

Wittier Webapps with RInside: Painlessly deploying R / C++ Apps on the Net

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Lightning Talk

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Let's talk about history

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And ever since, people have tried to fuse these two.

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- html, xml, css, ...
- cgi, ajax, javascript, websockets, ...
- xml, json, yaml, ...
- wdsl, soap, dom, ...
- java, perl, python, php, ruby, ...

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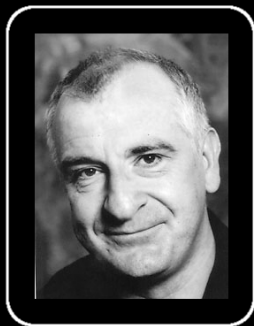
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In the beginning, the Universe was created. This has made a lot of people very angry and has been widely regarded as a bad move.

-Douglas Adams

Image source: <http://i.imgur.com/IFIFb.jpg>



There has got to be a better way

My focus here is on combining C++ and R into applications.
But how do I connect these to the Web?

- When I was researching this issue I still looked at the wrong place: [Wikipedia on JavaScript frameworks](#)
- A better answer lurked here: [Wikipedia on Web Application Frameworks](#)
- Years ago a sharp colleague implemented remote control of co-located 'bots' (essentially lean and mean headless C++ applications) via an *embedded web interface*

This led to [Wt](#) aka “witty”.

Key features of Wt

A fuller discussion / list is on the [Wt homepage](#), but in short:

- Automatic graceful degradation and progressive enhancement
- Supports server-initiated events (comet programming)
- A unified rendering API (SVG/HTML5 canvas/VML)
- Both client-side and server-side validation
- Various security features to avoid Cross-site scripting and CSRF vulnerabilities.
- Includes a compact, modern C++ ORM layer (Wt::Dbo)
- Uses WebSockets if available for communication between client and server, with fallbacks to Ajax or plain web pages

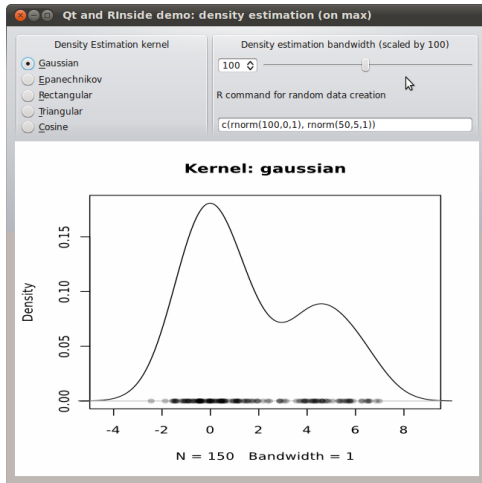
Source: [http://en.wikipedia.org/wiki/Wt_\(web_toolkit\)](http://en.wikipedia.org/wiki/Wt_(web_toolkit))

A more *personal* list:

- Zero effort installation on Debian / Ubuntu as Wt is packaged, and packaged well.
- A number of rather nice examples are included, and even the Wt website itself is written as a Wt / C++ app.
- Plenty of Doxygen-generated documentation on the API.
- Good mailing list support

It is really easy to get going.

So going from this Qt app ...



... to this Wt app is really painless

Witty WebApp With RInside - Mozilla Firefox

dirk.eddelbuettel.com:8088

10:52 PM Dirk Eddebuettel

Google

Density Estimation

Density estimation scale factor (div. by 100)

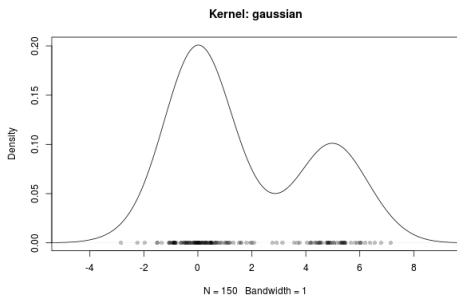
100

R Command for data generation

`c(rnorm(100,0,1), rnorm(50,5,1))`

- Gaussian
- Epanechnikov
- Rectangular
- Triangular
- Cosine

Resulting chart



Status

Finished request from 192.168.1.249 using Mozilla/5.0 (Ubuntu; X11; Linux i686; rv:8.0) Gecko/20100101 Firefox/8.0

... and even a dressier one with CSS and XML

Witty WebApp With RInside - Google Chrome

Witty WebApp With RInside x

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Overview

This example demonstrates some of the capabilities of the the [Wt library](#), in combination with the [RInside](#) classes for embedding the [R](#) statistical language and environment.

It reimplements a standard GUI / application setting: drawing from a random distribution, and estimation a non-parametric density for which the user selects the kernel and bandwidth. [RInside](#) already contains an example of this using [Qt](#) to provide a standard *application*.

Here we show how to do the same in a *web application* which, thanks to the abstractions provided by the [Wt](#), is rather straightforward.

User Input for Density Estimation

Density estimation scale factor (div. by 100)

100

R Command for data generation

Gaussian
 Epanechnikov
 Rectangular
 Triangular
 Cosine

Resulting R Chart

Kernel: gaussian

Density

0.20
0.15
0.10
0.05

Open issues for this example application

These points are mostly `RInside` issues:

- Single instance of R via `RInside`—so in the example, all 'session-specific data' goes back and forth to clients.
- Possibly cache it based on a per-client hash map cookie
- Or rather look into making `RInside` `fork()` on new connections (as e.g. `Rserve` does).
- Currently no error recovery, so each `eval()` should probably be wrapped in a `try/catch` block.

- The Wt toolkit is available and documented at `http://www.webtoolkit.eu/wt`.
- RInside is available via CRAN and `http://dirk.eddelbuettel.com/code/rinside.html`; the sources contain the Qt and Wt examples shown here.
- We mention Rcpp too as RInside relies heavily on it: available via CRAN and at `http://dirk.eddelbuettel.com/code/rcpp.html`.