在面向服务的架构中，Web服务的实现与规格说明（即WSDL文件）分离，服务使用者只能依据服务规格说明访问相关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**，本文通过在WSDL文件中引入Web服务行为相关的**数据约束**和**控制约束**描述，解决服务规格说明中缺乏服务行为逻辑描述而导致服务错误调用的问题。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，开发了相应的支持工具。本文取得的主要成果如下：

1. **采用服务行为约束刻画几类可能出错的服务调用情形，设计支持服务行为约束表达的服务描述语言EX-WSDL：**分析与归纳了由于服务存在的隐含行为逻辑导致服务调用失效的情况，提出了时效约束、区域约束、序列约束、调用约束、参数范围约束、参数关系约束等6类服务行为约束类型；通过扩展标准的Web服务描述语言WSDL开发了EX-WSDL，支持上述6类约束的形式化表达。
2. **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：**通过解析基于EX-WSDL的服务规格说明，构建基于事件序列图的Web服务行为模型；定义了请求节点、响应节点、边及状态4种覆盖准则；设计了满足不用覆盖准则的**测试序列生成算法**；针对测试序列生成**满足约束的测试数据**，形成可执行的**测试用例**。
3. **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。
4. **实例研究：**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，有助于增强Web服务可靠性，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 context of Service Oriented Architecture, the implementation of web services is separated from their specification, and users can invoke a web service only through its specification written in Web Service Description Lanaguage (WSDL). WSDL only provides a rough interface description without any description on behavior logic. In this situation, it is difficult for service consumers to properly understand the invocation of web services. Such misuse of relavant servies may result to failure of applications that are based on the involved web services.

In order to improve the reliability of web service based applications, we introduce the description of behavior related data and control constraints into the specification of web services, with an aim to address the problem that WSDL lacks the description of service behavior logic. As a result, we proposed a behavior model driven test case generation technique for web services, and developed a tool to support the proposed technique and improve its practicability. The main contributions made in this thesis are as follows:

1. **An extended service description language EX-WSDL**: which introduces the description of behavior related data and control constraints into the specification of web services. EX-WSDL supports the expression of time constraint, region constraint, sequence constraint, invocation constraint, parameter restriction constraint, and parameter relation constraint.
2. **A behavior model driven test case generation technique** **for service compositions**: Establishes a behavior model through parsing the service specification based on EX-WSDL, 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.
3. **A supporting tool:** which featured with EX-WSDL parsing, behavior model generation, test sequences generation, test data generation, test suite generation, and test results verification.
4. **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 improve the reliability of web service. 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.