Markov Chains in R

Gilbert

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The package markovchain in R can be used to work with Markov Chains. We can load it and define a markov chain as follows:

```
library(markovchain)
```

```
## Warning: package 'markovchain' was built under R version 3.4.4
```

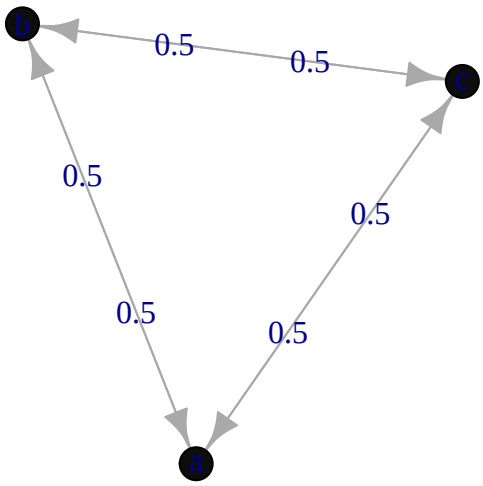
```
## Package:  markovchain
## Version:  0.6.9.11
## Date:     2018-07-01
## BugReport: http://github.com/spedygiorgio/markovchain/issues
```

```
tmA <- matrix(c(0,0.5,0.5,.5,0,.5,.5,.5,0),nrow = 3,
byrow = TRUE) #define the transition matrix

dtmcA <- new("markovchain",transitionMatrix=tmA,
states=c("a","b","c"),
name="MarkovChain A") #create the DTMC

dtmcA
```

```
## MarkovChain A
##  A  3 - dimensional discrete Markov Chain defined by the following states:
##  a, b, c
##  The transition matrix  (by rows)  is defined as follows:
##     a   b   c
## a 0.0 0.5 0.5
## b 0.5 0.0 0.5
## c 0.5 0.5 0.0
```

Including Plots

You can also plot a display with the igraph, for example:



Transistion probabilities

The easiest way to retrieve a transition probability and conditional distribution is:

```
dtmcA[2,3]
```

```
## [1] 0.5
```

```
conditionalDistribution(dtmcA,"b")
```

```
##   a   b   c
## 0.5 0.0 0.5
```

We can also simulate states distribution after n-steps, and the steady state distributions:

```
initialState<-c(0,1,0)
steps<-4
finalState<-initialState*dtmcA^steps #using power operator
finalState
```

```
##           a     b      c
## [1,] 0.3125 0.375 0.3125
```

```
steadyStates(dtmcA)
```

```
##              a         b         c
## [1,] 0.3333333 0.3333333 0.3333333
```

Another Example:

```
E <- matrix(0, nrow = 4, ncol = 4)
E[1, 2] <- 1;E[2, 1] <- 1/3; E[2, 3] <- 2/3
E[3,2] <- 1/4; E[3, 4] <- 3/4; E[4, 3] <- 1
MC <- new("markovchain", states = c("a", "b", "c","d"), transitionMatrix = E,name = "MC")
summary(MC)
```

```
## MC  Markov chain that is composed by:
## Closed classes:
## a b c d
## Recurrent classes:
## {a,b,c,d}
## Transient classes:
## NONE
## The Markov chain is irreducible
## The absorbing states are: NONE
```

This is a good environment to work with DTMCs