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Cyclic-waiting systems

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In real life one often meets queueing systems where customers enter, get service and then leave the server or servers. The first problems were connected with the functioning of telephone systems, the first paper in this field was published in 1909 by A.K. Erlang who was the collaborator of the Copenhagen Telephone Company. If we speak of calls by phone, it is normal that some of them are refused, in such case they usually are repeated after a certain time. Erlang accepted these repeated requests as new ones, later there were considered systems taking into account primary and secondary (repeated) calls. Such systems are known as retrial queues.

In the usual retrial systems a refused request usually is repeated after an exponentially distributed random time, its memoryless property makes the investigation much easier. We consider such a system having Poisson arrivals and exponentially distributed service time with constant retrial time, in this case the service of a customer may start at the moment of arrival (if the system is empty) or at a moment differing from it by the multiples of a given cycle time T. As example one can mention the landing of airplanes and the transmission of optical signals.

The functioning of system may be characterized by the number of present customers (queue length) and the waiting time of customers. We find them by using the embedded Markov chain technique and obtain the stability condition for the system.

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