Creating Animations with R

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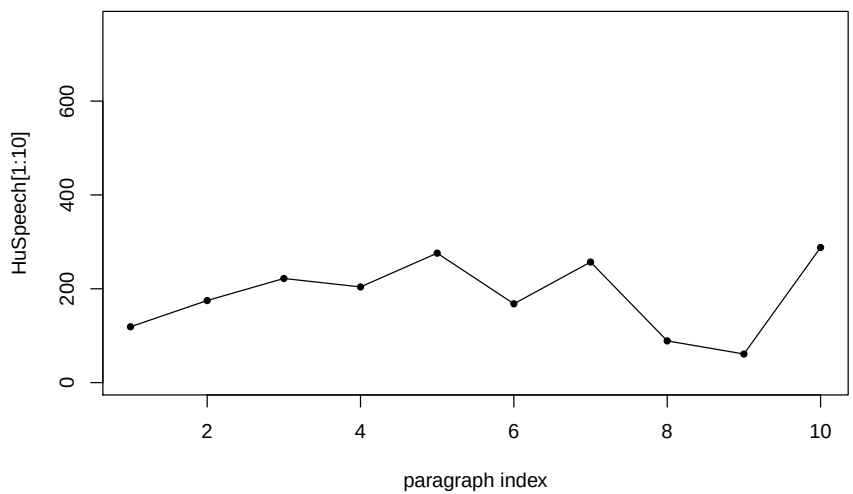
useR! 2010 @ NIST, Gaithersburg, MD



Contents

Introduction

- PhD?...
- some statistics ideas can be visualized
- and hopefully can be fun!
- the R package **animation**
  - in the beginning, the world was full of math formulae...
  - let there be animations, and there was (*awake*) audience
  - ...
  - and I created the R package **animation**
- to turn ideas into animations, quickly and faithfully
- John M. Chambers Statistical Software Award 2009
- begin with `install.packages('animation')` and enjoy!

Newton's Method

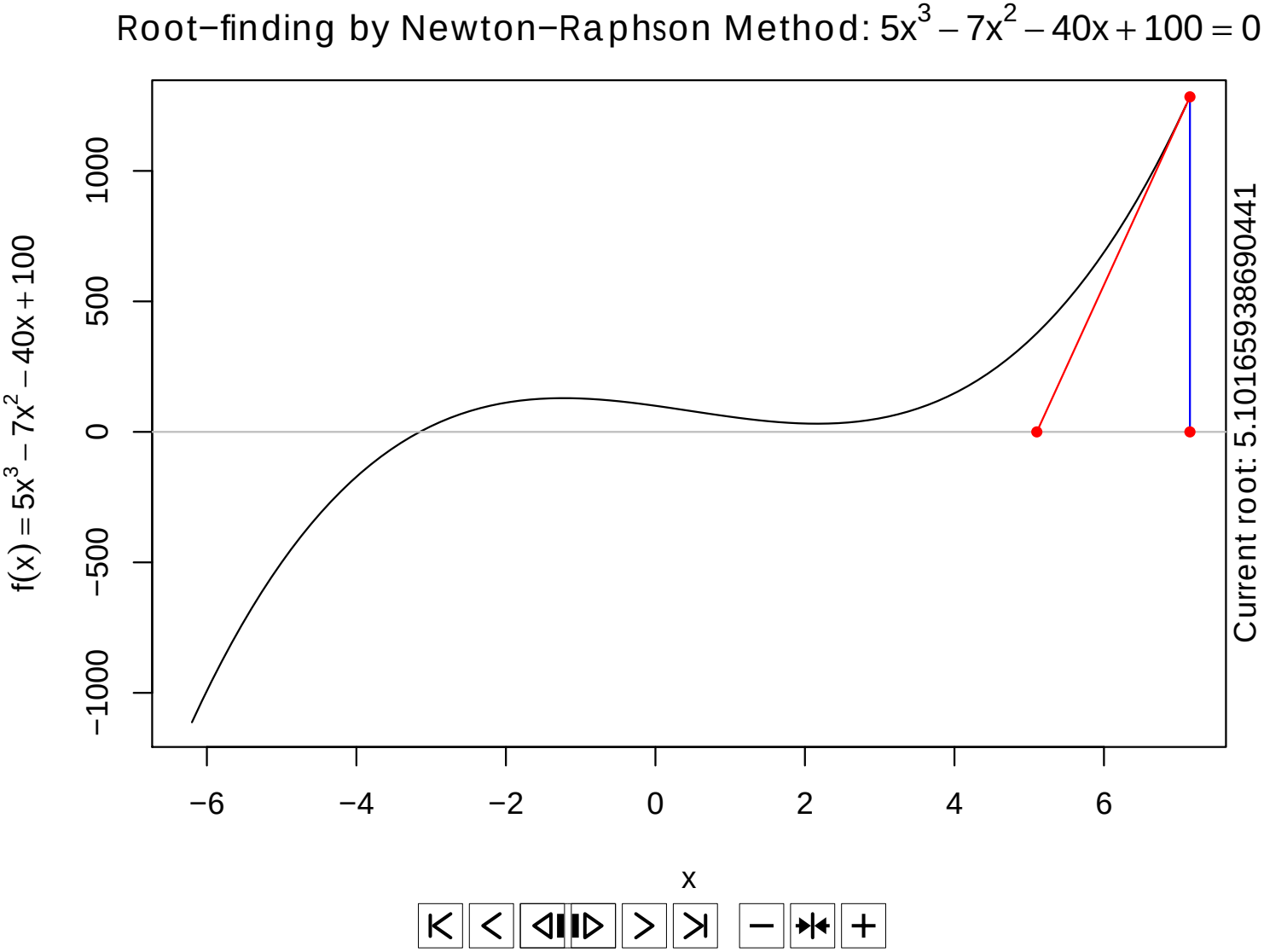


Figure 1: How Newton's method works: $x_{k+1} = x_k - f(x_k)/f'(x_k)$

Newton's Method (cont'd)

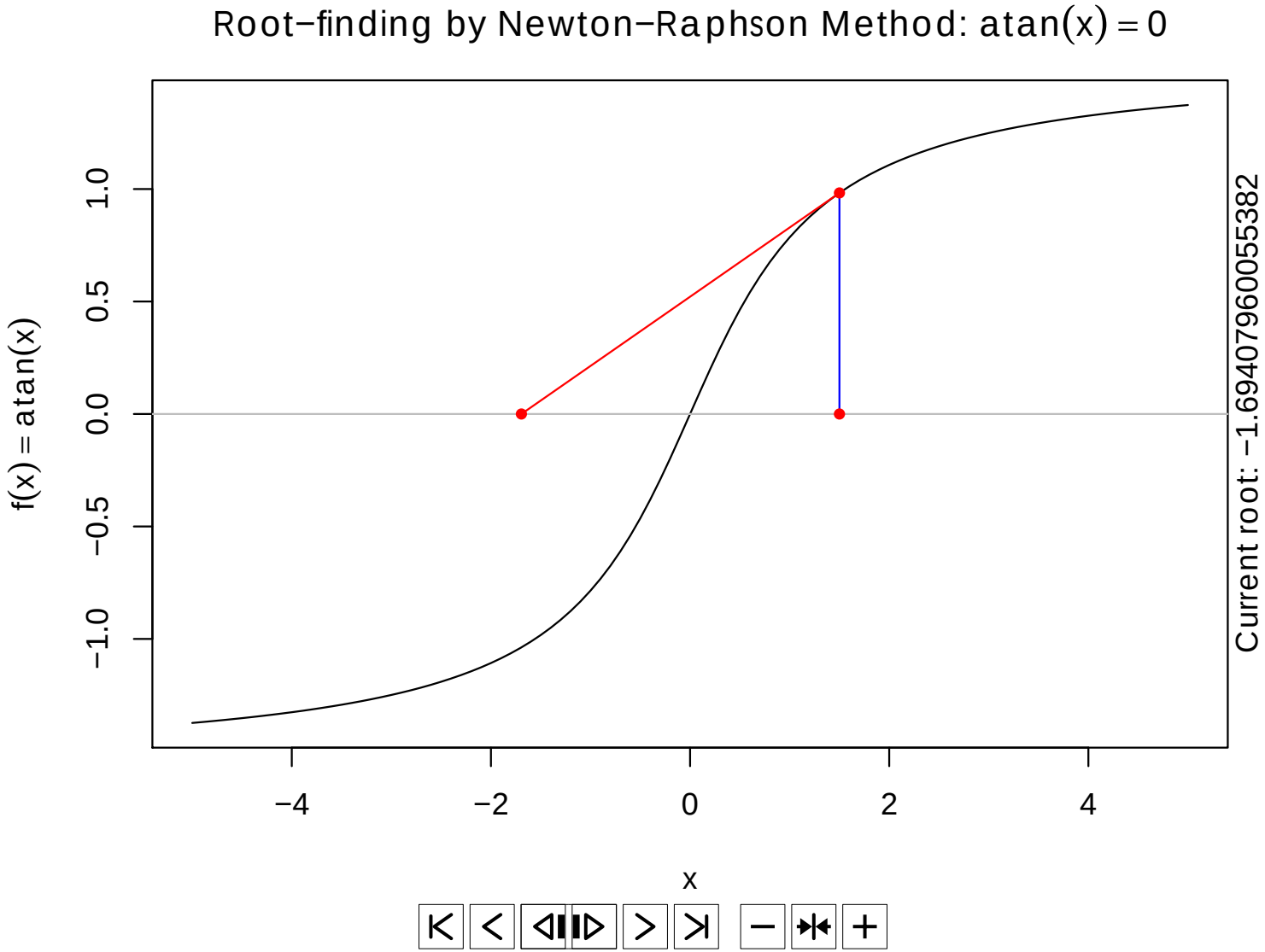


Figure 2: and when Newton's method does not work

Quincunx (the Bean Machine)

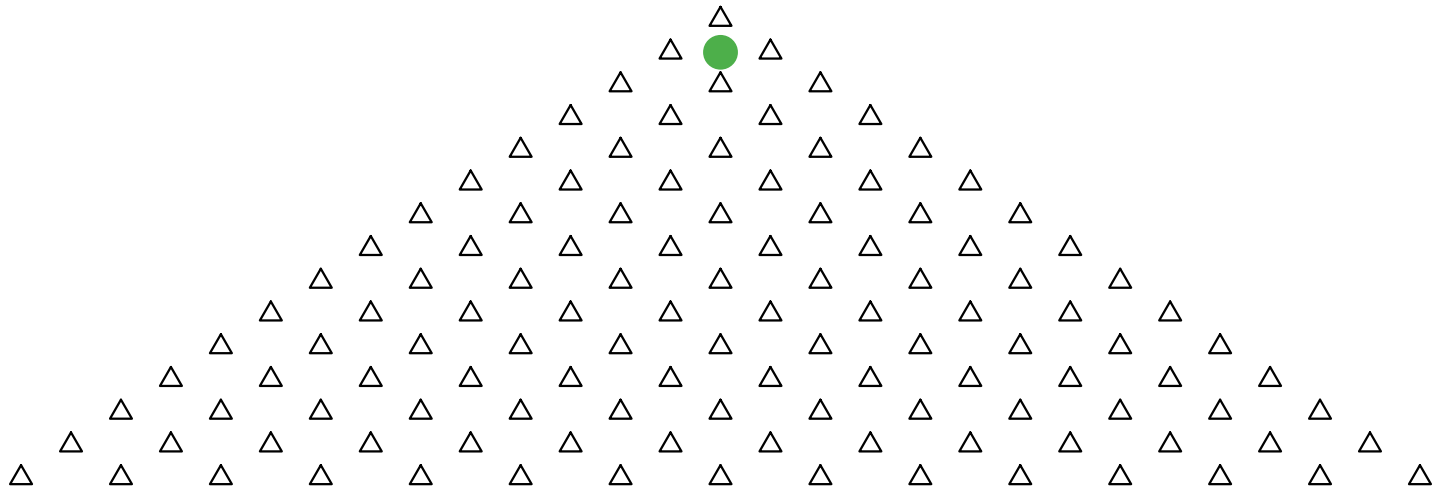


Figure 3: From randomly falling beans to the Normal distribution!

Bootstrapping

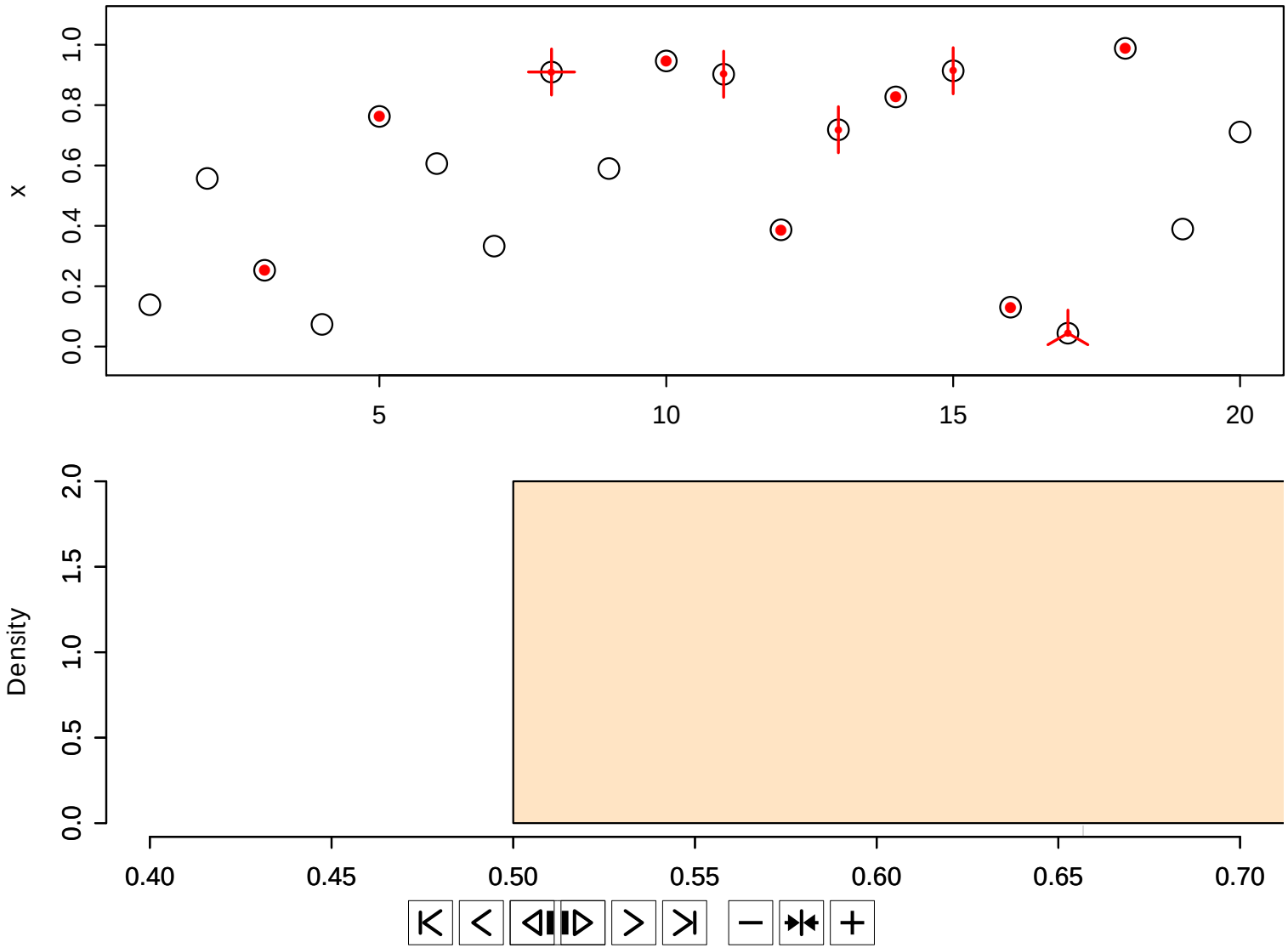


Figure 4: Bootstrapping i.i.d data and show the distribution of $\bar{x}_{\text{boot}}$

Moving Window Auto-Regression

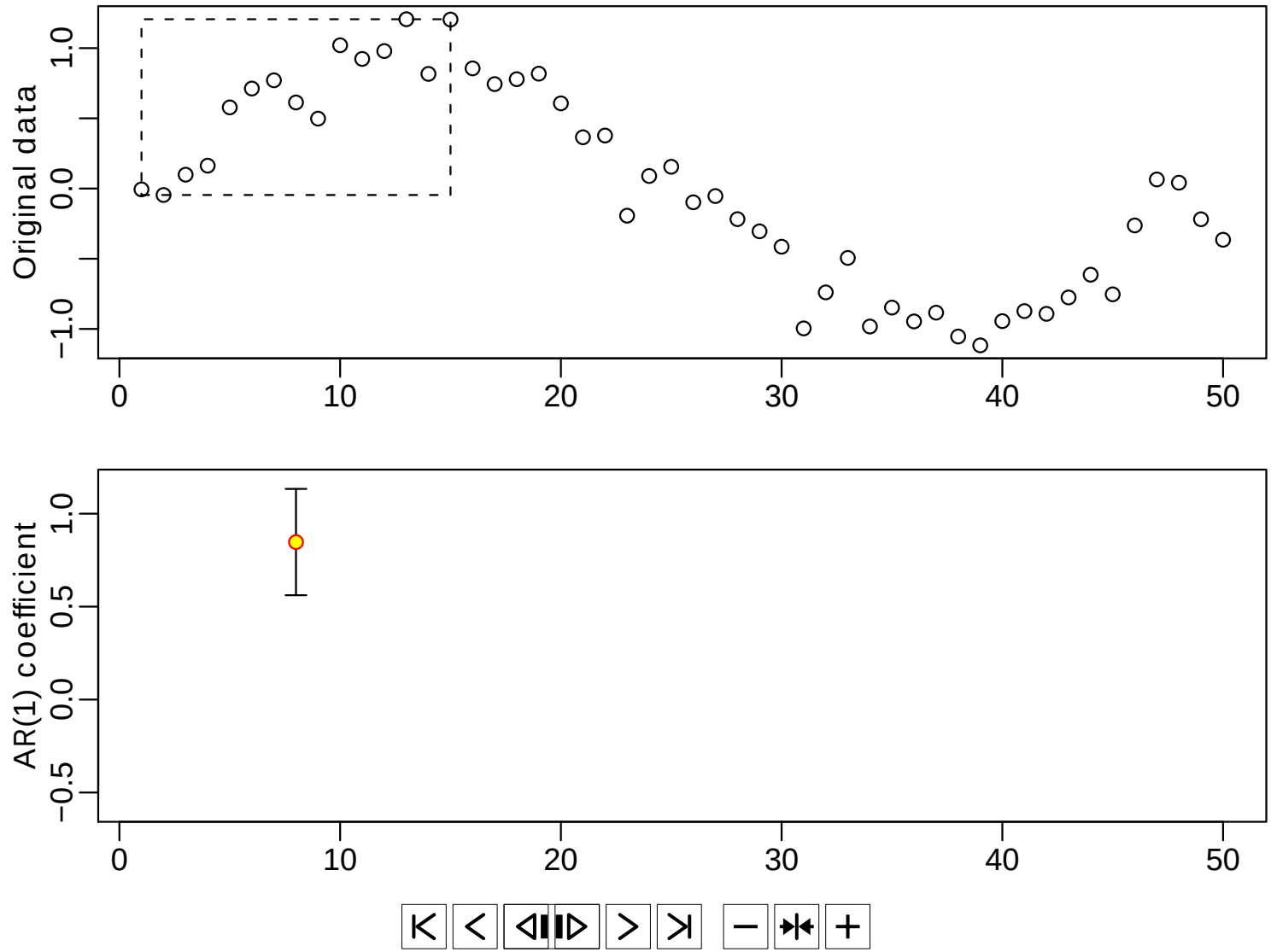


Figure 5: Moving Window Auto-Regression

Exporting Animations

- we can view the animations in the (default) windows graphics device
- but Linux users often find the pictures flickering (R does not support double buffering)
- the **animation** package supports four output formats
  - an HTML page which looks like a movie player
  - GIF created by ImageMagick
  - Flash by SWF Tools
  - PDF by LaTeX with the **animate** package

Supported Formats

Format	Function	Required tools	Viewer	Control
HTML	*ani.start()* *ani.stop()*		web browser (JavaScript)	Yes
GIF / MPEG	*saveMovie()*	ImageMagick (`convert`)	image viewer / movie player	No*
Flash	*saveSWF()*	SWF Tools (`*2swf`)	Flash player / browser plugin	No*
PDF	*saveLatex()*	pdfLaTeX	Acrobat Reader	Yes

Table 1: Supported output formats in the **animation** package (* depends on the viewer)

Other Approaches

the other two related packages (on Omegahat and R-Forge)

SVGAnnotation SVG animation with *smooth* transition between animation frames (the function *animate()*), but currently only the browser Opera supports SVG animations[1]

swfDevice generate native SWF files from R (graphics device *swf()*)

[1] sorry, this impression came from one year ago and might be inaccurate... Joran told me that Chrome and Safari also support SVG animations: `http://yihui.name/en/2010/07/my-talk-on-animations-at-user-2010/`

Conclusions

- we can reveal the processes of some statistical methods in a very straightforward way
- R is flexible enough to keep students awake in class

Thanks!

- Q&A?
- Homepage & Blog: `http://yihui.name` (slides & R code available in my CV page)
- Email: xie@yihui.name
- and check `http://animation.yihui.name` for more demonstrations online