

論文の内容の要旨  
Abstract of Dissertation

論文題目 Error Detection for Inconsistent Values Caused by Interaction Faults in Networked Systems Using Implicit Redundancies

(潜在冗長性を利用したネットワーク相互作用フォールトに起因するデータ誤りの検出)

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(本文)

Interaction faults are a major concern in networked systems build from interconnected sub-systems designed by independent parties. This work addresses the problem of detecting inconsistent values received from a sub-system, as a result of an interaction fault. This type of error is characterized by a field that is generated containing incorrect data, even though the message is correctly formatted and not corrupted during transmission. When the faulty sub-system cannot be modified and traditional schemes cannot be used, one alternative is resorting to receiver-based strategies that employ some kind of implicit redundancy --- relations between events or data. We propose an approach for detecting inconsistent values using implicit redundancies that are automatically located in examples of communications. Even without adding any redundant information to the communication, our approach can achieve reasonable error detection coverage in fields where sequential relations exist. Aspects such as false alarms and latency are also evaluated.

This work has several contributions. First and foremost, we propose a method for error detection that explores implicit redundancies, instead of the explicit redundancies used by traditional methods, which require cooperation between the sub-systems and imply in additional communication. Our method also differs from ad hoc receiver-based methods that use the knowledge of a human expert, locating implicit redundancies automatically and in a protocol-independent way. Furthermore, our approach produces sequential rules that are not discovered by existing approaches used for similar purposes, and considers more complex inputs as well. Other contributions are the overview of the challenges imposed by interaction faults in networked systems, and the method for injecting inconsistent values --- a type of error not covered by existing fault injection mechanisms.