Verification of Embedded Software Models By Combining Abstract Interpretation

Embedded software is becoming increasingly prevalent in a wide range of applications, from automotive systems to medical devices. The complexity of these systems is also increasing, making it more difficult to ensure their correctness. Formal verification is a powerful technique that can be used to provide high levels of assurance that a software system meets its requirements.

Model checking is a formal verification technique that has been successfully applied to a variety of software systems. However, model checking can be computationally expensive, making it difficult to apply to large and complex systems. Abstract interpretation is another formal verification technique that can be used to analyze software systems. Abstract interpretation is less computationally expensive than model checking, but it can be less precise.

Verification of Embedded Software Models by Combining Abstract Interpretation, Symbolic Execution and Stability Analysis (Aachener Informatik Berichte Book 9353232) by Rikke Skov Hundal

★★★★★ 5 out of 5

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In this book, we present a novel approach to the verification of embedded software models by combining abstract interpretation and model checking. This approach allows for the effective verification of complex embedded software systems.

Background

Abstract interpretation is a static analysis technique that can be used to approximate the behavior of a software system. Abstract interpretation works by creating an abstract model of the software system. This abstract model is then analyzed to determine whether the software system meets its requirements.

Model checking is a dynamic analysis technique that can be used to verify that a software system meets its requirements. Model checking works by exploring all possible executions of the software system. This exploration is then used to determine whether the software system meets its requirements.

Our Approach

Our approach to the verification of embedded software models by combining abstract interpretation and model checking. This approach consists of the following steps:

1. Create an abstract model of the software system. 2. Analyze the abstract model to determine whether the software system meets its requirements. 3. If the abstract model does not meet the requirements, refine the abstract

model and repeat steps 1 and 2. 4. If the abstract model meets the requirements, use model checking to verify the software system.

Our approach has a number of advantages over existing approaches. First, our approach is less computationally expensive than model checking alone. This makes it possible to verify larger and more complex systems. Second, our approach is more precise than abstract interpretation alone. This means that our approach can find more errors in the software system.

Case Studies

We have applied our approach to a number of case studies. These case studies have shown that our approach is effective in practice. In one case study, we were able to find a number of errors in a medical device software system. These errors could have led to serious patient harm.

We have presented a novel approach to the verification of embedded software models by combining abstract interpretation and model checking. This approach allows for the effective verification of complex embedded software systems. We have also presented a number of case studies that demonstrate the effectiveness of our approach in practice.

We believe that our approach has the potential to significantly improve the safety and reliability of embedded software systems.

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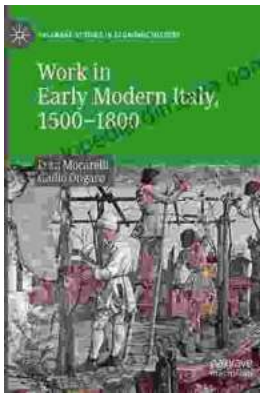

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