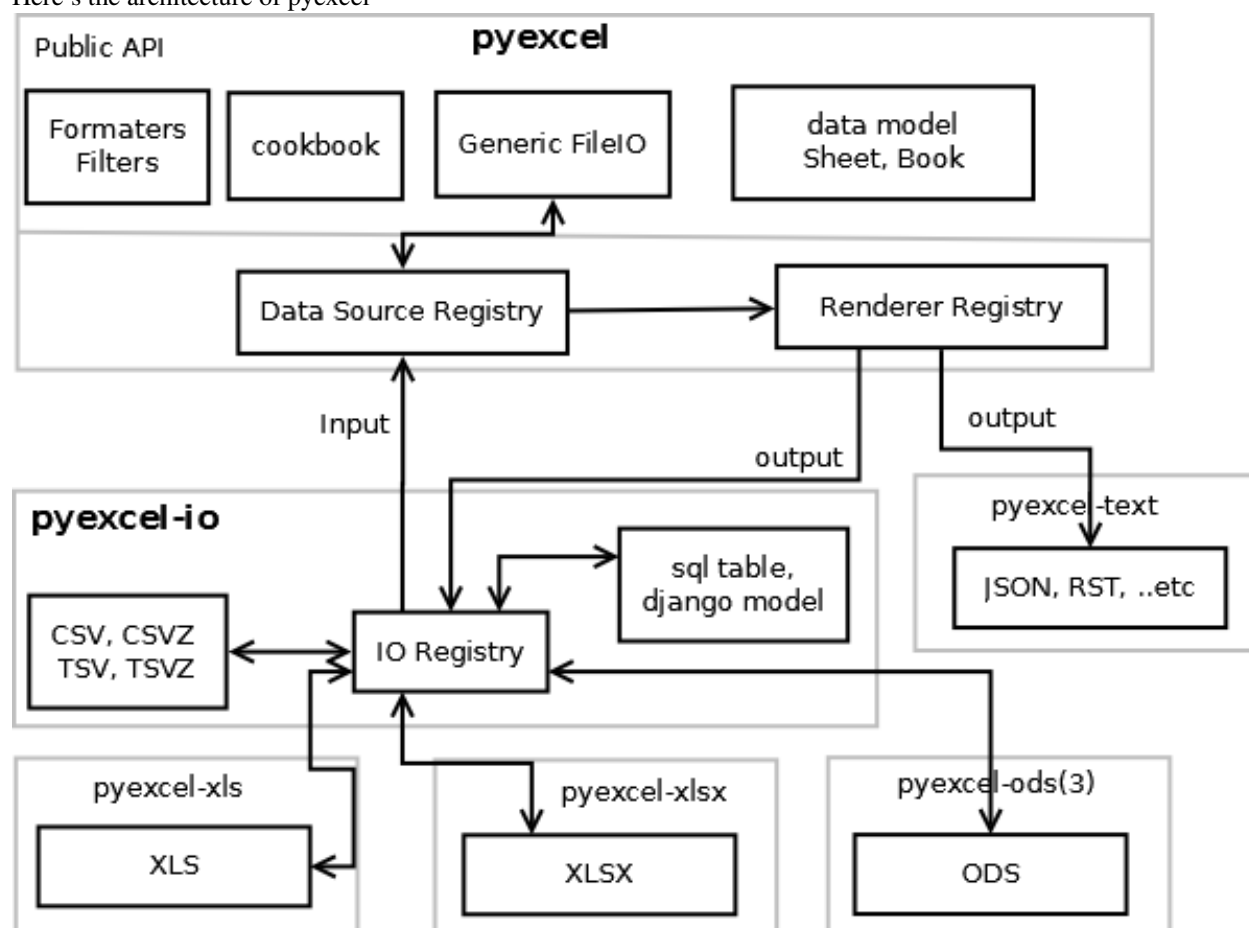
Methods

<code>__init__(matrix)</code>	
<code>format([column_index, formatter, format_specs])</code>	Format a column
<code>select(indices)</code>	Examples:

Developer's guide

9.1 Developer's guide

Here's the architecture of pyexcel



Pull requests are welcome.

Development steps for code changes

1. `git clone https://github.com/pyexcel/pyexcel.git`
2. `cd pyexcel`

Upgrade your setup tools and pip. They are needed for development and testing only:

1. `pip install --upgrade setuptools "pip==7.1"`

Then install relevant development requirements:

1. `pip install -r rnd_requirements.txt` # if such a file exists
2. `pip install -r requirements.txt`
3. `pip install -r tests/requirements.txt`

In order to update test environment, and documentation, additional setps are required:

1. `pip install moban`
2. `git clone https://github.com/pyexcel/pyexcel-commons.git`
3. make your changes in `.moban.d` directory, then issue command `moban`

9.1.1 What is `rnd_requirements.txt`

Usually, it is created when a dependent library is not released. Once the dependency is installed(will be released), the future version of the dependency in the `requirements.txt` will be valid.

9.1.2 What is `pyexcel-commons`

Many information that are shared across pyexcel projects, such as: this developer guide, license info, etc. are stored in `pyexcel-commons` project.

9.1.3 What is `.moban.d`

`.moban.d` stores the specific meta data for the library.

9.1.4 How to test your contribution

Although `nose` and `doctest` are both used in code testing, it is advisable that unit tests are put in tests. `doctest` is incorporated only to make sure the code examples in documentation remain valid across different development releases.

On Linux/Unix systems, please launch your tests like this:

```
$ make test
```

On Windows systems, please issue this command:

```
> test.bat
```

9.1.5 Acceptance criteria

1. Has fair amount of documentation
2. Has Test cases written
3. Has all code lines tested
4. Passes all Travis CI builds

5. Pythonic code please
6. Agree on NEW BSD License for your contribution

10.1 Change log

10.1.1 0.3.3 - unreleased

Updated

1. # 63: cannot display empty sheet(hence book with empty sheet) as texttable

10.1.2 0.3.2 - 2.11.2016

Updated

1. # 62: optional module import error become visible.

10.1.3 0.3.0 - 28.10.2016

Added:

1. file type setters for Sheet and Book, and its documentation
2. *iget_records* returns a generator for a list of records and should have better memory performance, especially dealing with large csv files.
3. *iget_array* returns a generator for a list of two dimensional array and should have better memory performance, especially dealing with large csv files.
4. Enable pagination support, and custom row renderer via pyexcel-io v0.2.3

Updated

1. Take *isave_as* out from *save_as*. Hence two functions are there for save a sheet as
2. # 60: encode 'utf-8' if the console is of ascii encoding.
3. # 59: custom row renderer
4. # 56: set cell value does not work
5. pyexcel.transpose becomes *pyexcel.sheets.transpose*

6. iterator functions of *pyexcel.Sheet* were converted to generator functions
 - *pyexcel.Sheet.enumerate()*
 - *pyexcel.Sheet.reverse()*
 - *pyexcel.Sheet.vertical()*
 - *pyexcel.Sheet.rvertical()*
 - *pyexcel.Sheet.rows()*
 - *pyexcel.Sheet.rrows()*
 - *pyexcel.Sheet.columns()*
 - *pyexcel.Sheet.rcolumns()*
 - *pyexcel.Sheet.named_rows()*
 - *pyexcel.Sheet.named_columns()*
7. *~pyexcel.Sheet.save_to_memory* and *~pyexcel.Book.save_to_memory* return the actual content. No longer they will return a io object hence you cannot call *getvalue()* on them.

Removed:

1. *content* and *out_file* as function parameters to the signature functions are no longer supported.
2. *SourceFactory* and *RendererFactory* are removed
3. The following methods are removed
 - *pyexcel.to_array*
 - *pyexcel.to_dict*
 - *pyexcel.utils.to_one_dimensional_array*
 - *pyexcel.dict_to_array*
 - *pyexcel.from_records*
 - *pyexcel.to_records*
4. *pyexcel.Sheet.filter* has been re-implemented and all filters were removed:
 - *pyexcel.filters.ColumnIndexFilter*
 - *pyexcel.filters.ColumnFilter*
 - *pyexcel.filters.RowFilter*
 - *pyexcel.filters.EvenColumnFilter*
 - *pyexcel.filters.OddColumnFilter*
 - *pyexcel.filters.EvenRowFilter*
 - *pyexcel.filters.OddRowFilter*
 - *pyexcel.filters.RowIndexFilter*
 - *pyexcel.filters.SingleColumnFilter*
 - *pyexcel.filters.RowValueFilter*
 - *pyexcel.filters.NamedRowValueFilter*

- *pyexcel.filters.ColumnValueFilter*
- *pyexcel.filters.NamedColumnValueFilter*
- *pyexcel.filters.SingleRowFilter*

5. the following functions have been removed

- *add_formatter*
- *remove_formatter*
- *clear_formatters*
- *freeze_formatters*
- *add_filter*
- *remove_filter*
- *clear_filters*
- *freeze_formatters*

6. *pyexcel.Sheet.filter* has been re-implemented and all filters were removed:

- *pyexcel.formatters.SheetFormatter*

10.1.4 0.2.5 - 31.08.2016

Updated:

1. # 58: `texttable` should have been made as compulsory requirement

10.1.5 0.2.4 - 14.07.2016

Updated:

1. For python 2, writing to `sys.stdout` by `pyexcel-cli` raise `IOError`.

10.1.6 0.2.3 - 11.07.2016

Updated:

1. For python 3, do not seek 0 when saving to memory if `sys.stdout` is passed on. Hence, adding support for `sys.stdin` and `sys.stdout`.

10.1.7 0.2.2 - 01.06.2016

Updated:

1. Explicit imports, no longer needed
2. Depends on latest `setuptools` 18.0.1
3. `NotImplementedError` will be raised if parameters to core functions are not supported, e.g. `get_sheet(cannot_find_me_option=)` will be thrown out as `NotImplementedError`)

10.1.8 0.2.1 - 23.04.2016

Added:

1. add pyexcel-text file types as attributes of pyexcel.Sheet and pyexcel.Book, related to [issue 31](#)
2. auto import pyexcel-text if it is pip installed

Updated:

1. code refactoring done for easy addition of sources.
2. bug fix [issue 29](#), Even if the format is a string it is displayed as a float
3. pyexcel-text is no longer a plugin to pyexcel-io but to pyexcel.sources, see [pyexcel-text issue #22](#)

Removed:

1. pyexcel.presentation is removed. No longer the internal decorate @outsource is used. related to [issue 31](#)

10.1.9 0.2.0 - 17.01.2016

Updated

1. adopt pyexcel-io yield key word to return generator as content
2. pyexcel.save_as and pyexcel.save_book_as get performance improvements

Indices and tables

- `genindex`
- `modindex`
- `search`

Symbols

[__getitem__\(\)](#) (pyexcel.Sheet method), 83
[__init__\(\)](#) (pyexcel.Book method), 66
[__init__\(\)](#) (pyexcel.Sheet method), 76
[__init__\(\)](#) (pyexcel.generators.BookStream method), 99
[__init__\(\)](#) (pyexcel.generators.SheetStream method), 98
[__init__\(\)](#) (pyexcel.sheets.Column method), 100
[__init__\(\)](#) (pyexcel.sheets.Matrix method), 97
[__init__\(\)](#) (pyexcel.sheets.Row method), 99

A

[apply_formatter\(\)](#) (pyexcel.Sheet method), 93
[array](#) (pyexcel.Sheet attribute), 87

B

[Book](#) (class in pyexcel), 66
[bookdict](#) (pyexcel.Book attribute), 69
[BookStream](#) (class in pyexcel.generators), 99

C

[cell_value\(\)](#) (pyexcel.Sheet method), 83
[colnames](#) (pyexcel.Sheet attribute), 86
[Column](#) (class in pyexcel.sheets), 100
[column_at\(\)](#) (pyexcel.Sheet method), 84
[column_range\(\)](#) (pyexcel.Sheet method), 79
[columns\(\)](#) (pyexcel.Sheet method), 80
[content](#) (pyexcel.Sheet attribute), 79
[csv](#) (pyexcel.Book attribute), 69
[csv](#) (pyexcel.Sheet attribute), 88
[csvz](#) (pyexcel.Book attribute), 70
[csvz](#) (pyexcel.Sheet attribute), 89
[cut\(\)](#) (pyexcel.Sheet method), 95

D

[delete_columns\(\)](#) (pyexcel.Sheet method), 84
[delete_named_column_at\(\)](#) (pyexcel.Sheet method), 85
[delete_named_row_at\(\)](#) (pyexcel.Sheet method), 86
[delete_rows\(\)](#) (pyexcel.Sheet method), 83
[dict](#) (pyexcel.Sheet attribute), 87

E

[enumerate\(\)](#) (pyexcel.Sheet method), 81
[extend_columns\(\)](#) (pyexcel.Sheet method), 85
[extend_rows\(\)](#) (pyexcel.Sheet method), 84
[extract_a_sheet_from_a_book\(\)](#) (in module pyexcel), 65

F

[filter\(\)](#) (pyexcel.Sheet method), 94
[format\(\)](#) (pyexcel.Sheet method), 93

G

[get_array\(\)](#) (in module pyexcel), 59
[get_book\(\)](#) (in module pyexcel), 60
[get_book_dict\(\)](#) (in module pyexcel), 60
[get_dict\(\)](#) (in module pyexcel), 59
[get_records\(\)](#) (in module pyexcel), 60
[get_sheet\(\)](#) (in module pyexcel), 61
[grid](#) (pyexcel.Book attribute), 72
[grid](#) (pyexcel.Sheet attribute), 91

H

[html](#) (pyexcel.Book attribute), 74
[html](#) (pyexcel.Sheet attribute), 93

I

[iget_array\(\)](#) (in module pyexcel), 62
[iget_records\(\)](#) (in module pyexcel), 62
[isave_as\(\)](#) (in module pyexcel), 63

J

[json](#) (pyexcel.Book attribute), 74
[json](#) (pyexcel.Sheet attribute), 92

L

[latex](#) (pyexcel.Book attribute), 73
[latex](#) (pyexcel.Sheet attribute), 92
[latex_booktabs](#) (pyexcel.Book attribute), 74
[latex_booktabs](#) (pyexcel.Sheet attribute), 92

M

map() (pyexcel.Sheet method), 94
 Matrix (class in pyexcel.sheets), 97
 mediawiki (pyexcel.Book attribute), 73
 mediawiki (pyexcel.Sheet attribute), 92
 merge_all_to_a_book() (in module pyexcel), 64
 merge_csv_to_a_book() (in module pyexcel), 64

N

name_columns_by_row() (pyexcel.Sheet method), 85
 name_rows_by_column() (pyexcel.Sheet method), 86
 named_column_at() (pyexcel.Sheet method), 85
 named_row_at() (pyexcel.Sheet method), 86
 number_of_columns() (pyexcel.Sheet method), 79
 number_of_rows() (pyexcel.Sheet method), 79
 number_of_sheets() (pyexcel.Book method), 68

O

ods (pyexcel.Book attribute), 71
 ods (pyexcel.Sheet attribute), 90
 orgtbl (pyexcel.Book attribute), 73
 orgtbl (pyexcel.Sheet attribute), 91

P

paste() (pyexcel.Sheet method), 95
 pipe (pyexcel.Book attribute), 72
 pipe (pyexcel.Sheet attribute), 91
 plain (pyexcel.Book attribute), 72
 plain (pyexcel.Sheet attribute), 90

R

rcolumns() (pyexcel.Sheet method), 81
 records (pyexcel.Sheet attribute), 87
 region() (pyexcel.Sheet method), 94
 reverse() (pyexcel.Sheet method), 81
 Row (class in pyexcel.sheets), 99
 row_at() (pyexcel.Sheet method), 83
 row_range() (pyexcel.Sheet method), 79
 rownames (pyexcel.Sheet attribute), 85
 rows() (pyexcel.Sheet method), 80
 rrows() (pyexcel.Sheet method), 80
 rst (pyexcel.Book attribute), 73
 rst (pyexcel.Sheet attribute), 91
 rvertical() (pyexcel.Sheet method), 82

S

save_as() (in module pyexcel), 62
 save_as() (pyexcel.Book method), 74
 save_as() (pyexcel.Sheet method), 96
 save_book_as() (in module pyexcel), 63
 save_to_database() (pyexcel.Book method), 75
 save_to_database() (pyexcel.Sheet method), 96
 save_to_memory() (pyexcel.Book method), 75

save_to_memory() (pyexcel.Sheet method), 96
 set_column_at() (pyexcel.Sheet method), 84
 set_named_column_at() (pyexcel.Sheet method), 85
 set_named_row_at() (pyexcel.Sheet method), 86
 set_row_at() (pyexcel.Sheet method), 83
 Sheet (class in pyexcel), 75
 sheet_names() (pyexcel.Book method), 68
 SheetStream (class in pyexcel.generators), 98
 simple (pyexcel.Book attribute), 72
 simple (pyexcel.Sheet attribute), 90
 split_a_book() (in module pyexcel), 64

T

transpose() (pyexcel.Sheet method), 94
 tsv (pyexcel.Book attribute), 70
 tsv (pyexcel.Sheet attribute), 88
 tsvz (pyexcel.Book attribute), 70
 tsvz (pyexcel.Sheet attribute), 89

U

url (pyexcel.Book attribute), 69
 url (pyexcel.Sheet attribute), 88

V

vertical() (pyexcel.Sheet method), 82

X

xls (pyexcel.Book attribute), 71
 xls (pyexcel.Sheet attribute), 89
 xlsx (pyexcel.Book attribute), 71
 xlsx (pyexcel.Sheet attribute), 90