Headless Chrome Automation with R

About the crrri package

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A web browser is like a shadow puppet theater

With behind the scene the puppet master

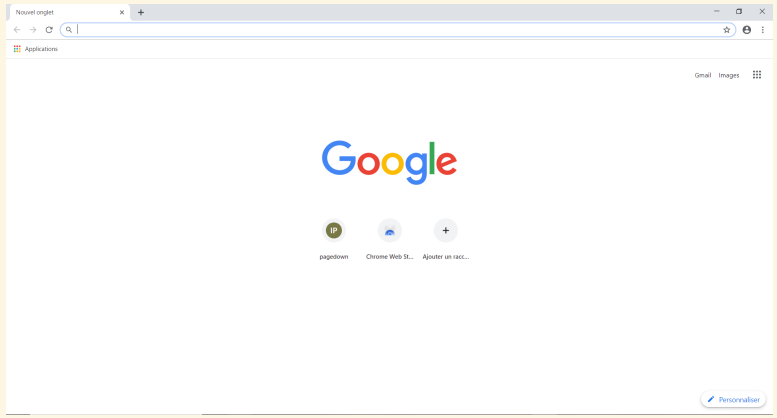
Using a headless browser

Be the stage director…

… and fully decide what should be done…

… but in the dark ! 🙉

No visual interface to see the result of your actions

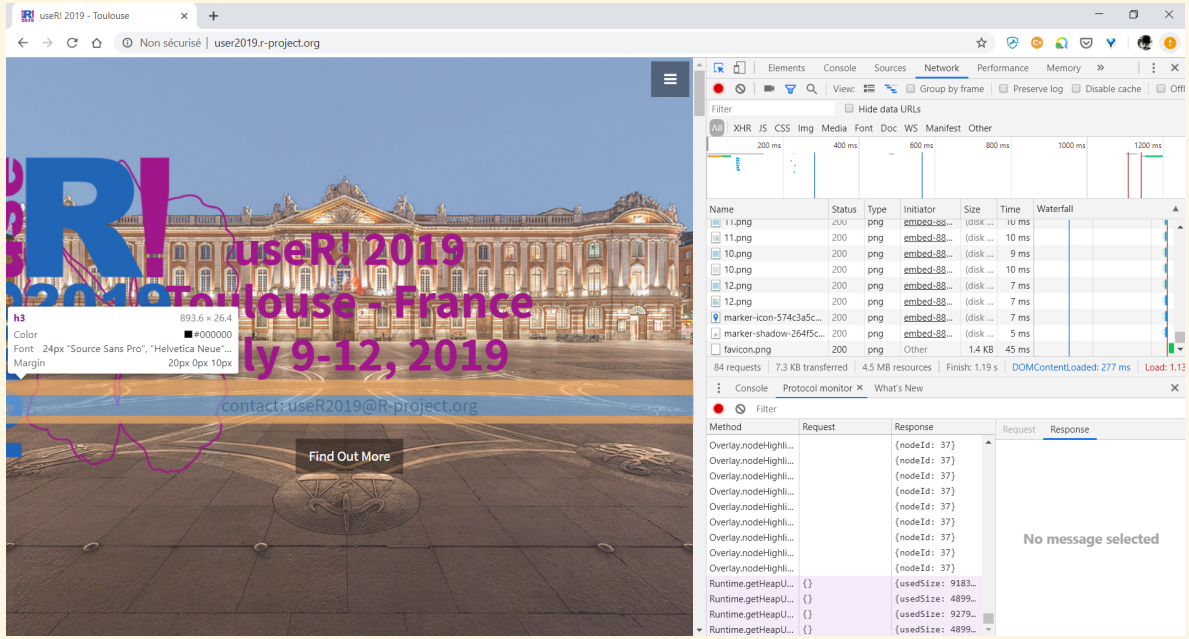


Chrome Headless mode and the Devtools protocol

Full control of Chrome using Node.js modules like
`puppeteer`, `chrome-remote-interface`

https://chromedevtools.github.io/devtools-protocol/

Interact with the protocol using json messages exchange through **websockets**.



You may already know other R related work

- RSelenium (@ropensci) client for Selenium WebDriver, requires a **`Selenium` server (Java)**.
- webshot (@wch), webdriver (@rstudio) relies on the abandoned **`PhantomJS`** library.
- htmlunit (@hrbrmstr) uses the **`HtmlUnit` Java library**.
- splashr (@hrbrmstr) works with the **`Splash` JavaScript Rendering Service**
- decapitated (@hrbrmstr) uses **headless Chrome command-line** instructions or the **Node.js gepetto module** (built-on top of the puppeteer Node.js module)
- chradle (@MilesMcBain), first tests for driving Chromium/Chrome from R using a websocket connection. An inspiration for `crrri`

What is different with the crrri package ?

https://github.com/RLesur/crrri/

Have the full control of from **without Java, NodeJS or any server**

Low-level API inspired by the chrome-remote-interface JS module **gives access to 500+ functions to control Chrome**

Dedicated to advanced uses / R packages developers

Also compatible with Opera, EdgeHtml and Safari

Only on github for now: `remotes::install_github("rlesur/crrri")`

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How to interact from R with Chrome ?

Headless Chrome can be controlled using the **Chrome DevTools Protocol (CDP)**

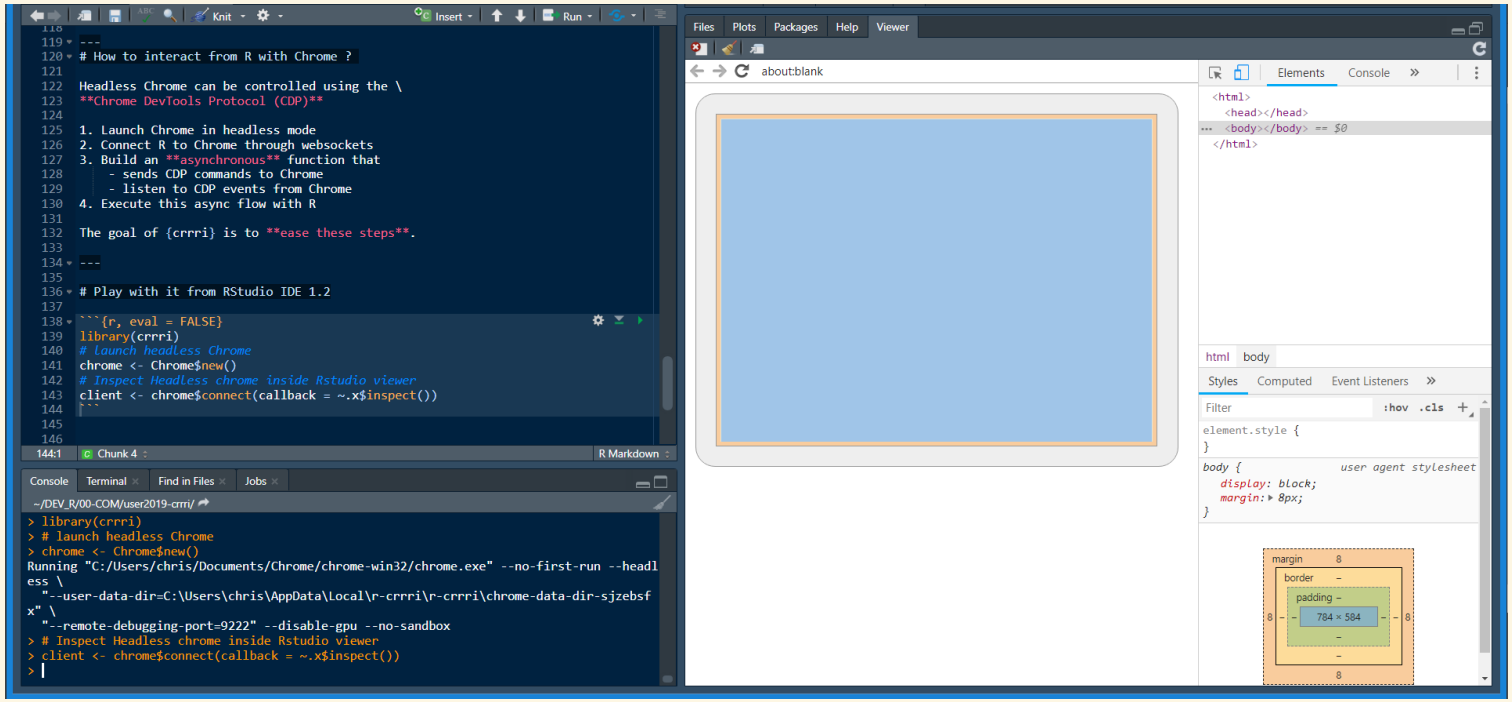
1. Launch Chrome in headless mode
2. Connect R to Chrome through websockets
3. Build an **asynchronous** function that
    - sends CDP commands to Chrome
    - listens to CDP events from Chrome
4. Execute this async flow with R

The goal of {crrri} is to **ease these steps**.

Requirement: You need to install chrome or chromium

Play with it from RStudio IDE 1.2

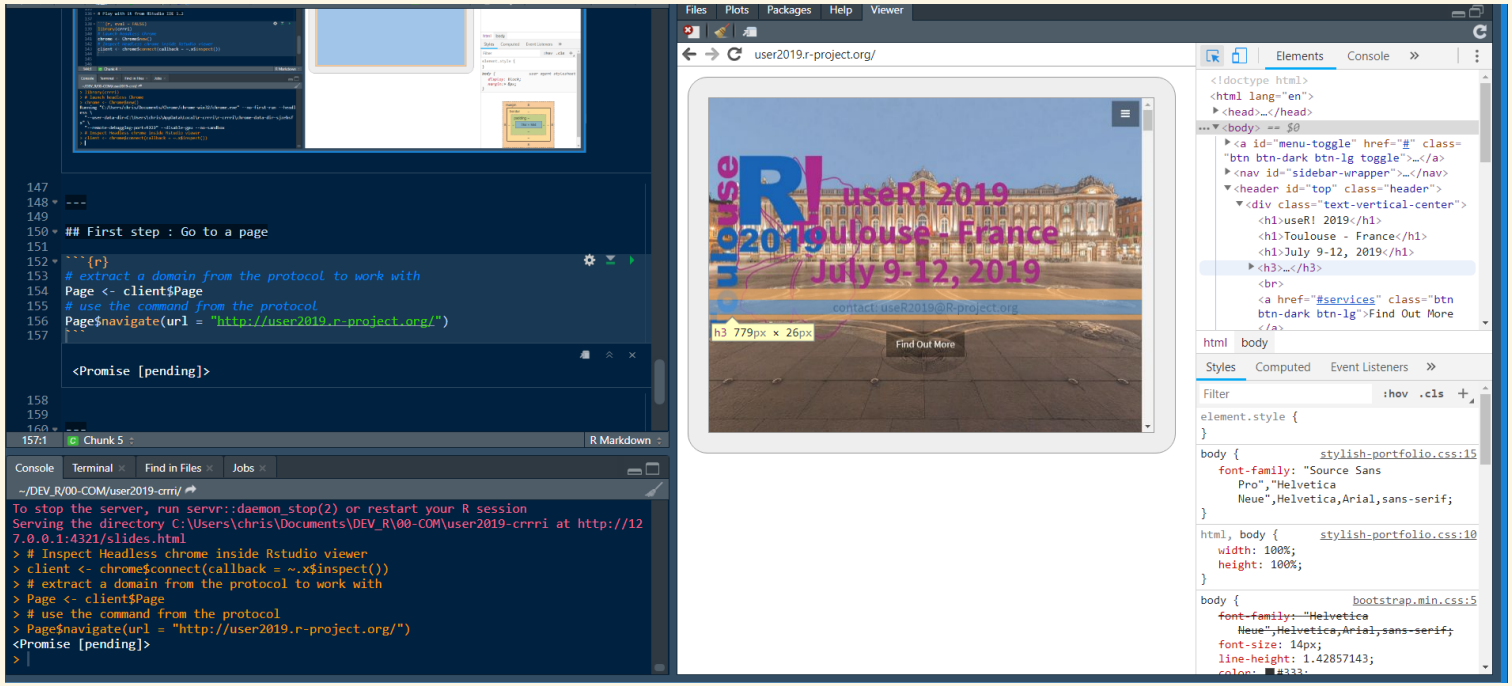
```r
library(crrri)
# launch headless Chrome
chrome <- Chrome$new()
# Inspect Headless chrome inside Rstudio viewer
client <- chrome$connect(callback = ~.x$inspect())
```



First step : Go to a page

Use a domain and its commands or event listeners

```
# extract a domain from the protocol to work with
Page <- client$Page
# Send the 'Page.navigate' command from the protocol
Page$navigate(url = "http://user2019.r-project.org/")
```



One example: Web Scraping

Using `promises` package to build aynchronous function to perform with chrome

An API close to Javascript

```
# Build an aynchronous flow - the puppet
library(crrri)
dump_DOM <- function(client) {
  Page <- client$Page
  Runtime <- client$Runtime
  Page$enable() %...>% {
    Page$navigate(
      url = 'http://user2019.r-project.org/talk_schedule/'
    )} %...>% {
      Page$loadEventFired()
    } %>% wait(3) %...>% {
       Runtime$evaluate(
         expression = 'document.documentElement.outerHTML'
      )
    } %...>% {
      writeLines(.$result$value, "users2019-talks.html")
    }
}
# and execute it using chrome - be the puppet master
perform_with_chrome(dump_DOM)
```

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}
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```

What is also possible ?

Print PDF

```
print_pdf <- function(client) {
  Page <- client$Page
  Page$enable() %...>% {
    Page$navigate(
     url = "https://r-project.org/"
    )
    # await the load event
    Page$loadEventFired()
  } %...>% {
     Page$printToPDF()
  } %...>% # await PDF reception
    write_base64("r_project.pdf")
}
# To modify depending on the page
# content (JS libraries…)
perform_with_chrome(print_pdf)
```

Screenshot and Device emulation

```
Emulation$setDeviceMetricsOverride(
  width = 375, height = 667,
  mobile = TRUE,
  deviceScaleFactor = 2
)
```

Screencast

- `Page$screencastFrame`
- `Page$startScreencast`
- `Page$stopScreencast`

Exemple on YouTube

Questions ?

See also uRos2019 talk by R.Lesur

We welcome feebacks, issues and ideas !
Tell us how you would use `crrri`

https://rlesur.github.io/crrri/


@cderv


@chrisderv


@RLesur


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