Abstract

Application of Crowdsourcing and Multi-Agent Systems to Logistics and Finances

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As the real world problems become more complex and dynamic, industry looks for ways to shift from rigid centralized control models to more flexible and dynamic ones. Distributed problem-solving has become a common approach for solving many types of tasks, including logistics, data mining, finances and management. Both crowdsourcing and multi-agent systems are relatively recently emerged models for distributed problem-solving. Multi-agent systems based models are usually characterized by high fault-tolerance, good adaptability to changes and efficient resource management. Such models are particularly useful for control of large number of relatively independent but interconnected entities as is in the case of logistics, for example. The model of logic based multi-agent systems is described in the thesis. This model has demonstrated good results in a simulated experiment of cleaning robot in a smart house. This model acts as a basis of the real world applications of multi-agent systems in the other experiments describes in the thesis. Crowdsourcing on the other hand allows us to utilize human evaluation for tasks in which machine judgement is inefficient or there is not enough data for efficient machine learning. Such tasks include evaluation of people opinions, text mining, and image processing. This thesis describes several applications of multi-agent systems and crowdsourcing to real industry tasks in the areas of logistics and finances. Particularly, application of multi-agent system and crowdsourcing to map update in context of taxi navigation is described. In the experiment conducted in Azerbaijan 80 taxi drivers were using proposed system for several months. Experiment has shown that the distance per client and time per client parameters were improved

by 7.42% and 15.3% respectively compared to the standard navigation system. This thesis also describes application of crowdsourcing to risk assessment of microcredits, a financial service that is rapidly gaining popularity in many developing countries. Crowdsourcing in this context is used to evaluate clients' data using social networks. Experiment was conducted in Azerbaijan using 400 people's social accounts data. The results demonstrate that such system is capable of giving correct predictions in 90.1% of cases, with 20% false positives and 5.9% false negatives.