
Clique

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Manage collections with common numerical component.

Overview and examples of using the system in practice.

1.1 Introduction

Clique is a library for managing collections that have a common numerical component.

A numerical component is any series of numbers in an item. The item *sc010_020_v001.0005.dpx* has four possible numerical components (**bolded**):

- **sc010**_020_v001.0005.dpx
- sc010_**020**_v001.0005.dpx
- sc010_020_v**001**.0005.dpx
- sc010_020_v001.**0005**.dpx

A common use would be to determine sequences of files on disk. For example, given the following input:

- file.0001.dpx
- file.0002.dpx
- file.0001.jpg
- file.0002.jpg

Clique can automatically assemble two collections:

- file.[index].dpx
- file.[index].jpg

where *[index]* is the commonly changing numerical component.

Read the [Tutorial](#) to find out more.

1.1.1 Copyright & License

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1.2 Installation

Installing Clique is simple with `pip`:

```
$ pip install clique
```

If the Cheeseshop (a.k.a. PyPI) is down, you can also install Clique from one of the mirrors:

```
$ pip install --use-mirrors clique
```

Alternatively, you may wish to download manually from Github where Clique is [actively developed](#).

You can clone the public repository:

```
$ git clone git://github.com/4degrees/clique.git
```

Or download an appropriate [tarball](#) or [zipball](#)

Once you have a copy of the source, you can embed it in your Python package, or install it into your site-packages:

```
$ python setup.py install
```

1.2.1 Dependencies

- `Python` $\geq 2.6, < 3$

For testing:

- `Pytest` $\geq 2.3.5$

1.3 Tutorial

This tutorial gives a good introduction to using Clique.

First make sure that you have Clique *installed*.

Clique revolves around creating collections of items that all have a commonly changing numerical component. Clique itself does not care what the numerical component represents. It could be a frame index for a sequence of files or a version number in a list of versioned files.

The easiest way to create these collections is to `assemble()` them from arbitrary items.

First, import clique:

```
>>> import clique
```

Then define the items to assemble (could be the result of `os.listdir()` for example):

```
>>> items = ['file.0001.jpg', '_cache.txt', 'file.0002.jpg',  
...         'foo.1.txt', 'file.0002.dpx', 'file.0001.dpx',  
...         'file.0010.dpx', 'scene_v1.ma', 'scene_v2.ma']
```

Finally, assemble them into collections:


```
>>> collections, remainder = clique.assemble(items)
>>> for collection in collections:
...     print repr(collection)
<Collection "scene_v%d.ma [1-2]">
<Collection "file.%04d.dpx [1-2, 10]">
<Collection "file.%04d.jpg [1-2]">
```

Notice how the items `_cache.txt` and `foo.1.txt` didn't form any collections (and were added to `remainder`). This is because `_cache.txt` has no numerical component and was ignored, whilst `foo.1.txt` resulted in a collection with only one item and was filtered out of the result.

The minimum items filter can be altered at assembly time:

```
>>> collections, remainder = clique.assemble(items, minimum_items=1)
>>> for collection in collections:
...     print repr(collection)
<Collection "scene_v%d.ma [1-2]">
<Collection "foo.%d.txt [1]">
<Collection "file.%04d.dpx [1-2, 10]">
<Collection "file.%04d.jpg [1-2]">
```

See also:

There is a full guide to [Assembly](#) available.

Each collection holds various properties to describe the items it contains:

```
>>> collection = collections[0]
>>> print collection.head
scene_v
>>> print collection.tail
.ma
>>> print collection.padding
0
>>> print collection.indexes
[1, 2]
```

See also:

There is a full guide to [Collections](#) available.

It is also possible to parse a string (such as that returned from `Collection.format`) to create a collection. To do this, use the `parse()` function:

```
>>> collection = clique.parse('/path/to/file.%04d.ext [1, 2, 5-10]')
>>> print repr(collection)
<Collection "/path/to/file.%04d.ext [1-2, 5-10]">
```

It is also possible to pass in a different pattern to the default one:

```
>>> collection = clique.parse(
...     '/path/to/file.%04d.ext [1-10] (2, 8)'
...     '{head}{padding}{tail} [{range}] ({holes})'
... )
>>> print repr(collection)
<Collection "/path/to/file.%04d.ext [1, 3-7, 9-10]">
```

1.4 Assembly

As seen in the *Tutorial*, Clique provides the high-level `assemble()` function to support automatically assembling items into relevant *collections* based on a common changing numerical component:

```
>>> import clique
>>> collections, remainder = clique.assemble([
...     'file.0001.jpg', 'file.0002.jpg', 'file.0003.jpg',
...     'file.0001.dpx', 'file.0002.dpx', 'file.0003.dpx'
... ])
>>> print collections
[<Collection "file.%04d.jpg [1-3]">, <Collection "file.%04d.jpg [1-3]">]
```

Note: Any items that are not members of a returned collection can be found in the *remainder* list.

However, as mentioned in the *Introduction*, Clique has no understanding of what a numerical component represents. Therefore, it takes a conservative approach and considers **all** collections with a common changing numerical component as valid. This can lead to surprising results at first:

```
>>> collections, remainder = clique.assemble([
...     'file_v1.0001.jpg', 'file_v1.0002.jpg', 'file_v1.0003.jpg',
...     'file_v2.0001.jpg', 'file_v2.0002.jpg', 'file_v2.0003.jpg'
... ])
>>> print collections
[<Collection "file_v1.%04d.jpg [1-3]">,
 <Collection "file_v2.%04d.jpg [1-3]">,
 <Collection "file_v%d.0001.jpg [1-2]">,
 <Collection "file_v%d.0002.jpg [1-2]">,
 <Collection "file_v%d.0003.jpg [1-2]">]
```

Here, Clique returned more collections that might have been expected, but, as can be seen, they are all valid collections. This is an important feature of Clique - it doesn't attempt to guess. Instead, it is designed to be wrapped easily with domain specific logic to get the results desired.

There are a couple of ways to influence the returned result from the `assemble()` function:

- Pass a *minimum_items* argument.
- Pass custom *patterns*.

1.4.1 Minimum Items

By default, Clique will filter out any collection from the returned result of `assemble()` that has less than two items. This value can be customised per `assemble()` call by passing *minimum_items* as a keyword:

```
>>> print clique.assemble(['file.0001.jpg'])[0]
[]
>>> print clique.assemble(['file.0001.jpg'], minimum_items=1)[0]
[<Collection "file.%04d.jpg [1]">]
```

1.4.2 Patterns

By default, Clique finds all groups of numbers in each item and creates collections that have common *head*, *tail* and *padding* values.

Custom patterns can be used to tailor the process. Pass them as a list of regular expressions (either strings or `re.RegexObject` instances):

```
>>> items = [
...     'file.0001.jpg', 'file.0002.jpg', 'file.0003.jpg',
...     'file.0001.dpx', 'file.0002.dpx', 'file.0003.dpx'
... ]
>>> print clique.assemble(items, patterns=[
...     '\.(?P<index>(?P<padding>0*)\d+)\.\D+\d?$'
... ]) [0]
[<Collection "file_v1.%04d.jpg [1-3]">,
 <Collection "file_v2.%04d.jpg [1-3]">]
```

Note: Each custom expression **must** contain the expression from `DIGITS_PATTERN` exactly once. An easy way to do this is using Python's string formatting.

So, instead of:

```
'\.(?P<index>(?P<padding>0*)\d+)\.\D+\d?$'
```

use:

```
'\.{0}\.\D+\d?$'.format(clique.DIGITS_PATTERN)
```

Some common expressions are predefined in the `PATTERNS` dictionary (contributions welcome!):

```
>>> print clique.assemble(items, patterns=[clique.PATTERNS['frames']])[0]

[<Collection "file_v1.%04d.jpg [1-3]">, <Collection "file_v2.%04d.jpg [1-3]">]
```

1.5 Collections

A collection holds items that all have a single common numerical component, whose value differs between each item.

Each collection comprises three main attributes:

- *head* - The common leading part of each item.
- *tail* - The common trailing part of each item.
- *padding* - The width of the index (to be padded to with zeros).

Given items such as:

- file.0001.jpg
- file.0002.jpg

The *head* would be `file.`, the *tail* `.jpg` and the *padding* `4`.

Note: If the numerical component is unpadded then the *padding* would be 0 and a variable index width supported.

A collection can be manually created using the `Collection` class:

```
>>> import clique
>>> collection = clique.Collection(head='file.', tail='.jpg', padding=4)
```

1.5.1 Adding & Removing Items

Items can then be added to the collection:

```
>>> collection.add('file.0001.jpg')
```

If an item does not match the collection's expression a `CollectionError` is raised:

```
>>> collection.add('file.0001.dpx')
CollectionError: Item does not match collection expression.
```

Whether an item matches the collection expression can be tested ahead of time if desired using `match()`:

```
>>> print collection.match('file.0002.jpg')
<_sre.SRE_Match object at 0x0000000003710D78>
>>> print collection.match('file.0002.dpx')
None
```

To remove an item:

```
>>> collection.remove('file.0001.jpg')
```

If the item is not present, a `CollectionError` is raised:

```
>>> collection.remove('file.0001.jpg')
CollectionError: Item not present in collection.
```

1.5.2 Accessing Items

To access items in the collection, iterate over it:

```
>>> collection.add('file.0001.jpg')
>>> collection.add('file.0002.jpg')
>>> for item in collection:
...     print item
file.0001.jpg
file.0002.jpg
```

Note: A collection may be sparse and so is not directly indexable. If you need to access an item by index, convert the collection to a list:

```
>>> print list(collection)[-1]
file.0002.jpg
```

1.5.3 Manipulating Indexes

Internally, Clique does not store the items directly, but rather just the properties to recreate the items (*head*, *tail*, *padding*). In addition it holds a sorted set of indexes present in the collection.

This set of indexes can be manipulated directly to perform the equivalent of adding and removing items (perhaps in bulk).

```
>>> print collection.indexes
[1, 2]
>>> collection.indexes.update([2, 3, 4])
>>> for item in collection:
```

```
...     print item
file.0001.jpg
file.0002.jpg
file.0003.jpg
file.0004.jpg
```

Note: It is not possible to assign a new index set directly:

```
>>> collection.indexes = set([1, 2, 3])
AttributeError: Cannot set attribute defined as unsettable.
```

Instead, first clear and update the set as required:

```
>>> collection.indexes.clear()
>>> collection.indexes.update(set([1, 2, 3]))
```

1.5.4 Formatting

It is useful to express a collection as a string that represents the collection expression and ranges in a standard way. Clique supports basic formatting of a collection through its `format()` method:

```
>>> collection = clique.Collection('file.', '.jpg', 4, indexes=set([1, 2]))
>>> print collection.format()
file.%04d.jpg [1-2]
```

The `format()` method can be passed an alternative pattern if required:

```
>>> print collection.format('{head}[index]{tail}')
file.[index].jpg
```

The passed pattern should match the formatting rules of Python's standard string formatter and will have the following keyword variables available to it:

- *:term:'head'* - Common leading part of the collection.
- *:term:'tail'* - Common trailing part of the collection.
- *:term:'padding'* - Padding value in `%0d` format.
- *range* - Total range in the form `start-end`
- *ranges* - Comma separated ranges of indexes.
- *holes* - Comma separated ranges of missing indexes.

1.5.5 Structure

Clique makes it easy to get further information about the structure of a collection and act on that structure.

To check if a collection contains items that make up a *contiguous* sequence use `is_contiguous()`:

```
>>> collection = clique.Collection('file.', '.jpg', 4)
>>> collection.indexes.update([1, 2, 3, 4, 5])
>>> print collection
file.%04d.jpg [1-5]
>>> print collection.is_contiguous()
True
>>> collection.indexes.discard(3)
```

```
>>> print collection
file.%04d.jpg [1-2, 4-5]
>>> print collection.is_contiguous()
False
```

To access the missing indexes in a non-*contiguous* collection use the `holes()` method (which returns a new `Collection`):

```
>>> missing = collection.holes()
>>> print missing.indexes
[3]
```

To separate a non-*contiguous* collection into a number of *contiguous* collections use the `separate()` method:

```
>>> subcollections = collection.separate()
>>> for subcollection in subcollections:
...     print subcollection
file.%04d.jpg [1-2]
file.%04d.jpg [4-5]
```

And to merge compatible collections into another use the `merge()` method:

```
>>> collection_a = clique.Collection('file.', '.jpg', 4, set([1, 2]))
>>> collection_b = clique.Collection('file.', '.jpg', 4, set([4, 5]))
>>> print collection_a.indexes
[1, 2]
>>> collection_a.merge(collection_b)
>>> print collection_a.indexes
[1, 2, 4, 5]
```

Note: The collection being merged into is modified in-place, whilst the collection being merged is left unaltered.

A collection can be tested for compatibility using the `is_compatible()` method:

```
>>> collection_a = clique.Collection('file.', '.jpg', 4, set([1, 2]))
>>> collection_b = clique.Collection('file.', '.jpg', 4, set([4, 5]))
>>> collection_c = clique.Collection('file.', '.dpx', 4, set([4, 5]))

>>> print collection_a.is_compatible(collection_b)
True
>>> print collection_a.is_compatible(collection_c)
False
```

Reference

API reference providing details on the actual code.

2.1 clique

`clique.DIGITS_PATTERN = '(?P<index>(P<padding>0*)\\d+)'`

Pattern for matching an index with optional padding.

`clique.PATTERNS = {'frames': '\\.(?P<index>(P<padding>0*)\\d+)\\.\\.D+\\d?$', 'versions': 'v(?P<index>(P<padding>0*)\\d+)'}`

Common patterns that can be passed to `assemble()`.

`clique.assemble(iterable, patterns=None, minimum_items=2)`

Assemble items in *iterable* into discreet collections.

patterns may be specified as a list of regular expressions to limit the returned collection possibilities. Use this when interested in collections that only match specific patterns. Each pattern must contain the expression from `DIGITS_PATTERN` exactly once.

A selection of common expressions are available in `PATTERNS`.

Note: If a pattern is supplied as a string it will be automatically compiled to a `re.RegexObject` instance for convenience.

When *patterns* is not specified, collections are formed by examining all possible groupings of the items in *iterable* based around common numerical components.

minimum_items dictates the minimum number of items a collection must have in order to be included in the result. The default is 2, filtering out single item collections.

Return tuple of two lists (collections, remainder) where 'collections' is a list of assembled `Collection` instances and 'remainder' is a list of items that did not belong to any collection.

`clique.parse(value, pattern='{head}{padding}{tail} [{ranges}]')`

Parse *value* into a `Collection`.

Use *pattern* to extract information from *value*. It may make use of the following keys:

- *head* - Common leading part of the collection.
- *tail* - Common trailing part of the collection.
- *padding* - Padding value in `%0d` format.
- *range* - Total range in the form `start-end`

- ranges* - Comma separated ranges of indexes.
- holes* - Comma separated ranges of missing indexes.

Note: *holes* only makes sense if *range* or *ranges* is also present.

2.1.1 collection

class `clique.collection.Collection` (*head, tail, padding, indexes=None*)

Bases: `object`

Represent group of items that differ only by numerical component.

__init__ (*head, tail, padding, indexes=None*)

Initialise collection.

head is the leading common part whilst *tail* is the trailing common part.

padding specifies the “width” of the numerical component. An index will be padded with zeros to fill this width. A *padding* of zero implies no padding and width may be any size so long as no leading zeros are present.

indexes can specify a set of numerical indexes to initially populate the collection with.

Note: After instantiation, the `indexes` attribute cannot be set to a new value using assignment:

```
>>> collection.indexes = [1, 2, 3]
AttributeError: Cannot set attribute defined as unsettable.
```

Instead, manipulate it directly:

```
>>> collection.indexes.clear()
>>> collection.indexes.update([1, 2, 3])
```

head

Return common leading part.

tail

Return common trailing part.

match (*item*)

Return whether *item* matches this collection expression.

If a match is successful return data about the match otherwise return `None`.

add (*item*)

Add *item* to collection.

raise `CollectionError` if *item* cannot be added to the collection.

remove (*item*)

Remove *item* from collection.

raise `CollectionError` if *item* cannot be removed from the collection.

format (*pattern='{head}{padding}{tail} [{ranges}]'*)

Return string representation as specified by *pattern*.

Pattern can be any format accepted by Python’s standard format function and will receive the following keyword arguments as context:

- head* - Common leading part of the collection.
- tail* - Common trailing part of the collection.
- padding* - Padding value in %0d format.
- range* - Total range in the form *start-end*
- ranges* - Comma separated ranges of indexes.
- holes* - Comma separated ranges of missing indexes.

is_contiguous ()

Return whether entire collection is contiguous.

holes ()

Return holes in collection.

Return `Collection` of missing indexes.

is_compatible (*collection*)

Return whether *collection* is compatible with this collection.

To be compatible *collection* must have the same head, tail and padding properties as this collection.

merge (*collection*)

Merge *collection* into this collection.

If the *collection* is compatible with this collection then update indexes with all indexes in *collection*.

raise `CollectionError` if *collection* is not compatible with this collection.

separate ()

Return contiguous parts of collection as separate collections.

Return as list of `Collection` instances.

2.1.2 error

Custom error classes.

exception `clique.error.CollectionError`

Bases: `exceptions.Exception`

Raise when a collection error occurs.

2.1.3 sorted_set

class `clique.sorted_set.SortedSet` (*iterable=None*)

Bases: `_abcoll.MutableSet`

Maintain sorted collection of unique items.

__init__ (*iterable=None*)

Initialise with items from *iterable*.

add (*item*)

Add *item*.

discard (*item*)

Remove *item*.

update (*iterable*)

Update items with those from *iterable*.

2.1.4 descriptor

class clique.descriptor.**Unsettable** (*label*)

Bases: object

Prevent standard setting of property.

Example:

```
>>> class Foo(object):
...     x = Unsettable('x')
...
...     def __init__(self):
...         self.__dict__['x'] = True
...
>>> foo = Foo()
>>> print foo.x
True
>>> foo.x = False
AttributeError: Cannot set attribute defined as unsettable.
```

__init__ (*label*)

Initialise descriptor with property *label*.

label should match the name of the property being described:

```
x = Unsettable('x')
```

Glossary

contiguous When all items in a collection are sequential with no missing indexes. For example, *1, 2, 3* is contiguous whilst *1, 3* is not.

head The common leading part of items in a collection. For example, the items *file.0001.jpg*, *file.0002.jpg*, *file.0003.jpg* have a head value of *file*.

padding The width of the numerical index in a collection. Each item's index will be padded with zeroes to match this width. A padding of 4 would result in *1* becoming *0001*. A padding of 0 means no width is defined and an index can be any width so long as it has no preceding zeroes.

tail The common trailing part of items in a collection. For example, the items *file.0001.jpg*, *file.0002.jpg*, *file.0003.jpg* have a tail value of *.jpg*

Indices and tables

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