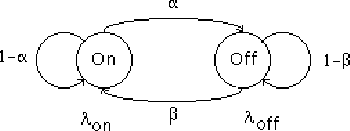
**1ste november 2009**

**http://www.stanford.edu/class/ee368c/Projects/project10/node3.html**

**Interrupted Poisson Process Source Model**

In this section we discuss the approach described by Yuang [[2](http://www.stanford.edu/class/ee368c/Projects/project10/node15.html#yuang98)]. Yuang uses a discrete-time Interrupted Poisson Process (IPP) to model packet interarrivals.

     
**Figure 1:** Interrupted Poisson Process source model.

More accurately, the channel model is a discrete-time IPP. The channel is either in the state *on* or the state *off*. In the *on* state, a packet arrives in each time slot according to a Bernoulli distribution with parameter tex2html_wrap_inline849. In the *off* state, packets do not arrive. The channel transitions from good to bad with probability tex2html_wrap_inline853, and from bad to good with probability tex2html_wrap_inline855. Thus, the transitions in the source model are given by

  equation32

Now that packet arrivals are characterized, we continue by modeling the state of the buffer, with another Markov model. In this model, each state corresponds to a level of buffer fullness. State 5, for instance, signifies that there are five packets in the buffer.

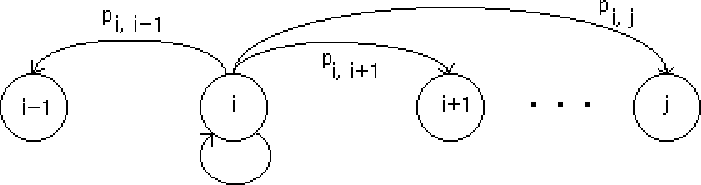
     
**Figure 2:** Markov model of buffer fullness

Figure [2](http://www.stanford.edu/class/ee368c/Projects/project10/node3.html#figbuffer) illustrates. In figure [2](http://www.stanford.edu/class/ee368c/Projects/project10/node3.html#figbuffer), state transitions occur each time a packet is removed from the buffer for playout. If the buffer is in state i and no packets arrive during the packet playout period, the buffer will transition to state i-1. If one packet arrives it will remain in state i, if two arrive it will transition to i+1 and so on. The key now is to find these transition probabilities.

Let tex2html_wrap_inline857, where tex2html_wrap_inline859, tex2html_wrap_inline861, tex2html_wrap_inline863be the probability that in t time slots *k* packets arrive and the channel ends in state *s*, given that the model begins in state *r* (*M* is the number of time slots per frame period). Define

equation48

The following expression allows the calculation of an arbitrary tex2html_wrap_inline857

equation61

It sums the probabilities of all the possible outcomes that give k packets arriving in t slots, during which time the channel transitions from r to s. Now we can use these packet arrival distributions to find the transition probabilities from one buffer state to another. Suppose that it takes *t* time slots to play out a frame. The probability that *k* packets arrive in time, *t* is given by

  equation70

Yuang assumes that the channel state probabilities are given by the steady-state distribution tex2html_wrap_inline893,

equation82

Using these stationary distributions of the channel state and allowing the length of time, *t*, between frame departures to be a function, *f*(*i*) of the buffer fullness for an adaptive scheme, we derive the transition probabilities from equation [4](http://www.stanford.edu/class/ee368c/Projects/project10/node3.html#eqntrnsprobs):

  equation92

Note that we have not specified the *i* = 0 case here. The zero state corresponds to a buffer underflow. In later sections of the paper we will vary how these transition probabilities from state zero are handled to suit our needs.

**http://www.it.lut.fi/kurssit/04-05/010611001/Exercises/Task13.htm**

1. Consider an overflow system, consisting of a primary group with N servers, and an overflow group also with N servers. The arrival process is a Poisson process with rate λa. The service time at each server is exponentially distributed with mean 1/μ.

|  |
| --- |
| **…** |

|  |
| --- |
| primary group |

|  |
| --- |
| N |

|  |
| --- |
| **…** |

|  |
| --- |
| overflow group |

|  |
| --- |
| N |

|  |
| --- |
| Poisson process |

|  |
| --- |
| λa |

|  |
| --- |
| switch all traffic to the overflow group if all servers from the primary group are busy |

The arrival process to the overflow group can be described by Interrupted Poisson Process (IPP).

|  |
| --- |
| overflow group |

|  |
| --- |
| Poisson process |

|  |
| --- |
| λa |

|  |
| --- |
| off |

|  |
| --- |
| on |

|  |
| --- |
| α |

|  |
| --- |
| β |

|  |
| --- |
| **…** |

|  |
| --- |
| IPP arrival process |

|  |
| --- |
| λ |

|  |
| --- |
| arrivals ignored |

The arrival process to the overflow group is a Poisson process which is “on”, when all servers in the primary group are busy, or “off”, when at least one server is idle.

1. Find the parameters for this IPP (λ, α, β).
2. What would be the state transmission diagram for the overflow group?

State (i,j) denotes, that there are i servers busy in the overflow group, and the arrival process is in state j (j=a: arrival process “on”, j=b: arrival process “off”).

Let N be the largest digit from your student ID.

Thus if the ID is 0110478, then N = 8.

Let λ and μ be undefined.

http://www.springerlink.com/content/xv225203h80050n5/

Abstract  Switched Poisson Processes and Interrupted Poisson Processes are often employed to characterize traffic streams in distributed computer and communications systems, especially in investigations of overflow processes in telecommunication networks. With these processes, input streams having inter-segment correlations and high variance as well as state-dependent traffic can properly be modelled. In this paper we first derive an approximation method to describe the Generalized Switched Poisson processes in conjunction with a renewal assumption. As a special case of this class of processes, the class of Interrupted Poisson processes is also included in the investigation. As a result, a generalization of the well-known class of Interrupted Poisson processes is obtained. It is shown that the renewal property is also given for this general class of Interrupted Poisson processes having generally distributed off-phase. To illustrate the accuracy of the presented renewal approximation of Generalized Switched Poisson processes and to show the major properties of the General Interrupted Poisson processes, applications to some basic queueing systems are discussed by means of numerical results.

<http://books.google.be/books?id=qUpL0OJMkrAC&pg=PA336&lpg=PA336&dq=Interrupted+Poisson+Process&source=bl&ots=MjEbTvk_qV&sig=fIeyis7zCKXOJm_56P-VNhEXd-w&hl=nl&ei=1NzFSsSmIo_m-QbQtKxJ&sa=X&oi=book_result&ct=result&resnum=10#v=onepage&q=Interrupted%20Poisson%20Process&f=false>

queueing theory and performance evaluation boek

http://ci.nii.ac.jp/naid/110001184372/en

We consider the covariance structure of an interrupted Markov modulated Poisson process. In this process, periods of on-time and off-time alternate; the on-time interval has a phase-type distribution and the off-time interval has a general one. The off-time period represents the time during which no customers arrive. The on-time period on the other hand, represents the time during which customers do arrive. Here, the arrival rate depends on the phase condition of the on-time interval distribution. We derive the Laplace-Stieltjes transform for the inter-arrival time distribution. Using the results, we study the correlation structures of succeeding inter-arrival times. When the on-time length distribution is hyperexponential, the covariance of succeeding inter-arrival lengths is positive, whereas becomes negative for Erlangian on-time lengths.

<http://books.google.be/books?id=q2iRlhPlu6cC&pg=PA17&lpg=PA17&dq=Interrupted+Poisson+Process&source=bl&ots=bQuRX7EGEN&sig=sGsb9n4JacL2sy5o9sjjyRyrlzE&hl=nl&ei=Q-DFSq7PG4PZ-Qbf69k7&sa=X&oi=book_result&ct=result&resnum=4#v=onepage&q=Interrupted%20Poisson%20Process&f=false>

**Telecomunication performance engineering**

[**http://books.google.be/books?id=IcVlwPS0qCwC&pg=PA112&lpg=PA112&dq=Interrupted+Poisson+Process&source=bl&ots=8p4\_TZTA2N&sig=7y5DQ7Ar41FOptS-ooubbvQLZnM&hl=nl&ei=Q-DFSq7PG4PZ-Qbf69k7&sa=X&oi=book\_result&ct=result&resnum=9#v=onepage&q=Interrupted%20Poisson%20Process&f=false**](http://books.google.be/books?id=IcVlwPS0qCwC&pg=PA112&lpg=PA112&dq=Interrupted+Poisson+Process&source=bl&ots=8p4_TZTA2N&sig=7y5DQ7Ar41FOptS-ooubbvQLZnM&hl=nl&ei=Q-DFSq7PG4PZ-Qbf69k7&sa=X&oi=book_result&ct=result&resnum=9#v=onepage&q=Interrupted%20Poisson%20Process&f=false)

**INTERESSANT -> Boek Stochastic Models**

**The interrupted Poisson Process is a renewal process with interevent times distributed according to an hyperexponentieel distribution.**

**http://www.maths.lth.se/matstat/kurser/fms180mas204/tenta060531.pdf**

Consider a Markov process with two states 0 and 1. The transition intensity from 0 to 1 is denoted by g, and d is the intensity of the reverse transition. When this process is in state 1, events (which you may think of as arrivals if you wish) occur according to an independent Poisson process with rate l. When the Markov process is in state 0, no Poisson events occur. The Markov process can thus be said to interrupt the Poisson process (when it is in state 0), and the sequence of events is often called an *interrupted Poisson process*.

(a) The interrupted Poisson process is a renewal process. Motivate this. (5p)

(b) Compute the intensity of this renewal process. (5p)

(c) Compute the inter-event time distribution of this renewal process.

<http://books.google.be/books?id=ErQBag-QCv0C&pg=PA250&lpg=PA250&dq=Interrupted+Poisson+Process&source=bl&ots=CldaPaSVOi&sig=6OrYCDdsxSGm_aua4-nKkt5RU74&hl=nl&ei=FOLFSonvIILX-QaB8qFG&sa=X&oi=book_result&ct=result&resnum=1#v=onepage&q=Interrupted%20Poisson%20Process&f=false>

Book 🡪 Performance analysis