

ReportLab Paragraphs Reloaded

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Agenda

- ReportLab Overview
- Paragraphs
- Paragraphs Reloaded & Examples
- Summary

ReportLab Overview

General Features

- Generating PDF with Python (+ some C)
- Content: fonts, graphics, images, tables
- PDF features: page transitions, hyperlinks, outline, ...
- Graphics import as bitmaps and SVG (ext.)
- Graphics export as bitmaps, PDF, EPS, SVG

Technologies

- PDF
- Type I and TrueType fonts
- PIL
- libart
- Unicode (UTF-8)

Meta Info

- Devellopped since ca. 1996
- By Andy Robinson, Robin Becker, et al.
- Current: SVN (v. 2.1 + 12 months)
- Open Source
- Closed Source: RML, PDF encryption, PDF import

1st Layer: Canvas

- Corresponds to a single page with
- Text,
- Graphics,
- PDF features (hyperlinks, page transitions...)
- Can also be saved as a bitmap, EPS, SVG

Example 1

```
#!/usr/bin/env python
# -*- coding: UTF-8 -*-

from reportlab.pdfgen.canvas import Canvas
from reportlab.lib.pagesizes import A4

canv = Canvas("helloworld.pdf", pagesize=A4)

### ...

canv.showPage()

canv.save()
```

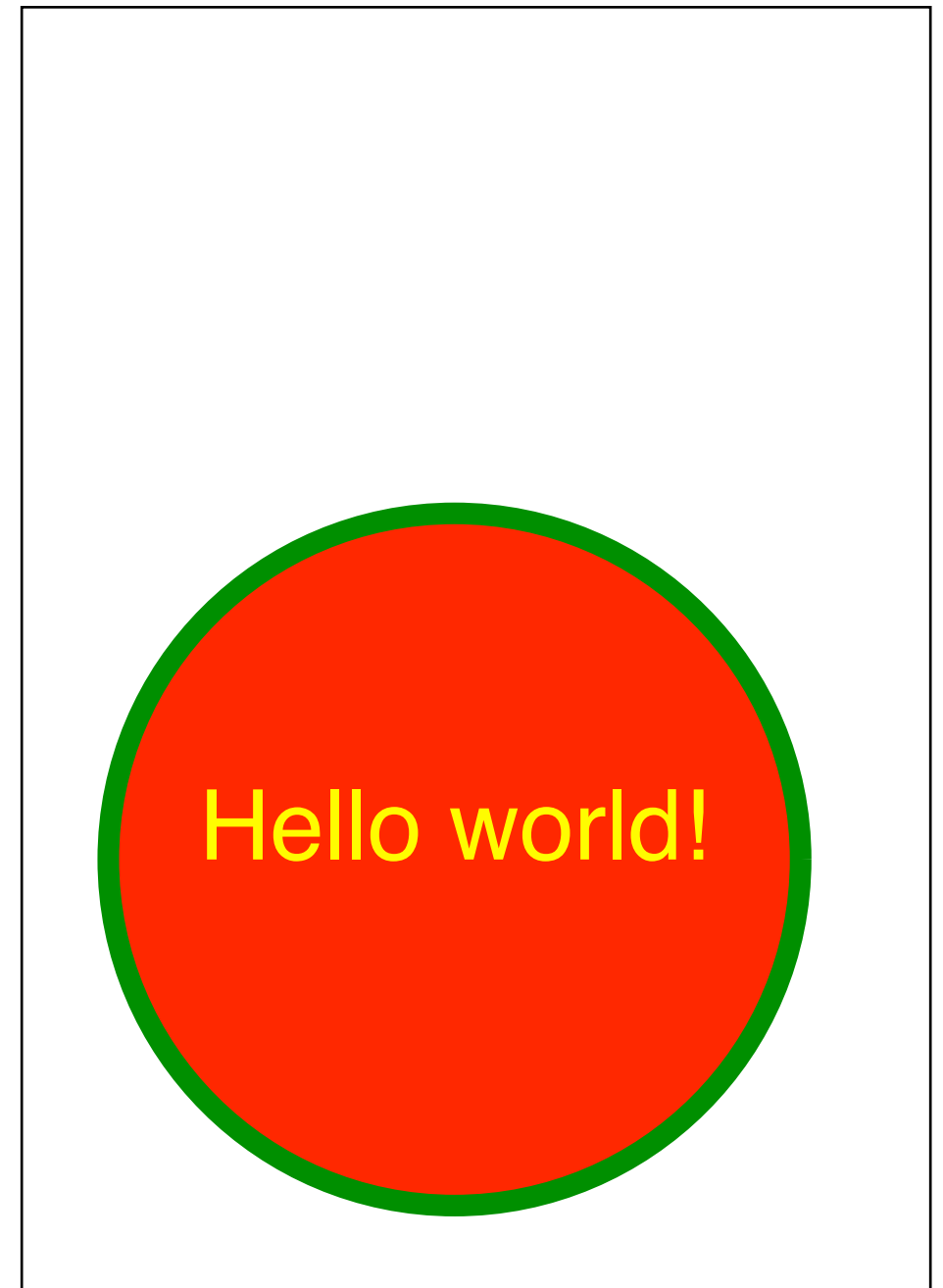
...


```
###
```

```
from reportlab.lib import colors  
from reportlab.lib.units import cm
```

```
# circle  
canv.setStrokeColor(colors.green)  
canv.setFillColor(colors.red)  
canv.setLineWidth(0.5*cm)  
x, y = 10*cm, 10*cm  
canv.circle(x, y, 5*cm,  
            stroke=True, fill=True)
```

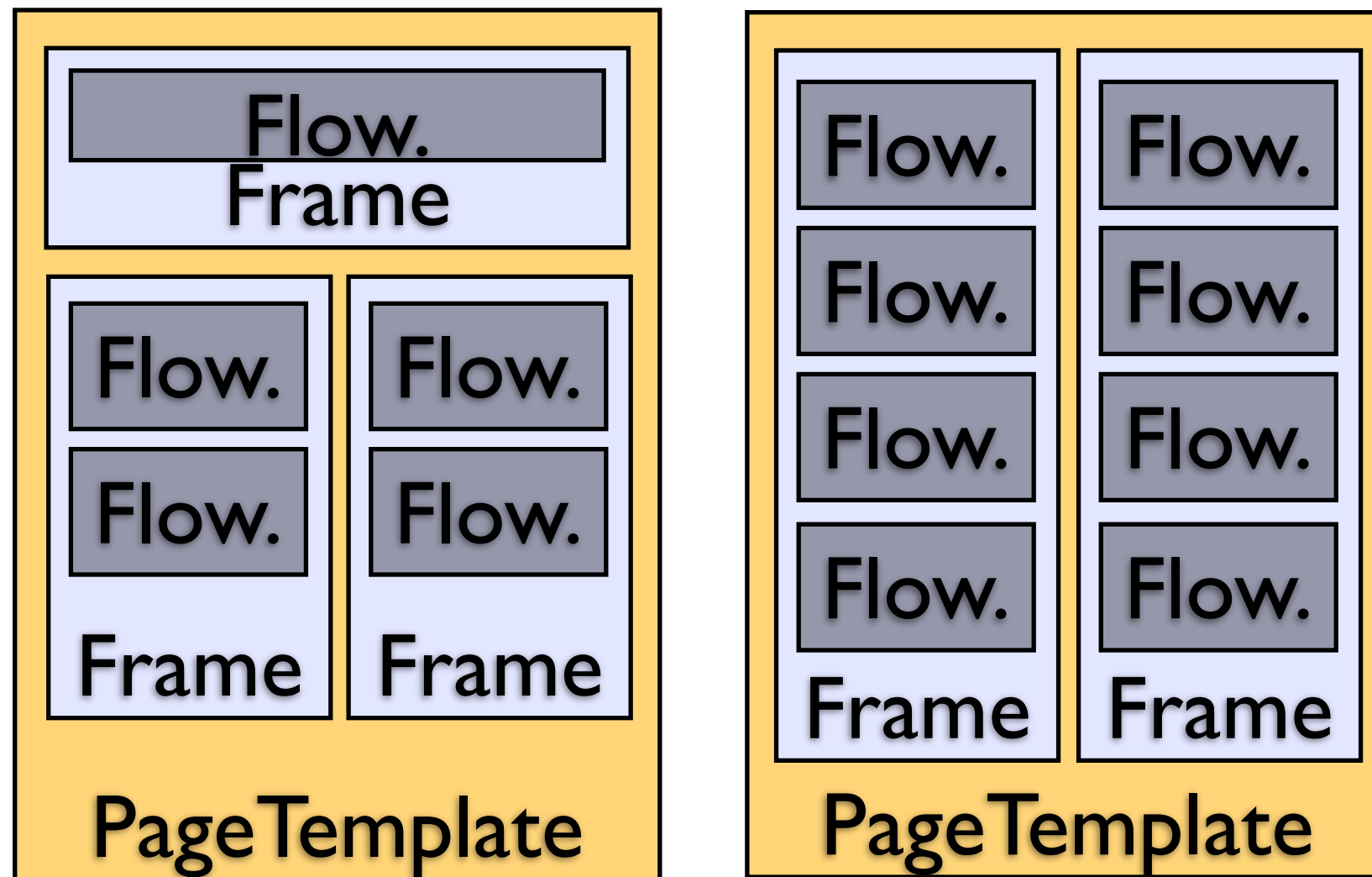
```
# text  
canv.setFillColor(colors.yellow)  
canv.setFont("Helvetica", 36)  
canv.drawCentredString(x, y,  
                        u"Hello world!")
```



2nd Layer: Platypus

- "Page LAYOUT Typography Using Scripts"
- Frames
- PageTemplate
- DocumentTemplate
- Content: Flowables & Styles ("Story")
- Rendered as PDF document

Structure



DocumentTemplate

Flowables

- *Content related:*
Paragraph, Preformatted, Image, Table, XBox, Spacer, ...
- *Logic related:*
FrameBreak, PageBreak, CondPageBreak, ...
- *Layout related:*
KeepWithNext, KeepInFrame, ...

Example 2

```
from reportlab.lib.units import cm
from reportlab.lib.pagesizes import A4
from reportlab.pdfgen.canvas import Canvas
from reportlab.platypus import \
    BaseDocTemplate, PageTemplate, \
    Frame, Paragraph
from reportlab.lib.styles import \
    getSampleStyleSheet

from django.contrib.webdesign import \
    lorem_ipsum as li

PAGE_SIZE = A4
```

...

```

class TwoColumnDocTemplate(BaseDocTemplate):
    "A simple two-column document template."

    def __init__(self, filename, **kw):
        m = margin = 2*cm
        tm = topMargin = 2*cm
        bm = bottomMargin = 2*cm
        cw, ch = (PAGESIZE[0]-2*m)/2., (PAGESIZE[1]-tm)
        leftCol = Frame(m, bm, cw-0.75*cm, ch-tm,
                        leftPadding=0, topPadding=0,
                        rightPadding=0, bottomPadding=0,
                        id="left", showBoundary=True
        )
        rightCol = Frame(cw+2.7*cm, bm, cw-0.75*cm, ch-tm,
                        leftPadding=0, topPadding=0,
                        rightPadding=0, bottomPadding=0,
                        id="right", showBoundary=True
        )
        apply(BaseDocTemplate.__init__, (self, filename), kw)
        allPages = PageTemplate("all", [leftCol, rightCol])
        self.addPageTemplates([allPages])

```

...

```
def generateTwoColDocument(outPath):
    "Create a 2-col doc with rand. text."

    stylesheet = getSampleStyleSheet()
    h1 = stylesheet['Heading1']
    h2 = stylesheet['Heading2']
    bt = stylesheet['BodyText']

    st = story = []
    p = li.words(3, common=False)
    p = p.capitalize()
    st.append(Paragraph(p, style=h1))
    for i in range(10):
        p = li.words(5, common=False)
        p = p.capitalize()
        st.append(Paragraph(p, style=h2))
        for j in range(3):
            p = li.paragraph()
            st.append(Paragraph(p, style=bt))

    doc = TwoColumnDocTemplate(outPath, pagesize=PAGESIZE)
    doc.build(story)
```

<p>Maiores cupiditate placeat</p> <p>Dolorem perferendis accusantium veniam optio</p> <p>Quidem explicabo officiis quasi soluta exercitationem blanditiis ullam nobis suscipit praesentium? Nostrum quaerat ullam recusandae esse nulla maiores eos eligendi adipisci consequatur dolores, sequi cum veniam dolor voluptates ipsa tempora, quibusdam nostrum quasi labore nobis perspiciatis illo eaque vero pariat quos? Ipsum odio ipsa quidem amet impedit recusandae quis, corporis cupiditate laboriosam alias ratione tempore? Exercitationem voluptates alias aspernatur odio laboriosam dolores unde vero.</p> <p>Blanditiis quo at consectetur impedit, iure fugiat sed voluptate nesciunt temporibus facilis, dignissimos aspernatur maiores assumenda nostrum, error nisi accusamus officiis quo deleniti facere recusandae animi quidem ea excepturi, recusandae quasi dolor nulla molestiae unde repellendus odit sint non officia omnis.</p> <p>Cupiditate minima pariat ut itaque alias suscipit, nulla culpa atque deleniti id et tenetur aliquid unde qui vel sint, cumque rerum maiores voluptate, quas et quia? Quam debitis praesentium vitae, nesciunt quas distinctio quisquam, impedit tempora architecto aut? Perspiciatis et ullam sit commodi cumque optio pariat, eum totam minus et quis, vero itaque molestias eius sed eligendi veniam quae dolore doloribus, unde rem odit similique sapiente eveniet?</p> <p>Cumque blanditiis ut facilis quasi</p> <p>Aut omnis atque molestiae est inventore delectus ipsam a commodi, tempora ratione unde quia non pariat nobis dolores, quisquam corporis iste quaerat illum atque ea sint doloribus iusto nemo, amet quidem nesciunt dolor commodi accusantium cumque ipsum, praesentium illum pariat? Dicta nobis culpa placeat tenetur repellat distinctio pariat debitis praesentium, exercitationem repudiandae dolore et fugiat neque? Doloremque et non architecto quas, laudantium repellat a deserunt minima explicabo beatae possimus, facilis fugit similique ad porro sapiente suscipit odit alias quod qui excepturi, autem provident fugiat pariat ullam perferendis ipsa fugit. Minus fugiat sint consequatur delectus necessitatibus eius eum.</p> <p>Voluptate sit ratione nobis aperiam omnis fugit accusantium totam sequi accusamus, nulla perspiciatis ut corporis eos possimus, ducimus id veniam earum, molestias ipsa dolorum aut eligendi doloremque laudantium atque aliquam voluptatibus hic esse, explicabo amet assumenda eaque autem molestiae exercitationem fugiat quasi sequi? Facilis tenetur qui eveniet obcaecati saepe porro repellat doloremque magni, dolor assumenda error recusandae rem</p>	<p>explicabo distinctio animi ad ipsam veniam enim, fugit quis recusandae amet eveniet praesentium veniam obcaecati consectetur maxime delectus?</p> <p>Harum molestias iure at nemo labore quod repellat quas ducimus eum similique, incidunt facilis itaque obcaecati iusto fugiat, enim unde voluptas illo? Enim eaque repudiandae cupiditate ad accusantium, alias error tempore ducimus a dicta aut voluptates vitae, error cupiditate assumenda quia culpa id illum rerum ipsam ipsum, quisquam blanditiis corporis fugiat excepturi facilis quaerat exercitationem cum tempore voluptas repudiandae? Eos hic reiiciendis excepturi recusandae ad esse.</p> <p>Excepturi sed repellendus facere ullam</p> <p>Ipsum omnis deleniti saepe sapiente, quibusdam neque aspernatur delectus quasi iusto a facilis, tenetur nostrum incidunt nesciunt veritatis, velit sunt nostrum quo quae necessitatibus? Delectus suscipit soluta veniam harum sunt, laudantium iusto voluptatibus, fuga facere nihil sed aspernatur placeat, impedit libero repellendus laudantium nisi nihil eveniet reiiciendis? Exercitationem nemo possimus debitis? Aliquid nesciunt cum natus eveniet obcaecati fugiat repellendus, et numquam odit velit alias, dolor aut quasi ut tempora itaque nemo earum animi, ipsa similique natus inventore nobis sed quia eaque totam tempore incidunt dolorum, molestias rem blanditiis ad autem.</p> <p>Tempora voluptatibus quo dicta expedita tempore harum porro?</p> <p>Cupiditate possimus dignissimos laborum consectetur laudantium, illum ipsa perferendis adipisci veritatis nemo voluptate, assumenda molestias unde aperiam quisquam cumque debitis, ea incidunt odit expedita facilis, molestiae quam sint doloremque officia nemo explicabo qui. Libero maxime magnam, dolores quaerat quos nisi dolorem libero eaque at, nobis eaque omnis labore libero magnam officia. Quis aperiam tempore perferendis asperiores pariat cum, accusamus error ratione, consectetur minus saepe veritatis harum, similique aliquid exercitationem cum assumenda, natus unde non veniam quas illum enim amet sequi quis molestias.</p> <p>Mollitia amet voluptatum facere blanditiis</p> <p>Et ullam placeat ut accusamus recusandae quidem totam veritatis voluptatibus. Officia quae voluptates necessitatibus beatae atque laudantium voluptas voluptate veritatis sequi vero, dolore asperiores at molestias iusto eum ab necessitatibus, voluptatibus quis minus? Distinctio eos dolore corporis corrupti ducimus facilis iste doloribus nisi eligendi.</p>
---	--

3rd Layer: RML

- "Report Markup Language"
- Platypus in XML + Black Box + ¥\$€
- See also: z3c.rml (S. Richter et al. – free)
- PageCatcher (more ¥\$€) for PDF import
- See also: one of my next announcements...

Paragraphs

Features

- Subclass of the Flowable class
- Core class in Platypus (paragraph.py)
- No alternative (except para.py – R.I.P.)
- Central feature: linebreaks
- Knows style attributes

Global Style Attributes

- `fontName, fontSize, textColor, backColor`
- `firstLineIndent, leftIndent, rightIndent`
- `alignment, leading, (spaceBefore, spaceAfter)`
- `bulletColor, bulletFontName, bulletFontSize, bulletIndent, bulletOffsetY`
- Sample:

```
stylesheet = getSampleStyleSheet()  
bt = stylesheet['BodyText']  
bt.leading = 16  
bt.textColor = colors.blue
```

Local Style Attributes

- XML tags in paragraph text:
- font, br, b, i, u, strong, strike, a, link, img
- superscript, subscript, greek
- seq, seqDefault, seqReset
- Sample:

```
t = "Hello <font color='red'>red</font> world!"  
p = Paragraph(t, style=myStyle)
```

Lacking...

- Inline images (new in SVN)
- Hyphenation
- Kerning
- Code comprehensibility
- Code extensibility

”Reporting Solutions“!?

Efficiency!?

Paragraphs Reloaded

New Approach

- New Flowable!
- MinimalParagraph class
- Easily extensible (shown in subclasses)
- Linebreaks (and not much more)!
- Critical methods: wrap, split, draw

Sample: XBox

```
class XBox(Flowable):

    def __init__(self, width, height, text='A Box'):
        Flowable.__init__(self)
        self.width, self.height, self.text = width, height, text

    def draw(self):
        canv, w, h = self.canv, self.width, self.height
        canv.rect(0, 0, w, h)
        canv.line(0, 0, w, h)
        canv.line(0, h, w, 0)

        canv.setFont('Times-Roman', 12)
        canv.drawCentredString(0.5*w, 0.5*h, self.text)

    # inherited by Flowable:

    def wrap(self, availWidth, availHeight):
        return (self.width, self.height)

    def split(self, availWidth, availheight):
        return []
```


Key Idea: "Events"

- Input text: "Hello world"
- Parsed: [{"text": "Hello"}, {"text": "world"}]
- Word widths: [{"text": "Hello", "width": 10}, {"text": "world", "width": 11}]
- Placement: [{"text": "Hello", "width": 10, "pos": (10, 5)}, {"text": "world", "width": 11, "pos": (23, 5)}]
- Add attributes as needed

MinimalParagraph

- Global attributes: `fontName`, `fontSize`, `leading`, `firstLineIndent`, `leftIndent`, `rightIndent`, `textColor`, (`spaceBefore`, `spaceAfter`)
- No alignment (left only), ...
- Focus on linebreaks and RL compliance

Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do: once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, 'and what is the use of a book,' thought Alice 'without pictures or conversation?'

So she was considering in her own mind (as well as she could, for the hot day made her feel very sleepy and stupid), whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a White Rabbit with pink eyes ran close by her.

There was nothing so VERY remarkable in that; nor did Alice think it so VERY much out of the way to hear the Rabbit say to itself, 'Oh dear! Oh dear! I shall be late!' (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but when the Rabbit actually TOOK A WATCH

well, and noticed that they were filled with cupboards and book-shelves; here and there she saw maps and pictures hung upon pegs. She took down a jar from one of the shelves as she passed; it was labelled 'ORANGE MARMALADE', but to her great disappointment it was empty: she did not like to drop the jar for fear of killing somebody, so managed to put it into one of the cupboards as she fell past it.

'Well!' thought Alice to herself, 'after such a fall as this, I shall think nothing of tumbling down stairs! How brave they'll all think me at home! Why, I wouldn't say anything about it, even if I fell off the top of the house!' (Which was very likely true.)

Down, down, down. Would the fall NEVER come to an end! 'I wonder how many miles I've fallen by this time?' she said aloud. 'I must be getting somewhere near the centre of the earth. Let me see: that would be four thousand miles down, I think--' (for you see

MinimalParagraph

ColouredParagraph

```
#!/bin/env/python
# -*- coding: utf-8 -*-

"An example for a coloured paragraph \
subclass."

import random

from reportlab.lib import colors

from minimalparagraph import \
MinimalParagraph

RL_COLORS = [v for (k, v) in \
    colors.__dict__.items() \
    if isinstance(v, colors.Color)]

class ColouredParagraph(MinimalParagraph):
    "A colourful tiny subclass \
of MinimalParagraph."

    def draw(self):
        "Render words in paragraph on randomly \
        coloured background."

        if not self.words:
            return

        canvas = self.canv
        style = self.style

        canvas.saveState()

        canvas.setFont(style.fontName, style.fontSize)

        for word in self.words:
            if "meta" in word or not "pos" in word:
                continue
            text, (x, y) = word["text"], word["pos"]
            col = random.choice(RL_COLORS)
            canvas.setStrokeColor(col)
            canvas.setFillColor(col)
            canvas.rect(x, y - self.dy,
                        word["width"], style.fontSize,
                        fill=True, stroke=True)
            canvas.setFillColor(style.textColor)
            canvas.drawString(x, y - self.dy, text)

        canvas.restoreState()
```

know. But do cats eat bats, I wonder?' And here Alice began to get rather sleepy, and went on saying to herself, in a dreamy sort of way, 'Do cats eat bats? Do cats eat bats?' and sometimes, 'Do bats eat cats?' for, you see, as she couldn't answer either question, it didn't much matter which way she put it. She felt that she was dozing off, and had just begun to dream that she was hand in hand with Dinah, and saying to her very earnestly, 'Now, Dinah, tell me the truth: did you ever eat a bat?' when suddenly, thump! thump! down she came upon a heap of sticks and dry leaves, and the fall was over.

Alice was not a bit hurt, and she jumped up on to her feet in a moment: she looked up, but it all dark overhead; before her another long passage, and the White Rabbit was still in sight, hurrying down it. There was not a moment to be lost: away went Alice like the wind, and was just in time to hear it say, as it turned a corner, 'Oh my ears and whiskers,

rat-hole: she knelt down and looked along the passage into the loveliest garden you ever saw. How she longed to get out of that dark hall, and wander about among those beds of bright flowers and those cool fountains, but she could not even get her head through the doorway; 'and even if my head would go through,' thought poor Alice, 'it would be of very little use without my shoulders. Oh, how I wish I could shut up like a telescope! I think I could, if I only know how to begin.' For, you see, so many things had happened lately, that Alice had begun to think that very few things indeed were really impossible.

There seemed to be no use in waiting by the little door, so she went back to the table, half hoping she might find another key on it, or at any rate a book of rules for shutting people up like telescopes: this time she found a little bottle on it, (which certainly was not here before,' said Alice,) and round the neck of the

Coloured Paragraph

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Highlighted Paragraph

herself. (Alice had been to the seaside once in her life, and had come to the general conclusion, that wherever you go to on the English coast you find a number of bathing machines in the sea, some children digging in the sand with wooden spades, then a row of lodging houses, and behind them a railway station.) However, she soon made out that she was in the pool of tears which she had wept when she was nine feet high.

'I wish I hadn't cried so much!' said Alice, as she swam about, trying to find her way out. 'I shall be punished for it now, I suppose, by being drowned in my own tears! That WILL be a queer thing, to be sure! However, everything is queer to-day.'

Just then she heard something splashing about in the pool a little way off, and she swam nearer to make out what it was: at first she thought it must be a walrus or hippopotamus, but then she remembered how small she was now, and she soon made out that it

'pardon!' cried Alice hastily, afraid that she had hurt the poor animal's feelings. 'I quite forgot you didn't like cats.'

'Not like cats!' cried the Mouse, in a shrill, passionate voice. 'Would YOU like cats if you were me?'

HyphenatedParagraph

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HyphenlightedParagraph

IconizedParagraph



- Input text: "Hello **file://smiley.jpeg** world"
- Events: [{"text": "Hello", ...}, {"text": "**file://smiley.jpg**", "type": "Image", "width": 16, "height": 16}, {"text": "world", ...}]
- draw method picks and renders image events...

hall, and wander about among those beds of
bright flowers and those cool fountains, 🍌 but
she could not even get her head through the
doorway; `and even if my head would go
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very little use without my shoulders. Oh, how I
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IconizedParagraph

CHAPTER II

The Pool of Tears

‘Curiouser  and curiouser!’  cried Alice (she was so much surprised, that for the moment she quite forgot how to speak good English); ‘now I’m opening out like the largest telescope that ever was! Good-bye, feet!’ (for when she looked down at her feet, they seemed to be almost out of

GraphicsParagraph

ReportLab Paragraph

If you need something that isn't on the feature list, please check the mailing-list archives. Lots of features are yet to be documented, but most of the functionality has been commented in the mailing-list. If you have a

CountingParagraph

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CountingParagraph

Summary

Code Length

```
rlpara dinu$ pycount2.py *.py
```

lines	code	doc	comment	blank	file
2380	1831	66	338	145	para-svn.py
1432	1127	131	59	115	paragraph-svn.py
1299	998	129	58	114	paragraph-2.1.py

```
alterparagraphs dinu$ pycount2.py *paragraph.py
```

lines	code	doc	comment	blank	file
48	30	0	2	16	colouredparagraph.py
101	64	0	7	30	graphicsparagraph.py
75	53	0	3	19	highlightedparagraph.py
204	132	0	33	39	hyphenatedparagraph.py
264	182	0	32	50	hyphenlightedparagraph.py
186	128	0	11	47	iconizedparagraph.py
202	111	25	13	53	minimalparagraph.py
271	163	26	18	64	simpleparagraph.py
31	15	2	4	10	ttfparagraph.py

```
$ run_performance_test.py --mnp 500 ../input/alice30.txt
```

```
input file: ../input/alice30.txt
```

```
#words: 28200
```

```
#lines: 3854
```

```
#paragraphs: 500
```

Runtime

Paragraph,	time needed:	0.564515	(s)
	file size:	91901	(Byte)
MinimalParagraph,	time needed:	1.143239	(2.03 x)
	file size:	210104	(2.29 x)
SimpleParagraph,	time needed:	1.872415	(3.32 x)
	file size:	262991	(2.86 x)
TTFParagraph,	time needed:	1.635452	(2.90 x)
	file size:	244040	(2.66 x)
ColouredParagraph,	time needed:	2.368929	(4.20 x)
	file size:	544549	(5.93 x)
HyphenatedParagraph,	time needed:	4.455254	(4.86 x)
	file size:	363638	(2.51 x)
HighlightedParagraph,	time needed:	2.958230	(3.23 x)
	file size:	403546	(2.79 x)
HyphenlightedParagraph,	time needed:	4.993915	(5.45 x)
	file size:	413874	(2.86 x)
IconizedParagraph,	time needed:	1.979934	(3.51 x)
	file size:	270026	(2.94 x)
GraphicsParagraph,	time needed:	1.799298	(3.19 x)
	file size:	269538	(2.93 x)

Current State

- Family of paragraph classes
- Usually domain specific (e.g. kerning)
- Small code size
- Ca. 2–3 x slower than RL (pure text)
- Easier extensible than RL

Future

- Further Paragraph attributes
- KerningParagraph
- XMLParagraph (tags)
- General callback mechanism
- RTLParagraph? (Right to Left)

Links

- <http://www.dinu-gherman.net/tmp/alterparagraphs-0.3.2.tar.gz>
- <http://www.reportlab.com>
- <http://pypi.python.org/pypi/z3c.rml> (z3c.rml)
- <http://deco-cow.sourceforge.net> (wordaxe)

Questions?

”

*'I have answered three questions, and that is enough,'
Said his father; 'don't give yourself airs!
Do you think I can listen all day to such stuff?
Be off, or I'll kick you down stairs!'*

“

Alice's Adventures in Wonderland, Lewis Carroll