The hwriter Package

Composing HTML documents with R objects

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Introduction

HTML documents are structured documents made of diverse elements such as paragraphs, sections, columns, figures and tables organized in a hierarchical layout. Combination of HTML documents and hyperlinking is useful to report analysis results; for example, in the package arrayQualityMetrics (Kauffmann et al., 2009), estimating the quality of microarray data sets and cellHTS2 (Boutros et al., 2006), performing the analysis of cell-based screens.

There are several tools for exporting data from R into HTML documents. The package **R2HTML** is able to render a large diversity of R objects in HTML but does not easily support combining them in a structured layout and has a complex syntax. On the other hand, the package **xtable** can render R matrices with simple commands but cannot combine HTML elements and has limited formatting options.

The package **hwriter** allows rendering R objects in HTML and combining resulting elements in a structured layout. It uses a simple syntax, supports extensive formatting options and takes full advantage of the ellipsis '...' argument and R vector recycling rules.

Comprehensive documentation and examples of hwriter are generated by running the command example(hwriter), which creates the package web page http://www.ebi.ac.uk/~gpau/hwriter.

The function hwrite

The generic function hwrite is the core function of the package **hwriter**. hwrite (x, page=NULL, ...) renders the object x in HTML using the formatting arguments specified in '...' and returns a character vector containing the HTML element code of x.

If page is a filename, the HTML element is written in this file. If it is an R connection/file, the element is appended to this connection, allowing the sequential building of HTML documents. If NULL, the returned HTML element code can be concatenated with other elements with paste or nested inside other elements through subsequent hwrite calls. These operations are the tree structure equivalents of adding a sibling node and adding a child node in the document tree.

Formatting objects

The most basic call of hwrite is to output a character vector into an HTML document.

> hwrite('Hello world !', 'doc.html')

Hello world!

Character strings can be rendered with a variety of formatting options. The argument link adds a hyperlink to the HTML element pointing to an external document. The argument style specifies an inline Cascaded Style Sheet (CSS) style (color, alignment, margins, font, ...) to render the element. Other arguments allow a finer rendering control.

> hwrite('Hello world !', 'doc.html', link='http://cran.r-project.org/')

Hello world!

> hwrite('Hello world !', 'doc.html',
 style='color: red; font-size: 20pt;
 font-family: Gill Sans Ultra Bold')

Hello world!

Images can be included using hwriteImage which supports diverse formatting options.

- > img=system.file('images', c('iris1.jpg',
 'iris3.jpg'), package='hwriter')
 > hwriteImage(img[2], 'doc.html')

Arguments recycling

Objects written with formatting arguments containing more than one element are recycled by hwrite, producing a vector of HTML elements.

> hwrite('test', 'doc.html', style=paste(
 'color:', c('peru', 'purple', 'green')))

test test test

Vectors and matrices

Vectors and matrices are rendered as HTML tables.

> hwrite(iris[1:2, 1:2], 'doc.html')

Sepal.Length	Sepal.Width
1 5.1	3.5
2 4.9	3

Formatting arguments are recycled and distributed over table cells. Arguments link and style are valid. Cell background color is controlled by the argument bgcolor.

- > colors=rgb(colorRamp(c('red', 'yellow',
 'white'))((0:7)/7), max=255)
- > hwrite(0:7, 'doc.html', bgcolor=colors,
 style='padding:5px')



Formatting arguments can also be distributed on rows and columns using the syntax row.* and col.* where * can be any valid HTML attribute. Global table properties are specified using the syntax table.* where * can be any valid HTML attribute. As an example, table.style controls the global table CSS inline style and table.cellpadding controls the global cell padding size.

> hwrite(iris[1:2, 1:2], 'doc.html',
row.bgcolor='#ffdc98', table.style=
'border-collapse:collapse',
table.cellpadding='5px')

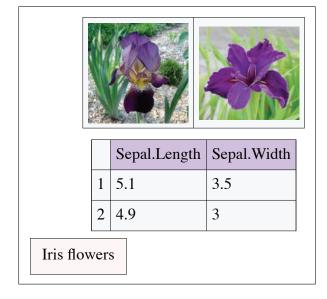
	Sepal.Length	Sepal.Width
1	5.1	3.5
2	4.9	3

Appending HTML elements to a page

A new HTML document is created by the function openPage which returns an R connection. Appending HTML elements to the page is done by passing the connection to hwrite instead of a filename. The document is closed by closePage which terminates the HTML document. The function openPage supports the argument link.css which links the document to external stylesheets containing predefined CSS styles and classes. Classes can be used with the argument class of the function hwrite.

> hcss=system.file('images', 'hwriter.css',
 package='hwriter')
> p=openPage('doc.html', link.css=hcss)
> hwriteImage(img, p, br=TRUE)
> hwrite(iris[1:2, 1:2], p, br=TRUE,
 row.bgcolor='#d2c0ed')
> hwrite('Iris flowers', p, class='intro')

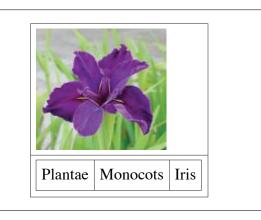
> closePage(p)



Nesting HTML elements

The function hwrite always returns a character vector containing HTML code parts. Code parts can be reused in further hwrite calls to build tables containing complex cells or inner tables, which are useful to compose HTML document layouts.

- > cap=hwrite(c('Plantae','Monocots','Iris'),
 table.style='border-collapse:collapse',
 table.cellpadding='5px')
 > print(cap)
- PlantaeMonocotsIris
- > hwrite(matrix(c(hwriteImage(img[2]),cap)),
 'doc.html', table.cellpadding='5px',
 table.style='border-collapse:collapse')



Bibliography

M. Boutros, L. Bras, and W. Huber. Analysis of cellbased RNAi screens. *Genome Biology*, 7(66), 2006.

A. Kauffmann, R. Gentleman, and W. Huber. arrayQualityMetrics - a Bioconductor package for quality assessment of microarray data. *Bioinformatics*, 25(3), 2009.

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