Game-Theoretic Algorithm Designs and Analysis for Interactions Among Contributors in Mobile Crowdsourcing With Word of Mouth

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Abstract

Word-of-Mouth (WoM) mode, as a new mode of task sensing in crowdsourcing, shows high efficiency in building contributor groups. To better tap the potential of WoM mobile crowdsourcing, the underlying rationale of interactions among contributors needs to be well understood. In this article, we analyze the behavior of contributors based on the Stackelberg game, and find optimal strategies for contributors. We consider two different crowdsourcing tasks announcement methods: 1) one-time parallel and 2) multitime sequential announcement ways, which form two different market scenarios. Then, we formulate two-stage and multistage contributor game models for the two scenarios, respectively. The backward induction approach is used to analyze each game, and the problems to find the optimal strategies for contributors are transformed into optimization problems. Furthermore, the Lagrange multiplier and Karush-Kuhn-Tucker (KKT) methods are used to solve the optimization problems. We theoretically prove that Stackelberg equilibrium exists and is unique. Based on the proposed theory, we design algorithms to compute the profit-maximizing contribution quantity of sensing data for each contributor. Finally, we present the detailed experimental analysis and the experimental result shows the effectiveness of the proposed algorithms.

Palabras clave

Palabras clave de autor: Games; Crowdsourcing; Task analysis; Sensors; Analytical models; Mouth; Optimization; Mobile crowdsourcing; multistage game; optimization problem; Stackelberg game; Word of Mouth (WoM)
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