Dinner Party

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Description

Suppose you are at a dinner party. The host wants to give out a door prize that is wrapped in a box. Everyone (including the host) sits around a circular table and each person is given a fair coin. Initially the host is holding the box. He/she flips his coin. If it is heads, the box is passed to the right; if it is tails, it is passed to the left. The process is repeated by whichever guest is holding the box. (Heads, they pass right; tails, they pass left.) The game ends when the last person to receive the box finally gets it for the first time. That person gets to keep the box as the winner of the game.

Solution

```r
set.seed(2018)
n <- 10 # number of people
winner <- numeric()
repeattimes <- 10000
for (i in 1:repeattimes){
  table <- rep(0,n)
  gift <- rep(0,n)
  table[1] = 1
  gift[1] = 1
  while (length(which(table == 0)) > 1){
    coin <- sample(c(0,1),1) # 0 is left, 1 is right
    if (coin == 0){
      if (which(gift == 1) == 1){
        gift[n] = 1
        gift[1] = 0
        table[n] = 1
      }
      else {
        flag <- which(gift == 1)
        gift[flag - 1] = 1
        gift[flag] = 0
        table[flag - 1] = 1
      }
    }
    else {
      if (which(gift == 1) == n){
        gift[1] = 1
        gift[n] = 0
      }
      else {
        flag <- which(gift == 1)
        gift[flag + 1] = 1
        gift[flag] = 0
        table[flag + 1] = 1
      }
    }
```

```
  }
  winner[i] <- which(table == 0)
}

as.data.frame(table(winner))
```

```
##    winner Freq
## 1       2 1099
## 2       3 1149
## 3       4 1104
## 4       5 1052
## 5       6 1111
## 6       7 1181
## 7       8 1060
## 8       9 1141
## 9      10 1103
```

OH!

Although it's unbelievable, there is no optimal method to achieve the gift. The distribution of the winner is the same.