In de probabiliteitstheorie, is een continue Markov process a stochastisch proces dat de Markov propriteit voldoet en waarde neemt van een set state space genoemd.

**http://en.wikipedia.org/wiki/Continuous-time\_Markov\_process**

**Continuous-time Markov process**

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In [probability theory](http://en.wikipedia.org/wiki/Probability_theory), a **continuous-time** [**Markov process**](http://en.wikipedia.org/wiki/Markov_process) is a [stochastic process](http://en.wikipedia.org/wiki/Stochastic_process) { *X*(t) : *t* ≥ 0 } that satisfies the [Markov property](http://en.wikipedia.org/wiki/Markov_property) and takes values from a set called the [state space](http://en.wikipedia.org/wiki/State_space). The Markov property states that at any times *s* > *t* > 0, the conditional [probability distribution](http://en.wikipedia.org/wiki/Probability_distribution) of the process at time *s* given the whole history of the process up to and including time *t*, depends only on the state of the process at time *t*. In effect, the state of the process at time *s* is [conditionally independent](http://en.wikipedia.org/wiki/Conditional_independence) of the history of the process *before* time *t*, given the state of the process *at* time *t*.

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**[**[**edit**](http://en.wikipedia.org/w/index.php?title=Continuous-time_Markov_process&action=edit&section=1)**] Mathematical definitions**

Intuitively, one can define a time-homogeneous Markov process as follows. Let *X*(*t*) be the random variable describing the state of the process at time *t*. Now prescribe that, given that the process starts in a state *i* at time *t*, it has made the transition to some other state *j* (*j* ≠ *i*) at time *t+h* with probability given by[[1]](http://en.wikipedia.org/wiki/Continuous-time_Markov_process#cite_note-0)

\Pr(X(t+h) = j | X(t) = i) = q_{ij}h + o(h),\,

and, for *j* = *i*, the probability is given by

\Pr(X(t+h) = i | X(t) = i) = 1+ q_{ii} h + o(h),\,

where *o*(*h*) represents a quantity that goes to zero faster than *h* goes to zero (see the article on [order notation](http://en.wikipedia.org/wiki/Big_O_notation#Related_asymptotic_notations)). Hence, over a sufficiently small interval of time, the probability of a particular transition (between different states) is roughly proportional to the duration of that interval.

Continuous-time Markov processes are most easily defined by specifying the transition rates *qij*, and these are typically given as the *ij*-th elements of the **transition rate matrix** *Q*. For the probabilities to be conserved, i.e., to add up to one, the off-diagonal elements of *Q* must be non-negative and the diagonal elements must satisfy q_{ii} = -\sum_{j\neq i} q_{ij}. With this notation, and letting *pt* = \Pr(X(t) = j), the evolution of a continuous-time Markov process is given by the first-order differential equation

\frac{\partial}{\partial t} p_t = p_t Q

The probability that no transition happens in some time *r* is

\Pr(X(s) = i ~\forall~ s\in(t, t+r]\, |\, X(t) = i ) = e^{q_{ii} r}.

That is, the [probability distribution](http://en.wikipedia.org/wiki/Probability_distribution) of the waiting time until the first transition is an [exponential distribution](http://en.wikipedia.org/wiki/Exponential_distribution) with rate parameter −*qii*, and continuous-time Markov processes are thus [memoryless](http://en.wikipedia.org/wiki/Memorylessness) processes.

The [stationary probability distribution](http://en.wikipedia.org/wiki/Stationary_probability_distribution), *π*, of a continuous-time Markov process, *Q*, may (subject to some important technical assumptions) be found from the property

π*Q* = 0.

Note that

π*e* = 1,

where *e* is a column matrix with all elements consisting of 1's.

A time dependent (time heterogeneous) Markov process is a Markov process as above, but with the *q*-rate a function of time, denoted *qij*(*t*).

Verschil transition rate matrix and transition probability matrix

**http://books.google.be/books?id=31XS7ypY6IQC&pg=PA95&lpg=PA95&dq=transition+rate+matrix+and+transition+probability+matrix&source=bl&ots=x1\_0wFLPv-&sig=5IUbC7v9d4jGteu6EvqAG9sa6z4&hl=nl&ei=gYnQSrjGH4224QbH\_qikAw&sa=X&oi=book\_result&ct=result&resnum=4&ved=0CB8Q6AEwAw#v=onepage&q=transition%20rate%20matrix%20and%20transition%20probability%20matrix&f=false**