在面向服务的框架中，Web服务的实现与规格说明分离，服务使用者只能依据服务规格说明（即WSDL文件）访问相关Web服务。由于WSDL文件中仅仅包含Web服务接口的抽象描述，缺乏对服务提供操作的语义信息的描述，Web服务使用者难以了解Web服务的正确使用方式，易于出现无法满足Web服务的使用约束的情形，从而导致基于Web服务的应用程序的失效。

**为了提高基于Web服务的应用程序的可靠性**，本文引入约束思想，建立WSDL文件与服务实现之间的关系，解决Web服务实现与规格说明分离的问题。从Web服务行为相关的**数据**和**控制约束**出发，提出了行为模型驱动的服务组合程序测试用例生成技术，开发了相应的支持工具。本文取得的主要成果如下：

1. **归纳了服务使用过程中的行为约束：**分析由于服务存在的隐含行为逻辑导致服务调用失效的情况，归纳总结了6种服务行为约束：时效约束、区域约束、序列约束、调用约束、参数范围约束及参数关系约束。
2. **设计了支持服务行为约束表达的服务描述语言EX-WSDL：**扩展Web服务描述语言WSDL，定义了描述数据约束与控制约束的标签，支持时效约束、区域约束、序列约束、调用约束、参数范围约束及参数关系约束的表达。
3. **提出了一种基于EX-WSDL的服务行为模型生成技术：**通过解析基于EX-WSDL的服务规格说明，建立基于事件序列图的Web服务行为模型。
4. **提出了一种行为模型驱动的服务组合程序测试用例生成技术：**依据服务行为模型的特征，定义了请求节点、响应节点、边及状态四种**覆盖准则**；针对给定的行为模型，设计了满足不用覆盖准则的**测试序列生成算法**；针对每条测试序列生成**满足约束的测试数据**，形成可执行的**测试用例**。
5. **开发了行为模型驱动的服务组合程序测试用例生成工具MDGen：**MDGen支持扩展后服务描述（EX-WSDL）解析、服务行为模型生成及可视化、测试序列集生成、测试数据生成、测试用例集生成、测试执行及判定和测试结果统计。
6. **经验研究：**采用两个Web服务程序实例验证并评估提出的技术的有效性与支持工具的实用性。

本文提出的行为模型驱动的服务组合程序测试用例生成技术可以有效检测服务调用过程中违反服务行为约束的情况，为验证与增强Web服务可靠性提供理论支持。开发的支持工具提高了服务组合测试用例生成的自动化程度。

Research on Behavior Model Driven Test Case Generation Technique for Service Compositions

Abstract

In the Service Oriented Architecture framework, the implementation of Web Services is separated from specification, and users can only invocate the relevant Web Services based on the specification (that is, the WSDL file). The WSDL file only contains an abstract description of Web service interface and lack of a description of behavior logic. In this case, it is difficult for users to understand the proper usage of Web Services, and it is easy to find situations that cannot satisfy the use constraints of Web Services, resulting in the failure of applications based on Web Services.

In order to improve the reliability of the application based on Web Service, a Behavior Model Driven Test Case Generation technology is brought up from the perspective of data and control constraints related to Web Service behavior. A tool is designed and actualized to support this technique so that the practicability of the brought up method can be tested. The main contributions made in this thesis are as follows:

1. **The behavior constraints of services are summarized:** Six kinds of service behavior constraints are summarized basing on the analysis of the implicit behavior logic in services.
2. **An extended service description language EX-WSDL**: which extends WSDL to define and describe the data and control constraints. EX-WSDL supports the expression of time constraint, region constraint, sequence constraint, invocation constraint, parameter restriction constraint, and parameter relation constraint.
3. **A Behavior Model Generation Technique based on EX-WSDL**: which establishes a behavior model through parsing the service specification based on EX-WSDL.
4. **A Behavior Model Driven Test Case Generation Technique** **for Service Compositions**: Defines four kinds of coverage criteria according to the features of service behavior model to generate test sequences, extracts constraints of each test sequence and employs the constraint solving to generate test case.
5. **A Behavior Model Driven Test Case Generation tool:** which featured with EX-WSDL parsing, behavior model generation, test sequences generation, test data generation, test suite generation, and test results verification.
6. **An empirical study:** in which two Web Service programs are used to validate the applicability and effectiveness of the proposed behavior model driven test case generation technique and the practicality of the supporting tool.

In summary, the proposed Behavior Model Driven Test Case Generation technique for Service Compositions are able to detect the violation of service behavior constraints during service invocation and provide theoretical support for verifying and enhancing the reliability of Web Services. The supporting tool further improves the automation [of](E:/tool/Youdao/Dict/6.3.69.8341/resultui/frame/javascript:void(0);) this technique and thus increases its efficiency.