

QoS Assessment of Mobile Crowdsensing Services

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Abstract

© 2015, Springer Science+Business Media Dordrecht. The wide spreading of smart devices drives to develop distributed applications of increasing complexity, attracting efforts from both research and business communities. Recently, a new volunteer contribution paradigm based on participatory and opportunistic sensing is affirming in the Internet of Things scenario: Mobile Crowdsensing (MCS). A typical MCS application considers smart devices as contributing sensors able to produce geolocalized data about the physical environment, then collected by a remote application server for processing. The growing interest on MCS allows to think about its possible exploitation in commercial context. This calls for adequate methods able to support MCS service providers in design choices, implementing mechanisms for the quality of service (QoS) assessment while dealing with complex time-dependent phenomena and churning issues due to contributors that unpredictably join and leave the MCS system. In this paper, we propose an analytical modeling framework based on stochastic Petri nets to evaluate QoS metrics of a class of MCS services. This method requires to extend the Petri net formalism by specifying a marking dependency semantics for non-exponentially distributed transitions. The approach is then applied to an MCS application example deriving some QoS measures that can drive quantitative evaluation and characterization of the “crowd” behavior.

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Keywords

Crowdsensing, Marking dependency, Non-Markovian phenomena, performability, Petri nets, QoS