sheetparser Documentation

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Contents

sheetparser is a library for extracting information from Excel sheets (as well as csv and pdf) that contain complex or variable layouts of tables.

Obtaining data from various sources can be very painful, and loading Excel sheets that were designed by humans for humans is especially difficult. The focus of the persons who create those sheet is first to display the information in a way that pleases their eyes or can convince others, and readability by a computer is low on the list of priorities. Also as time goes, they add intermediate lines or columns, or add more information. The systematic loading of historical information can then become a very heavy task.

The purpose of this package is to simplify the data extraction of those tables. Complex and flexible layouts can be implemented in a few lines.

CHAPTER 1

Contents:

Introduction to sheetparser

The purpose of this library is to simplify complex Excel sheets reading. The idea is to describe the layout of the sheet with spatial patterns, allowing for changes in actual position of the elements.

For instance, let's assume that we need to extract data from sheet 1 on the right. That sheet could be described as:

- One table with top and left header
- Followed by and empty line
- Another table with top and left header
- An empty line
- And 2 lines

We code the pattern as follows:

```
from sheetparser import *

pattern = Sheet('sheet', Rows,
                Table,
                Empty,
                Table,
                Empty,
                Line, Line)
```

This pattern will recognize all sheets with a similar layout. The tables could be smaller or larger. The argument *Rows* is for the layout of the sheet: it would be *Columns* if the tables were aligned horizontally.

table 1	a	b	c
1	a11	b11	c11
2	a21	b21	c21
3	a31	b31	c31
table 2	a2	b2	c2
1	a12	b12	c12
2	a22	b22	c22
3	a32	b32	c32
line1			
line2			

Fig. 1.1: sheet 1: Example of tables inside a sheett

The pattern is used as follows:

```
wbk = load_workbook('test_
↪table1.xlsx',with_formatting=False)
context = ListContext()
pattern.
↪match_range(wbk['Sheet2'], context)
print(context.root)
```

We first open the workbook, and create a context. This object will store the parsing result. There are 2 provided context classes: *PythonObjectResult* will contain results in a hierarchy that replicates the hierarchy of patterns, and ListResult will return them as a list of values.

The next step is to check if the pattern matches the sheet. It will raise a DoesntMatchException if not. The final step to read the result from context.root.

The result is available in context. If we print it, we obtain the following value

```
{'table': [Table table ([['a11', 'b11', 'c11'], ['a21', 'b21', 'c21'],
['a31', 'b31', 'c31']]), Table table ([['a12', 'b12', 'c12'], ['a22',
'b22', 'c22'], ['a32', 'b32', 'c32']])], 'line': [['line1'],
['line2']], '__meta': [{'name': 'Sheet2'}]}
```

This represents the result of the parsing, and can be easily used in a program, for instance to load in a database.

Now let'ss assume that the accounting department issues one month later an updated version of this document (version 2), but there is now only 1 table and 3 lines. We can add a little more flexibility in our pattern:

```
pattern = Sheet('sheet', Rows,

↪    Many(Table, Empty, min=1,max=2),
            Many(Line)
            )
```

With that pattern, we can match both sheets. Alternatively, we could code this:

```
pattern = Sheet('sheet', Rows,
            Table, Empty,
            Maybe(Table, Empty),
            Many(Line)
            )
```

The idea is similar to regular expressions. It provides a powerful language to accommodate different situations, and with a flexible system to detect sheet features such as text or formatting.

table 1	a	b	c
1	a11	b11	c11
2	a21	b21	c21
3	a31	b31	c31
line1			
line2			
line3			

Fig. 1.2: sheet 2: Version 2 of the sheet

Another example

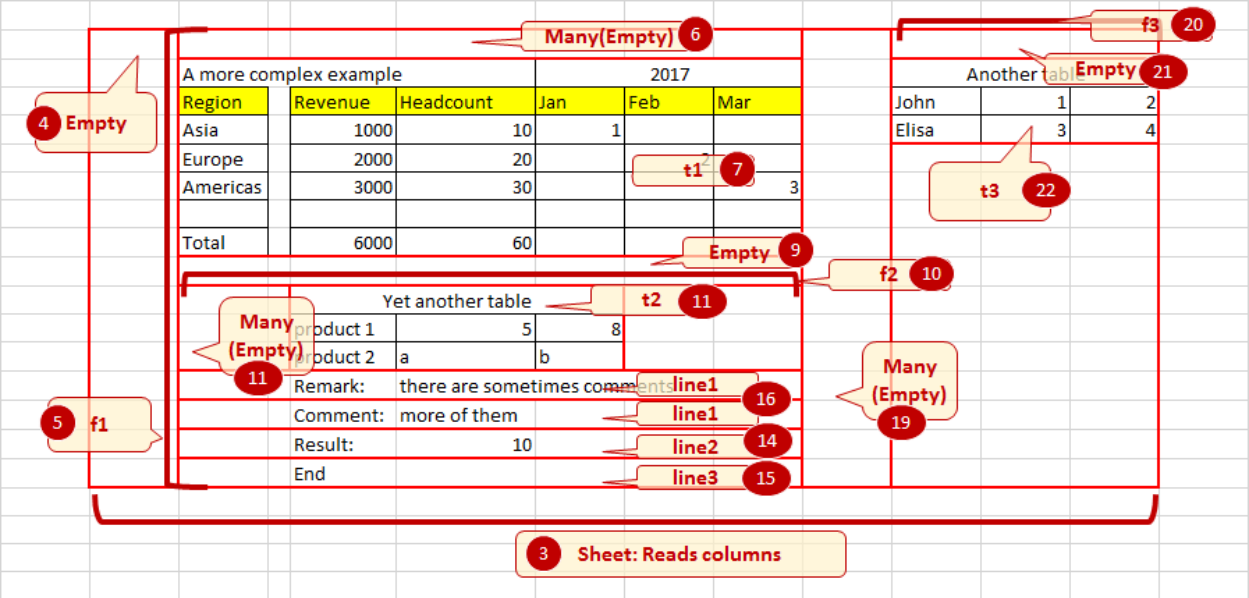
Here's a more complex example:

```
1  wbk = load_workbook(filename,
   ↪ with_formatting=True)
2  sheet = wbk['Sheet6']
3  pattern = Sheet('sheet', Columns,
4                  Many(Empty),
5                  FlexibleRange('f1',Rows,
6                                Many(Empty),
7                                Table('t1',[GetValue,
   ↪HeaderTableTransform(2,1),FillData,
   ↪RemoveEmptyLines('columns')],
8                                stop=no_horizontal),
9                                Empty,
10                               FlexibleRange('f2',Columns,
11                                             Many(Empty),Table('t2'),
12                                             stop=no_horizontal),
13                               Many(Empty),
14                               Many((Line('line2
   ↪',[get_value,Match('Result:')])
15                                             + Line(
   ↪'line3',[StripLine(),get_value]))
16                               | Line('line1')),
17                               stop = lambda line,linecount:
   ↪linecount>2 and empty_line(line)
18                               ),
19                 Many(Empty),
20                 FlexibleRange('f3',Rows,
21                               Many(Empty),
22                               Table('t3',stop = no_horizontal)))
```

Here's how it works (the numers refer to the line number in the code above):

PDF Files

Version 0.2 includes a PDF backend. The document is seen as a Book and the Sheet are the pages of the document. Use the page number instead of the sheet name.



Patterns

Some definitions

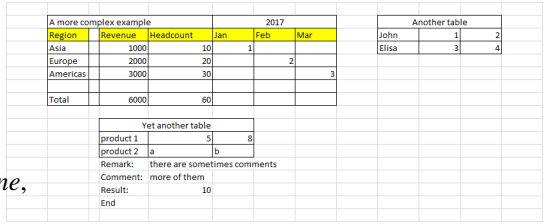
range is an Excel range, delimited with a top, a left, a right and a bottom. A sheet is an example of a range.

line is a row or a column. This is decided by the chosen **layout**: horizontal layouts will yield rows, vertical will yield columns.

pattern is an object that matches the given range or line(s). If the match fails, the method raises a DoesntMatchException. If it succeeds, it fills up the context given as a parameter.

Note that patterns can be passed as arguments to the upper level pattern as object or classes. Classes will be instatianted.

There are 3 types of patterns:



Workbook

This pattern will be called to match a workbook:

class `sheetparser.patterns.`**`Workbook`**(*names_dct=None*, *re_dct=None*, **args*, ***options*)

A top level pattern to match a workbook. Call match_workbook on an opened workbook document (as provided by a backend)

Parameters

- **`names_dct`** (*map*) – a dictionary that associates a sheet name to the sheet pattern

- **re_dct** (*map*) – a dictionary or a tuple of pairs that associate a regular expression to the sheet pattern

match_workbook(*workbook*, *context*)
Iterates through the sheets in the workbook. If *names_dct* contains the sheet name, it will try and match the associated pattern. If not, the method will try in *re_dct* if any of the regular expressions matches the names. Finally, if any other pattern is provided, they will be tried in sequence.

The context will contain the matching sheet in the same order as in the workbook,

Ranges

The following patterns match either the whole sheet or a range:

class sheetparser.patterns.**Sheet**(*name*, *layout*, **patterns*)

class sheetparser.patterns.**Range**(*name*, *layout*, **patterns*, *top=None*, *left=None*, *bottom=None*, *right=None*)
A range of cells delimited by top, left, bottom, right. RangePatterns are to be used directly under Workbook.

Layout is Rows or Columns, and will be used to know if the range should be read horizontally or vertically.

Iterators of lines

These patterns are called on an iterator of lines, and will be passed as parameters to Range patterns or other patterns matching iterators of lines.

These patterns can be combined with the operator +, which returns a Sequence. a+b is equivalent to Sequence(a,b). Similarly, a|b is equivalent to OrPattern(a,b).

The name of the pattern is used by the ResultContext to store the matched element. The existing patterns that operate on an line iterator are:

class sheetparser.patterns.**Empty**(*name*)
Matches an empty line. Doesn't match if there is no more lines in the line_iterator

class sheetparser.patterns.**Sequence**(*name='sequence'*, **patterns*)
matches the sub patterns in sequence. Will match all or nothing. Name is an optional parameter. If omitted, the name will be 'sequence'.

class sheetparser.patterns.**Many**(*name='many'*, *pattern*)
Matches the subpattern several times. The number of times is limited by the parameters max and min. Name defaults to 'many'

class sheetparser.patterns.**Maybe**(*name=None*, *pattern*)
Matches the subpattern or nothing. Equivalent to ? in regexes

class sheetparser.patterns.**OrPattern**(*pattern1*, *pattern2*)
matches the first pattern and if it fails tries the seconds.

Parameters

- **pattern1** (*Pattern*) – first pattern to try
- **pattern2** (*Pattern*) – fall back patter

class sheetparser.patterns.**FlexibleRange**(*name='flexible'*, *layout*, **patterns*, *stop=None*, *min=None*, *max=None*)
Finds a range by itering through the lines until the stop test returns true. That range is then used as a new range with the given layout and patterns.

Parameters

- **name** (*str*) – pattern name
- **layout** (*Layout*) – layout used to iter the result range
- **patterns** (*Pattern*) – patterns to be used with the new layout
- **stop** (*function(line_count, line)*) – stop test, by default empty line
- **min** (*int*) – minimum length of the range
- **max** (*int*) – maximum length of the range (None for unbound)

class sheetparser.patterns.**Table**(*name='table'*, *table_args=DEFAULT_TRANSFORMS*, *stop=None*)

A range of cells read from a line iterator. The table transforms are read in sequence at 2 times: when new lines are appended and when the table is complete.

Parameters

- **name** (*str*) – optional name of the table, "table" by default.
- **table_args** (*list*) – the arguments that are sent to the ResultContext that will store the result. For ResultTable, the default, that will be the list of transforms.
- **stop** (*function*) – that function is called on the following line. The table end is reached when that function returns True. It takes 2 parameters: the number of lines read so far and the line itself. By default, will stop on empty lines

class sheetparser.patterns.**Line**(*name='line'*, *line_args=None*)

Matches a line: there must be one more row/column in the line_iterator and it must be non empty.

Parameters **line_args** (*list*) – list of transforms to the result (strip, raise if empty...)

Stop tests

Stop tests are functions that are passed to FlexibleRange and Table to detect the end of a block. You can create your own and pass it as a parameter to the pattern.

sheetparser.patterns.**empty_line**(*cells*, *line_count*)

returns true if all cells are empty

sheetparser.patterns.**no_horizontal**(*cells*, *line_count*)

return True is no cell has horizontal border

sheetparser.patterns.**no_vertical**(*cells*, *line_count*)

check that there is no vertical line in the cells

Line and table transformations

The contents that is matched by the *Line* and *Table* patterns is stored in the context result. Another level of processing is provided by list of transformations.

Line transformations

They are passed as *line_args* parameters to the Line pattern. It is a list of function that take a list and return a list. These functions are called in sequence, the result of one function is passed to the following one.

The first function of the list must accept a list of Cell. The function get_value transforms it to the list of values.

These are the included line transformations:

sheetparser.results.**non_empty**(*line*)
A transformer that matches only non empty lines. Other will raise a DoesntMatchException

Parameterized functions (objects with a method __call__):

class sheetparser.results.**StripLine**(*left=True*, *right=True*)

class sheetparser.results.**Match**(*regex*, *position=None*, *combine=None*)
A transformer that matches lines that contain the given regex. Use combine to decide if all or any item should match

Parameters

- **regex** (*regex*) – a regular expression
- **position** (*list*) – a list of positions or a slice
- **combine** (*function*) – function that decides if the whole line matches

Table transformations

Similarly, the lines matched by the *Table* pattern are passed to a series of processings. They are subclasses of *TableTransform* which implement *wrap* or *process_line* (or both). *process_line* is called when a new line is added, and *wrap* is called at the end when all lines have been added.

class sheetparser.results.**GetValue**
Transforms a list of cells into a list of strings. All built in processors expect GetValue to be included as the first transformation.

class sheetparser.results.**FillData**
Adds the line to the table data

class sheetparser.results.**HeaderTableTransform**(*top_header=1*, *left_column=1*)
Extract the first lines and first columns as the top and left headers

Parameters

- **top_header** (*int*) – number of lines, 1 by default
- **left_column** (*int*) – number of columns, 1 by default

sheetparser.results.**RepeatExisting**
alias of <lambda>

class sheetparser.results.**RemoveEmptyLines**(*line_type=u'rows'*)
Remove empyt lines or empty columns in the table. Note: could be really simplified with numpy

class sheetparser.results.**ToMap**
Transforms the data from a list of lists to a map. The keys are the combination of terms in the headers (top and left) and the values are the table data

class sheetparser.results.**MergeHeader**(*join_top=()*, *join_left=()*, *ch=u'.'*)
merges several lines in the header into one

class sheetparser.results.**Transpose**
Transforms lines into columns and columns to lines

Results

When a pattern is matched, it fills a *ResultContext*. The *ResultContext* has to be instantiated by the client and passed to the match method. Here are the provided classes that derive from *ResultContext*:

`sheetparser.results.`**`PythonObjectContext`**`()`
Store the results are a hierarchy of objects that mimics the initial hierarchy of patterns

`sheetparser.results.`**`ListContext`**`()`
a context that returns a dictionary where the key is the name of the pattern

`sheetparser.results.`**`DebugContext`**`()`
A result context that implements the debug function

Documents and backends

We load first a backend - that's the module that will read the Excel sheet and provide the information to the library. There are 5 provided backends:

- one based on xlrd, that can read xls file and xlsx without

formatting,

- one based on openpyxl that can read xlsx files with some

formatting information

- one is based on win32com and the actual Excel program, with serious performance issues
- raw provides an interface for data stored as list, as well as csv files
- pdfminer provides an interface for pdf files. This feature is experimental and is limited by the amount of information that pdf files can provide.

CHAPTER 2

Indices and tables

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