basque center for applied mathematics

Strategic behavior in queues

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Dates: 31 January – 4 February 2011

Abstract: The course will first introduce some concepts borrowed from non-cooperative game theory to the analysis of strategic behavior in queues. Among them: Nash equilibrium, socially optimal strategies, price of anarchy, evolutionarily stable strategies, avoid the crowd and follow the crowd. Various decision models will be considered. Among them: to join or not to join an M/M/1 or an M/G/1 queue, when to abandon the queue, when to arrive to a queue, and from which server to seek service (if at all). We will also look at the application of cooperative game theory concepts to queues. Among them: how to split the cost of waiting among customers and how to split the reward gained when servers pooled their resources.

Program:

1. Basic concepts in strategic behavior in queues: Unobservable and observable queueing models, strategy profiles, to avoid or to follow the crowd, Nash equilibrium, evolutionarily stable strategy, social optimization, the price of anarchy.
2. Examples: to queue or not to queue, priority purchasing, retrials and abandonment, server selection.
3. Competition between servers. Examples: price war, capacity competition, discipline competition.
4. When to arrive to a queue so as to minimize waiting and tardiness costs? Examples: Poisson number of arrivals, fluid approximation.
5. Basic concepts in cooperative game theory: The Shapley value, the core, the Aumann-Shapley prices. Examples: Cooperation among servers, charging customers based on the externalities they inflict on others.

Bibliography:

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