Hexagon Tiling Test

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```r
options(digits = 6)
library(tictoc)
```

```
 Hexagon Tiling

   02    04    06
01    03    05
   08    10    12
07    09    11
   14    16    18
13    15    17
   19    20    21
```

```r
V = 21
S = 1:V
START = 1
Reward = 100
R = cbind(c(0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0),
          c(1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0),
          c(1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0),
          c(0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0),
          c(0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0),
          c(0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0),
          c(0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0),
          c(0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0),
          c(0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0),
          c(0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0),
          c(0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0),
          c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1, 1),
          c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1),
          c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0),
          c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0),
          c(0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0)
          )
R <- R-1

R[c(1,8,13,14), 7] = Reward
Q = matrix(0, V, V)
alpha = 0.6
END = 7
```

```r
get_actions <- function(s) {
  a = c()
  for (i in 1:V) {
    if(R[s,i] != -1) a = c(a, i)
  }
  return(a)
}
```

```
r = 1
rounds = 100
tic()
while (r <= rounds) {
  s = sample(S, 1)
  while (TRUE) {
    action_space = get_actions(s)
    action <- sample(action_space, 1)
    s_next <- action
    actions_next = get_actions(s_next)
    qs = c()
    for (i in actions_next) qs = c(Q[s_next,i], qs)
    Q[s,action] <- R[s,action] + alpha * max(qs)
    s = s_next
    if (s == END) break
  }
  r <- r+1
}
```

```
path = c()
state = START
Q[Q == 0] <- 1000
while (length(path) < V)
{
  pre_state = state
  path = c(path, state)
  state = match((min(Q[state,])), Q[state,])
  Q[pre_state, ] = 1000
  Q[, pre_state] = 1000
}
path = c(path, START)
```

```
toc()
```

```
## 0.203 sec elapsed
```

```
path
```

```
##  [1]  1  2  3  4  5  6 12 18 21 17 11 10 16 20 15  9  8 14 19 13  7  1
```