MonGame

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```
# Dice ------------------------------------------------------------------

dice <- function(verbose=FALSE){
  faces <- sample(1:6, 2, replace=TRUE)
  if(faces[1] == faces[2]){
    doubles = TRUE
  }
  else {
    doubles = FALSE
  }
  movement = sum(faces)
  if(verbose){
    cat("Rolled:", faces[1], faces[2], "\n")
  }
  return(list(faces=faces, doubles=doubles, movement=movement))
}




# Player Reference Class ------------------------------------------------


# a **very basic** reference class for our players
player <- setRefClass("player",
  fields = list(
    pos = "numeric",      # position on the board
    verbose = "logical",
    in_jail = "logical",
    n_jail = "numeric"
  ),
  methods = list(
    move_n = function(n) {
      if(verbose) cat("Player at:", pos, "\n")
      if(verbose) cat(" Player moves:", n, "\n")
      pos <<- pos + n
# Landing on Go to Jail -------------------------------------------------------------------------
      if(pos == 31){
        pos <<- 11
        in_jail <<- TRUE
      }
      if(pos > 40) pos <<- pos - 40
      if(verbose) cat(" Player now at:", pos,"\n")
    },
    go_2_space_n = function(n){
      if(verbose) cat("Player at:", pos,". \n")
```

```
      pos <<- n
# Landing on Go to Jail ------------------------------------------------------------------------
      if(pos == 31){
        pos <<- 11
      }
      if(verbose) cat(" Player now at:", pos,".\n")
    },
    inc_jail_count = function(){
      n_jail <<- n_jail + 1
    },
    reset_jail_count = function(){
      n_jail <<- 0
    },
    jailed = function(a){
      if(a == TRUE){
        in_jail <<- TRUE
      } else if (a == FALSE){
        in_jail <<- FALSE
      }
    }
  )
)



# Drawing a Chance Card ------------------------------------------------------------------------
chance <- function(p, n){ # pass in player ID and player$pos
        chance_sample <- sample(chancedeck$index, 1)
        if (chance_sample == 1){
          p$go_2_space_n(1)
        }
          else if (chance_sample == 2){
           p$go_2_space_n(25)
        }
          else if(chance_sample == 3){
           p$go_2_space_n(12)
        }
          else if(chance_sample == 4){
            if(n == 23){
              p$go_2_space_n(29)
          } else {
              p$go_2_space_n(13)
          }
        }
          else if(chance_sample == 5){
            if(n == 8){
              p$go_2_space_n(16)
          }
            else if(n == 23){
              p$go_2_space_n(26)
          }
            else p$go_2_space_n(6)
        }
```

```
          else if(chance_sample == 6){
           p$go_2_space_n(6)
        }
          else if(chance_sample == 7){
           p$go_2_space_n(40)
        }
          else if(chance_sample == 8){
           p$go_2_space_n(11)
           p$jailed(TRUE)
        }
          else if(chance_sample == 9){
           p$move_n(-3)
        }
          else{
           p$go_2_space_n(n)
        }
}


# Drawing a Community Chest Card ------------------------------------------------------------------
chest <- function(p, n){
    chest_sample <- sample(communitydeck$index, 1)
    if(chest_sample == 1){
      p$go_2_space_n(1)
    } else if(chest_sample == 2){
      p$go_2_space_n(11)
      p$jailed(TRUE)
    } else
      p$go_2_space_n(n)
}




# Space Tracking Reference Class ----------------------------------------

# a *basic* reference class to keep track of where people landed
tracking <- setRefClass("tracking",
  fields = list(
    tally = "numeric"
  ),
  methods = list(
    increase_count = function(n){
      tally[n] <<- tally[n] + 1
    }
  )
)

space_tracking <- tracking$new(tally = rep(0,40))


# Jail Functionality ------------------------------------------------------
```

```r
jail <- function(p){
  roll <- dice()
  # If player rolls a double, he leaves jail
  if(roll$doubles == TRUE){
    p$jailed(FALSE)
    p$reset_jail_count()
    p$move_n(roll$movement)
  }
  else if (p$n_jail == 3){
    p$jailed(FALSE)
    p$reset_jail_count()
    p$move_n(roll$movement)
  }
  else(p$go_2_space_n(11))
}




# Taking a turn ------------------------------------------------------------

taketurn <- function(p, track){
  #### If player is in jail ####
  if(p$in_jail == TRUE){
    p$inc_jail_count()
    jail(p)
    track$increase_count(p$pos)
  }

  #### If player not in jail ####
  else if(p$in_jail == FALSE){
    # First roll
    roll <- dice()
    # ROUTE 1: NOT A DOUBLE
    if(roll$doubles == FALSE){
      p$move_n(roll$movement)
      if(p$pos == 8 | p$pos == 23 | p$pos == 37){ # calls chance function if applicable
        chance(p, p$pos)
      }
      else if(p$pos == 3 | p$pos == 18 | p$pos == 34){ # calls chest function if applicable
        chest(p, p$pos)
      }
      track$increase_count(p$pos) # Tracks at the end of each turn
    }

    # ROUTE 2: DOUBLE
    else if(roll$doubles == TRUE){
      p$move_n(roll$movement)
      if(p$pos == 8 | p$pos == 23 | p$pos == 37){ # calls chance function if applicable
        chance(p, p$pos)
      }
      else if(p$pos == 3 | p$pos == 18 | p$pos == 34){ # calls chest function if applicable
        chest(p, p$pos)
```

```
      }
      track$increase_count(p$pos) # Tracks at the end of each turn

# Roll again for rolling doubles ------------------------------------------------------------------
      # Roll 2
      if(p$in_jail == FALSE){
      roll2 <- dice()
      # ROUTE 2.1: NOT A DOUBLE
      if(roll2$doubles == FALSE){
        p$move_n(roll2$movement)
        if(p$pos == 8 | p$pos == 23 | p$pos == 37){ # calls chance function if applicable
          chance(p, p$pos)
        }
        else if(p$pos == 3 | p$pos == 18 | p$pos == 34){ # calls chest function if applicable
          chest(p, p$pos)
        }
        track$increase_count(p$pos) # Tracks at the end of each turn
      }

      # ROUTE 2.2: DOUBLE
      else if(roll2$doubles == TRUE){
        p$move_n(roll2$movement)
        if(p$pos == 8 | p$pos == 23 | p$pos == 37){ # calls chance function if applicable
          chance(p, p$pos)
        }
        else if(p$pos == 3 | p$pos == 18 | p$pos == 34){ # calls chest function if applicable
          chest(p, p$pos)
        }
        track$increase_count(p$pos) # Tracks at the end of each turn

# Roll again (third roll) for rolling doubles -----------------------------------------------------
        # Roll 3
        if(p$in_jail == FALSE){
        roll3 <- dice()
        # ROUTE 2.2.1: NOT A DOUBLE
        if(roll3$doubles == FALSE){
          p$move_n(roll3$movement)
          if(p$pos == 8 | p$pos == 23 | p$pos == 37){ # calls chance function if applicable
            chance(p, p$pos)
          }
          else if(p$pos == 3 | p$pos == 18 | p$pos == 34){ # calls chest function if applicable
            chest(p, p$pos)
          }
          track$increase_count(p$pos) # Tracks at the end of each turn
        }
# Go to jail for rolling three doubles ------------------------------------------------------------
        # ROUTE 2.2.2: DOUBLE (JAIL)
        else if(roll3$doubles == TRUE){
          p$go_2_space_n(11)
          p$jailed(TRUE)
          track$increase_count(p$pos) # Tracks at the end of each turn

        }
```

```
      }
      }

    }

    }
  }
}



# Simulation ------------------------------------------------------------

player1 <- player$new(pos = 1, verbose = TRUE, in_jail = FALSE, n_jail = 0)  # create new players
player2 <- player$new(pos = 1, verbose = TRUE, in_jail = FALSE, n_jail = 0)




# Running the simulation ------------------------------------------------

set.seed(1)

space_tracking <- tracking$new(tally = rep(0,40))
for(i in 1:1000){ # simulate 100 games
  # cat("#### NEW GAME",i,"##### \n") no need to output after each iteration
  # new players for each game
  player1 <- player$new(pos = 1, verbose = FALSE, in_jail = FALSE, n_jail = 0)
  player2 <- player$new(pos = 1, verbose = FALSE, in_jail = FALSE, n_jail = 0)
  for(i in 1:150){ # 150 turns for each game
    if(player1$verbose) cat("Player 1 turn\n")
    taketurn(player1, space_tracking)
    if(player2$verbose) cat("Player 2 turn\n")
    taketurn(player2, space_tracking)
  }
}
# the results after 100 turns. No rules have been implemented
library(magrittr)
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.3.2
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
results <- cbind(gameboard, tally = space_tracking$tally)
results <- cbind(results, rel = results$tally/sum(results$tally))
results <- results %>% arrange(desc(rel))
```

```
print(results)
```

```
##    space                 title tally         rel
## 1     11                  Jail 39781 0.113743845
## 2     25       Illinois Avenue 10479 0.029962086
## 3      1                    Go 10037 0.028698298
## 4     19      Tennessee Avenue  9977 0.028526743
## 5     20       New York Avenue  9792 0.027997781
## 6     21          Free Parking  9759 0.027903426
## 7      6      Reading Railroad  9559 0.027331576
## 8     29           Water Works  9492 0.027140006
## 9     13      Electric Company  9472 0.027082821
## 10    26        B & O Railroad  9360 0.026762585
## 11    17       St. James Place  9310 0.026619622
## 12    22       Kentucky Avenue  9176 0.026236483
## 13    12     St. Charles Place  9150 0.026162142
## 14    27       Atlantic Avenue  8957 0.025610307
## 15    24        Indiana Avenue  8926 0.025521670
## 16    32        Pacific Avenue  8851 0.025307226
## 17    28        Ventnor Avenue  8770 0.025075627
## 18    16 Pennsylvania Railroad  8749 0.025015583
## 19    40              Boardwalk  8576 0.024520933
## 20    15       Virginia Avenue  8477 0.024237867
## 21    30        Marvin Gardens  8441 0.024134934
## 22    33 North Carolina Avenue  8414 0.024057734
## 23    18       Community Chest  8400 0.024017704
## 24    35   Pennsylvania Avenue  8236 0.023548787
## 25     5            Income Tax  7926 0.022662420
## 26     9        Vermont Avenue  7879 0.022528035
## 27    36   Short Line Railroad  7872 0.022508020
## 28    34       Community Chest  7839 0.022413665
## 29    10    Connecticut Avenue  7795 0.022287858
## 30     7       Oriental Avenue  7640 0.021844674
## 31    14         States Avenue  7583 0.021681697
## 32     4         Baltic Avenue  7175 0.020515123
## 33    39            Luxury Tax  7171 0.020503686
## 34    38            Park Place  7104 0.020312116
## 35     2  Mediterranean Avenue  6949 0.019868932
## 36     3       Community Chest  6326 0.018087619
## 37    23                Chance  4282 0.012243311
## 38     8                Chance  3131 0.008952313
## 39    37                Chance  2929 0.008374745
## 40    31            Go to jail     0 0.000000000
```

```
sum(results$tally)
```

```
## [1] 349742
```