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AUTOMATED REASONING ON EXCEPTIONS IN COMMITMENT-BASED MULTIAGENT SYSTEMS

Exceptions constitute a significant portion of people's lives. When things do not go as planned, due to environmental reasons or because one does not bring about his responsibility in a given task, unexpected situations occur. When faced with exceptions, people need to deal with them in a timely fashion in order to restore proper working. However, dealing with exceptions is not an easy task for people to accomplish. First, it requires understanding that something has gone wrong (detection). Second, the actual source of the problem needs to be identified (diagnosis). Moreover, in some situations, identifying that an exception will possibly occur in the future helps changing the course of previously planned actions in order to avoid the exception (prediction). Accordingly, this thesis proposes to use agents for automating the reasoning on exceptions. We model the problem domains with open multiagent systems, and use commitments to formalize agent interactions. We propose automated methods based on computational logic for detecting, predicting, and diagnosing exceptions. We prove that our methods are sound and complete. We study our methods on two domains, online social networks and e-commerce, which exhibit different characteristics for the exceptions that may arise in them. Our specific contributions in this thesis are three-fold. First, we extend the scope of detected exceptions in the literature such that an exception is not limited to a commitment violation. Second, we provide a prediction system based on model checking that identifies exceptions before they even occur. Finally, we investigate the temporal relations among commitments in order to diagnose what has gone wrong during an agent's execution.

PUBLICATIONS

International Journals

1) **Özgür Kafalı**, Akın Günay and Pınar Yolum. Detecting and Predicting Privacy Violations in Online Social Networks. In Distributed and Parallel Databases, 2013.
2) **Özgür Kafalı** and Paolo Torroni. Exception Diagnosis in Multiagent Contract Executions. In Annals of Mathematics and Artificial Intelligence, volume 64, number 1, pages 73-107, 2012.

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1) **Özgür Kafalı**, Akın Günay and Pınar Yolum. PROTOSS: A run time tool for detecting PRivacy viOlaTions in Online Social networkS (Short Paper). In IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining, 2012.
2) **Özgür Kafalı**, Francesca Toni and Paolo Torroni. Reasoning About Exceptions to Contracts. In Computational Logic in Multi-Agent Systems (CLIMA XII), volume 6814 of Lecture Notes in Computer Science, pages 225-242, 2011.
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