Markdown Exercise

Using a Random Number Generator to create a cleaning schedule

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Contents

Notes

Welcome dear reader

This document concerns an exercise in writing reproducible code and learning the markdown language in R.

Objectives

Here are some notes on the objectives of this document.

1. The target audience of this document is regarded as the one and only Gerko Vink and possibily classmates
2. This document should be reproducible and run flawless on any device
3. There should be a glossary, consisting of three parts
    - Abbreviations (in text, e.g. *"RNG"*)
    - Long form (in glossary, e.g. *"Random Number Generator"*)
    - Exhaustive definition (in glossary, e.g. *"A Random Number Generator creates random numbers"*)
4. Easy to read and use
5. Each function will be seperately created and stored in a folder
6. Compatability with PDF, and if the glossary allows it also HTML

Glossary

RNG Random Number Generator

Random number generation (RNG) is a process which, through a device, generates a sequence of numbers or symbols that cannot be reasonably predicted better than by a random chance. Random number generators can be true hardware random-number generators (HRNGS), which generate random numbers as a function of current value of some physical environment attribute that is constantly changing in a manner that is practically impossible to model, or pseudo-random number generators (PRNGS), which generate numbers that look random, but are actually deterministic, and can be reproduced if the state of the PRNG is known.

Chapter 1

Introduction

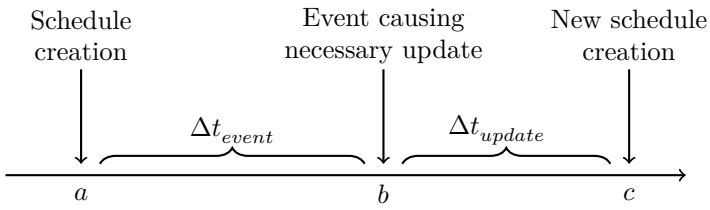
1.1 Background

Students at both selective and nonselective institutions frequently engage in academic procrastination regardless of their gender, race, or learning style. Studies indicate that fear of failure, aversiveness of the task, and fear of social disapproval by peers are primary motives for academic procrastination. Ferrari and Scher (2000) found that academic and non-academic tasks should be challenging, yet fun, to heighten the likelihood that they are completed by students.

This document will aim to challenge the author in a fun way, as suggested by Ferrari and Scher (2000). Three methods of which two use a RNG will be deployed to automatically create a cleaning schedule for a six person household with three cleaning tasks. This creates a challenge that is fun and a solution to a relevant problem which the author faces.

Since we've established that procrastination is bad, we can postulate that it is desirable to minimize the amount of effort that needs to be undertaken in order to fulfill tasks, such as household chores. In student housing, cleaning schedules are often used as tool to plan divide tasks. However, student housing is a high throughput system where residents often move to other places and new roommates take their place. This immediatly causes the schedule to be outdated. Furthermore, the schedule can be outdated. Both factors cause the schedule to be outdated as we can see in Figure 1.

Figure 1



Timeline scheduling process

A new schedule will take effort to make, causing an increase of Δt_{update}. To minimalize Δt_{update}, it is useful to automate process b as much as possible. In order to achieve this goal an approach to automate this process will be presented. This way we follow the guidelines by Ferrari and Scher (2000) in the sense that it makes this assignment challenging, fun, but also useful.

It should have the following structure:

Date	Chore 1	Chore 2	Chore 3
Date 1	Name roommate	Name roommate	Name roommate
Date 2	Name roommate	Name roommate	Name roommate

Chapter 2

Method

2.1 Deterministic versus Random Number Generator

The Random Number Generator will be used to divide tasks among roommates in a pseudo-random manner. This will then be compared to a deterministic approach so that the two methods can be compared.

First the seed is set so that our results are reproducible. Also, the tidyverse is loaded since we'll need it later.

```
library(tidyverse)
library(knitr)
set.seed(123)
```

Deterministic approach

First a function will be created for the deterministic approach. One pattern will repeat itself for the entire sequence of dates specified. We will do this as following:

```
createSchedule <- function(startDate = Sys.Date(),          # the current date is used as default
                           endDate   = Sys.Date() + 305,    #
                           createCSV = "no",
                           roommateNames
                           ) {

  # create a string of dates between startDate and endDate
  dateString <- seq(from = startDate,
                    to   = endDate,
                    by   = "days")
```

```
  # turn it into dataframe
  data <- as.data.frame(dateString)

  # add weekdays
  data <- data %>%
    mutate(days = weekdays(dateString))

  # filter out fridays
  data <- data %>%
    filter(days == "vrijdag" | days == "friday")

  # shuffle the orders of the name strings so that they can be put into dataframe
  roommateNames2 <- roommateNames[c(5,6,1,2,3,4)]
  roommateNames3 <- roommateNames[c(3,4,5,6,1,2)]

  # add columns with chores
  data <- data %>%
    mutate(gang     = rep_len(roommateNames,  length.out = nrow(data)),
           keuken   = rep_len(roommateNames2, length.out = nrow(data)),
           badkamer = rep_len(roommateNames3, length.out = nrow(data))
           )

  # format dates
  data <- data %>%
    mutate(datum = format(dateString, "%d-%m-%y"))

  # delete weekday and dateString column
  data <- data %>%
    select(datum,
           gang,
           keuken,
           badkamer)

  if (createCSV == "yes") {
    write.csv(data, file = "schedule.csv")
  } else {
      return(data)
  }

}
```

Now, we test the function and show the first 10 rows of the schedule. To do this in a reproducible manner, we specify:

- a start date

- an end date
- the names of my roommates

This will be used throughout this document. Completely by chance, the start date is my birthday and the end date Sinterklaas evening (which is my grandfathers birthday).

```
startDate     <- as.Date("1996-02-16")
endDate       <- as.Date("1996-12-15")
roommateNames <- c("thijs", "jur", "wies", "hidde", "piet", "jette")

kable(createSchedule(startDate     = startDate,
                     endDate       = endDate,
                     createCSV     = "no",
                     roommateNames = roommateNames)[1:10,])
```

datum	gang	keuken	badkamer
16-02-96	thijs	piet	wies
23-02-96	jur	jette	hidde
01-03-96	wies	thijs	piet
08-03-96	hidde	jur	jette
15-03-96	piet	wies	thijs
22-03-96	jette	hidde	jur
29-03-96	thijs	piet	wies
05-04-96	jur	jette	hidde
12-04-96	wies	thijs	piet
19-04-96	hidde	jur	jette

RNG approach 1

In this version, we use the sample function to sample one name per chore per week, The sample function uses the RNG. This approach might not be the most convenient, since it is possible for one person to have all the chores in a given week.

```
createScheduleFull <- function(startDate = Sys.Date(),
                               endDate   = Sys.Date() + 305,
                               createCSV = "no",
                               roommateNames
                           ) {

  # create a string of dates between startDate and endDate
  dateString <- seq(from = startDate,
                    to   = endDate,
                    by   = "days")

  # turn it into dataframe
```

```
  data <- as.data.frame(dateString)

  # add weekdays
  data <- data %>%
    mutate(days = weekdays(dateString))

  # filter out fridays
  data <- data %>%
    filter(days == "vrijdag" | days == "friday")

  data <- data %>%
    rowwise() %>%
    mutate(gang     = sample(roommateNames, 1, replace = TRUE),
           keuken   = sample(roommateNames, 1, replace = TRUE),
           badkamer = sample(roommateNames, 1, replace = TRUE)
           )

  # format dates
  data <- data %>%
    mutate(datum = format(dateString, "%d-%m-%y"))

  # delete weekday column and rename
  data <- data %>%
    select(datum,
           gang,
           keuken,
           badkamer)

  if (createCSV == "yes") {
    write.csv(data, file = "schedule.csv")
  } else {
      return(data)
  }

}
```

Again, we test the function and show the first 10 rows

```
kable(createScheduleFull(startDate     = startDate,
                         endDate       = endDate,
                         createCSV     = "no",
                         roommateNames = roommateNames)[1:10,])
```

datum	gang	keuken	badkamer
16-02-96	wies	jette	jette
23-02-96	jette	thijs	wies
01-03-96	wies	jur	jette
08-03-96	jur	piet	piet
15-03-96	jur	piet	wies
22-03-96	jette	hidde	jette
29-03-96	wies	piet	jur
05-04-96	piet	jur	piet
12-04-96	hidde	thijs	piet
19-04-96	jette	thijs	wies

RNG approach 2

Now, we create the another function which uses the sample function to pick roommates for chores. Every other week three names from the string of six names will be randomly assigned for a task. The next week, the three remaining names from that sample will be assigned. This way, a random sample is taken, but we avoid the problem of someone having multiple chores in one week.

```
createScheduleSemi <- function(startDate = Sys.Date(),
                               endDate   = Sys.Date() + 305,
                               createCSV = "no",
                               roommateNames
                               ) {

  # create a string of dates between startDate and endDate
  dateString <- seq(from = startDate,
                    to   = endDate,
                    by   = "days")

  # turn it into dataframe
  data <- as.data.frame(dateString)

  # add weekdays
  data <- data %>%
    mutate(days = weekdays(dateString))

  # filter out fridays
  data <- data %>%
    filter(days == "vrijdag" | days == "friday")

  # draw a random sample, fill the first row with the first three elements of the sampled vector
 for(i in seq(from = 1, to = nrow(data), by = 2)){
    sample       <- sample(roommateNames, 6)
    data[i,3]    <- sample[1]
```

```
    data[i,4]    <- sample[2]
    data[i,5]    <- sample[3]
    data[i+1, 3] <- sample[4]
    data[i+1, 4] <- sample[5]
    data[i+1, 5] <- sample[6]
 }

  # rename columns for clarity
 data <- data %>%
   rename(gang     = V3,
          keuken   = V4,
          badkamer = V5)

  # format dates
  data <- data %>%
    mutate(datum = format(dateString, "%d-%m-%y"))

  # delete weekday column and rename
  data <- data %>%
    select(datum,
           gang,
           keuken,
           badkamer)

  if (createCSV == "yes") {
    write.csv(data, file = "schedule.csv")
  } else {
      return(data)
  }

}
```

Again, we test the function and show the first 10 rows

```
kable(createScheduleSemi(startDate     = startDate,
                         endDate       = endDate,
                         createCSV     = "no",
                         roommateNames = roommateNames)[1:10,])
```

datum	gang	keuken	badkamer
16-02-96	piet	wies	thijs
23-02-96	jette	jur	hidde
01-03-96	thijs	jur	hidde
08-03-96	jette	wies	piet
15-03-96	hidde	jette	thijs
22-03-96	jur	wies	piet
29-03-96	thijs	wies	hidde
05-04-96	piet	jette	jur
12-04-96	hidde	jette	jur
19-04-96	thijs	piet	wies

We have now showed three methods to create schedules, where two use a RNG. I would really like to do an analysis go into depth on the statistics of the approaches such as double or triple assignments in a week. Also, I could have done some form of simulation to see if the approaches are fair when done X amount of times.

Unfortunetaly, most of my time went into creating the bookdown/markdown format, so I'll save this part for a later endeavour. Thanks for reading!

Bibliography

Ferrari and Scher (2000). Toward an understanding of academic and nonacademic tasks procrastinated by students. the use of daily logs. *Psychology in the Schools*, 37(4):359–366.