

# Paradoxical Phenomena in Theory of probability and their Applications

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**Abstract.** Mathematical models of moving particles with interaction and without overtaking are constructed. Such models are widely used in various applications, for instance in queuing theory, traffic and communication systems, biology and others. Although motion of each particle depends on a motion of the next, for motion on a straight line it was derived unusual phenomena, that separately considered particles makes random binomial walk with some parameters, which are calculated. This result allows to find the various characteristics of traffic systems and predict a traffic jam. The result also is generalized for motion on a closed curve. For queuing systems, which are described by mathematical models of moving particles the control function is introduced, which means a delay of service beginning (delay of particle moving). It was shown (Paradoxial Phenomena), that for some systems delay can improve service (reduce a customer average waiting time). The class of systems, for which it is advisable to introduce delays are described. The form of optimal function, which minimizing a customer waiting time has found. Numerical examples, demonstrating these results are given.