

STAT 6560
Graphical Methods
Spring Semester 2009
Project 02

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R Graphics and Numerical R Output in a Web Browser Using RinRuby and Erubis

1 Motivation

- Non-programmers have difficulty to directly interact with *R*, e.g. doctors, engineers, psychologists...
- Statisticians who do the data analysis for them should be able to create a friendly interface: Web interface
- A possible outlet: *RinRuby* combined with *Erubis*
 - *RinRuby*: is a *Ruby* gem (library) that integrates the *R* interpreter in *Ruby*, making *R*'s statistical routines and graphics available within *Ruby*. Dahl & Crawford (2008)
 - *Erubis*: is a *Ruby* gem which allows you to weave *Ruby* code into *HTML* pages. Berube (2007)

2 RinRuby

- Ruby is a scripting language. Thus, it can decrease development time compared to traditional languages such as *C*, *C++*, and *Java*. Scripting languages avoid explicit type declarations and compile code at run time
- Unfortunately statistical analysis routines and graphing abilities are quite limited in Ruby. Dahl & Crawford (2008)
- *RinRuby* is a simple but effective bridge to *R* from *Ruby*
- Installation:
 - The command:

`gem install rinruby`
 - Make sure to change the path in the “initialization” procedure in the RinRuby script to “Rterm.exe”

3 Erubis

- *Erubis* is another *Ruby* gem that allows you weave *Ruby* code into *HTML* pages.

```
require "erubis"
```

- Two type of delimiter tags that mark text as being embedded *Ruby* Code:

- `<% = ...% >`: Executes code and inserts it into the output
- `<%...% >`: Simply executes code

- Example:

- Input:

```
<p> 5 + 1 = <%=5+1%></p>
```

- Output:

```
<p> 5 + 1 = 6</p>
```

- To save your output in an *HTML* file, you need to define a template object in *Ruby*:

- Input:

```
require "erubis"
template = "<html>
<body>
<h1> This is a test document <h1>
<%1.upto(3) do |number|%>
<p> This is paragraph number <%=number%>!</p>
<%end%>
<body>
"
erubyObject = Erubis :: Eruby.new(template)
puts erubyObject.evaluate()
```

– Output:

```
<html>
<body>
<h1> This is a test document </h1>
<p> This is paragraph number 1!</p>
<p> This is paragraph number 2!</p>
<p> This is paragraph number 3!</p>
</body>
```

4 A Simple Linear Regression Example

The following script (Fig.2) shows how to connect *Ruby* to *R*, and then produce the output in an *HTML* document. It presents a simple linear regression example. The simulation parameters are defined in *Ruby*, computations are performed in *R*, and *Ruby* reports the result in an *HTML* document. The output of this code is shown in (Fig.3). An enhanced version of it would be to input the simulation parameters from a graphical user interface.

```

1 require "rinruby"
2 require "erubis"
3
4 n = 10
5 beta_0 = 1
6 beta_1 = 0.25
7 alpha = 0.05
8 seed = 23423
9
10 R.x = (1..n).entries
11
12 R.eval <<EOF
13   set.seed(#{seed})
14   y <- #{beta_0} + #{beta_1}*x + rnorm(#{n})
15   fit <-lm(y~x)
16   est <-round(coef(fit),3)
17   pvalue <-summary(fit)$coefficients[2,4]
18 EOF
19
20 R.eval <<EOF
21 jpeg("scatterplot.jpg", width=700, height=500)
22 plot(x,y, main = "Scatter plot that shows the relationship between x and y.")
23 dev.off()
24 EOF
25
26 template = "
27 <html>
28 <body>
29   <center> <h1> Simple Linear Regression </h1></center>
30   <hr size="2" align="left" width="100%" color="GREEN">
31   <h3>E(y|x) ~<= #{R.est[0]}<+> <%= #{R.est[1]}< %> * x </h3>
32   <% if #{R.pvalue} < #{alpha}< %>
33     <p> Reject the null hypothesis and conclude that x and y are related.</p>
34   <% else%>
35     <p> There is insufficient evidence to conclude that x and y are related.</p>
36   <% end %>
37   <hr size="2" align="left" width="100%" color="GREEN">
38   <center>  </center>
39 </body>
40 </html>
41 "
42 f= File.open("output.html", 'w')
43 eruby_object= Erubis::Eruby.new(template)
44 eruby_object.evaluate()
45 f.write(eruby_object.evaluate())
46 f.close()
47 [EOF]

```

Figure 2: Simple Linear Regression Example using R and Ruby.

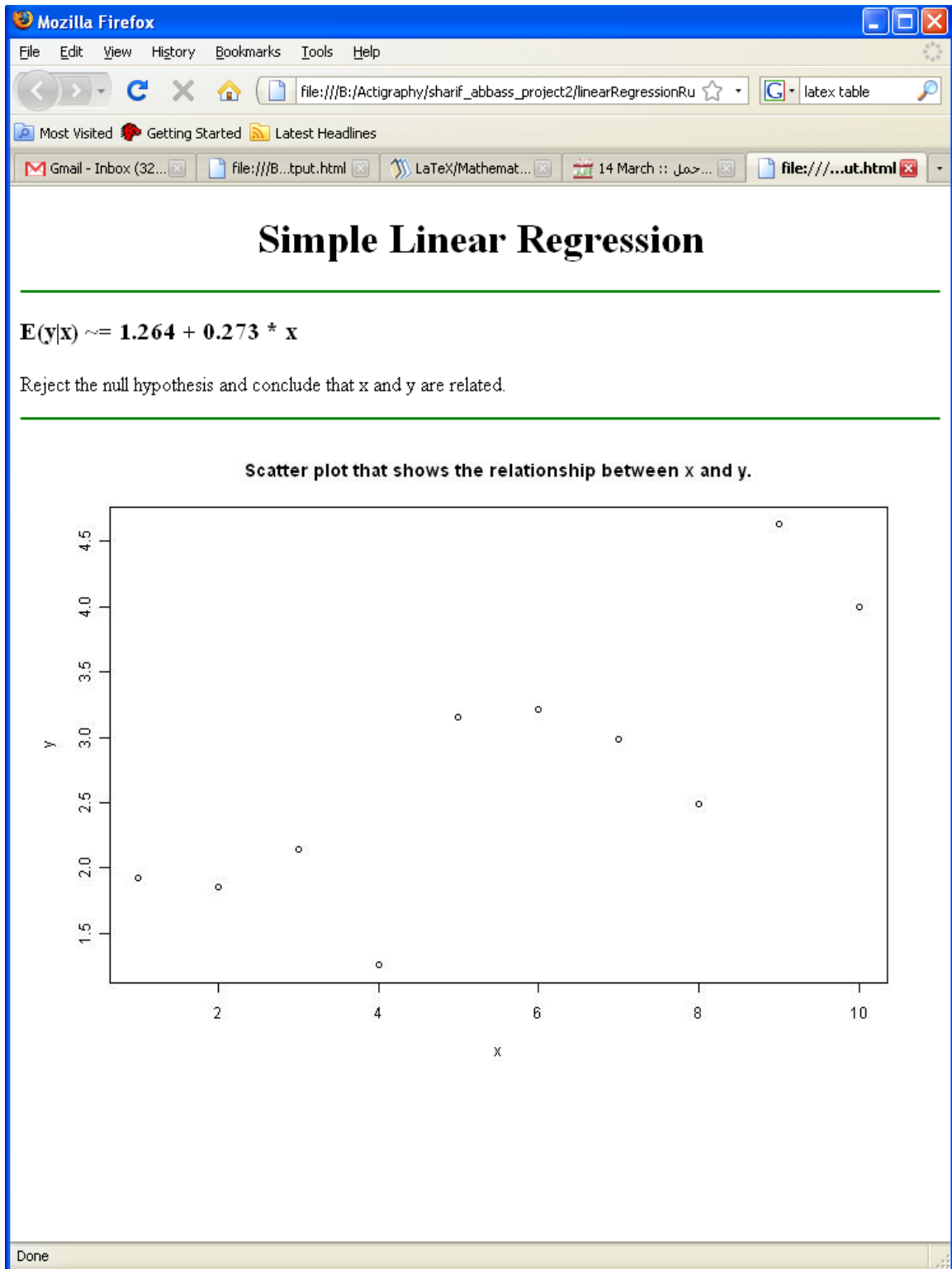


Figure 3: Output of Simple Linear Regression Example.

5 Future Work

- If *Ruby* is put on “*Rails*”, then we will have the “*Ruby on Rails*” web development environment, which is more flexible, and does most of the job for us.
- Another option is to use *FastRWeb*. It is an *R* package that allows users to create dynamic web content very easily. Urbanek (2008)

6 Links

- For a detailed description on how to install Ruby, RinRuby and Erubies, you can watch the following videocast:
http://www.screentoaster.com/watch/stUkpSS0ZIR11fQVVeXFpcU1FW/connecting_r_to_ruby
- The linear regression script could be found here:
http://www.math.usu.edu/~symanzik/teaching/2009_stat6560/RDataAndScripts/sharif_abbass_linear_regression.rb

References

- Berube, D. (2007), *HTML Templating with Erubis*, Apress, New York, NY.
- Dahl, D. B. & Crawford, S. (2008), ‘Rinruby: Accessing the r interpreter from pure ruby’, *Journal of Statistical Software* **29**(4), 1–18.
URL: <http://www.jstatsoft.org/v29/i04>
- Urbanek, S. (2008), *Fastrweb: Fast interactive web framework for data mining using r*, in ‘Proceedings of IASC, December 5-8 ,Yokohama, Japan’.