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# 2022 The 11th international Conference on Smart Media & Applications (SMA2022)

## October 19-22, 2022
## World Resort, Saipan, USA

# Final Program

Smart Media
KOREAN INSTITUTE OF SMART MEDIA

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Korea Institute of Science and Technology Information

# Contents

# Overall Schedule

| | | |
|---|---|---|
| **Wednesday (Oct. 19)** | | |
| 16:00~17:30 | Design Exhibition Session | Sun flower |
| | SMA Annual Meeting | Woongjin |
| **Thursday (Oct. 20)** | | |
| 09:00~10:20 | Keynote Speech #1 / Invited Talk | Sun flower |
| 10:20~10:40 | Coffee Break | Tapo Chao |
| 10:40~12:00 | Poster Session | Sun flower |
| | Regular Papers Session I | Tapo Chao A |
| | Regular Papers Session II | Tapo Chao B |
| 12:00~13:30 | Lunch Time | - |
| 13:30~14:10 | Keynote Speech #2 | Sun flower |
| 14:10~15:30 | Design Exhibition Session | Sun flower |
| | Regular Papers Session III | Tapo Chao A |
| | Regular Papers Session IV | Tapo Chao B |
| 15:30~16:00 | Coffee Break | Tapo Chao |
| 16:00~17:30 | Design Exhibition Session | Sun flower |
| | Regular Papers Session V | Tapo Chao A |
| | Regular Papers Session VI | Tapo Chao B |
| 18:30~21:00 | Banquet | World Buffet |
| **Friday (Oct. 21)** | | |
| 9:00~10:40 | Design Exhibition Session | Sun flower |
| | Session Chairs / Program Committee Meeting | Woongjin |
| 10:40~12:00 | Design Exhibition Session | Sun flower |
| | SMA Steering Committee Meeting | Woongjin |
| 13:30~16:00 | Design Exhibition Session | Sun flower |
| | Panel Discussion - 4th Industrial Revolution and Smart Media | Woongjin |
| 16:00~17:30 | Design Exhibition Session | Sun flower |
| **Saturday (Oct. 22)** | | |
| 9:00~12:00 | Design Exhibition Session | Sun flower |
| **Conference Ends at 13:30** | | |

■ **Program on October 20** **( World Resort, Saipan )**

| | **Sun flower (Link #1)** | **Tapo Chao A (Link #2)** | **Tapo Chao B (Link #3)** |
|---|---|---|---|
| 09:00~10:20 | **Keynote Speech #1 / Invited Talk** | - | - |
| 10:20~10:40 | Coffee Break | | |
| 10:40~12:00 | **Posters Session** | **Regular Papers Session I**<br>Intelligent Computing & Artificial Intelligence I<br>(Paper ID : 13.18.20.19.22.23) | **Regular Papers Session II**<br>Smart Farms, Smart Agriculture & Image Processing<br>(Paper ID : 63.49.62.42) |
| 12:00~13:30 | Lunch Time | | |
| 13:30~14:10 | **Keynote Speech #2** | - | - |
| 14:10~15:30 | **Design Exhibition Session** | **Regular Papers Session III**<br>Intelligent Computing & Artificial Intelligence II<br>(Paper ID : 9.10.12.24.27.33) | **Regular Papers Session IV**<br>Big Data, Software Engineering & Security and Trusted Computing<br>(Paper ID : 6.30.67.28) |
| 15:30~16:00 | Coffee Break | | |
| 16:00~17:30 | **Design Exhibition Session** | **Regular Papers Session V**<br>Internet of Things & Smart Transportation<br>(Paper ID : 2.3.4.14.73) | **Regular Papers Session VI**<br>Smart Grid Computing & 5G and Future Mobile Technologies<br>(Paper ID : 31.7.8.11) |

■ **Program on October 21** **( World Resort, Saipan )**

| | **Sun flower** | **Woongjin** |
|---|---|---|
| 09:00~10:40 | **Design Exhibition Session** | **Session Chairs / Program Committee Meeting** |
| 10:40~12:00 | | **SMA Steering Committee Meeting** |
| 12:00:13:30 | | |
| 13:30~16:00 | **Design Exhibition Session** | **Panel Discussion**<br>**- 4th Industrial Revolution and Smart Media** |
| 16:00~17:30 | | - |

# Session Rooms & Chairs

■ **October 20, Thursday**

| | Contents | Room | Chair |
|---|---|---|---|
| 09:00~10:20 | Opening Session<br>Keynote Speech Session#1 | Sun flower | Han Suk Choi<br>(Mokpo National University) |
| | Invited Talk | Sun flower | Junyoung Heo<br>(Hansung University) |
| 10:20~10:40 | Coffee Break | | |
| 10:40~12:00 | Poster Session | Sun flower | Kyungbaek Kim<br>(Chonnam National University)<br>Hyukro Bark<br>(Chonnam National University) |
| | Regular Papers Session I | Tapo Chao A | Lee Chilwoo<br>(Chonnam National University) |
| | Regular Papers Session II | Tapo Chao B | Seok won Jung<br>(Mokpo National University) |
| 12:00~13:30 | Lunch Time | | |
| 13:30~14:10 | Keynote Speech Session #2 | Sun flower | Jiman Hong<br>(Soongsil University) |
| 14:10~15:30 | Design Exhibition Session | Sun flower | - |
| | Regular Papers Session III | Tapo Chao A | Rim KwangCheol<br>(Chosun University) |
| | Regular Papers Session IV | Tapo Chao B | R. Young Chul Kim<br>(Hongik University) |
| 15:30~16:00 | Coffee Break | | |
| 16:00~17:30 | Design Exhibition Session | Sun flower | - |
| | Regular Papers Session V | Tapo Chao A | Hyun Seung Son<br>(Mokpo National University) |
| | Regular Papers Session VI | Tapo Chao B | Myunggwon Hwang<br>(KISTI) |

■ **October 21, Friday**

| | Contents | Room | Chair |
|---|---|---|---|
| 09:00~12:00 | Design Exhibition Session | Sun flower | - |
| 09:00~10:40 | Session Chairs / Program Committee Meeting | Woongjin | Han suk Choi (Mokpo National University) |
| 10:40~12:00 | SMA Steering Committee Meeting | Woongjin | Gueesang Lee (Chonnam National University) |
| 12:00~13:30 | | | |
| 13:30~17:30 | Design Exhibition Session | Sun flower | - |
| 13:30~16:00 | Panel Discussion<br>- 4th Industrial Revolution and Smart Media | Woongjin | Han Suk Choi<br>Junyoung Heo<br>Gueesang Lee<br>Pan-koo Kim |

# Automatic Requirement Sentence Extractions from Byproducts based on Heterogeneous Issue Tracking models in Software Visualization Environment

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## ABSTRACT

In software engineering, Automatic test case extraction from natural language requirements is a critical issue. We work on the test case generation method with requirement sentences, which tries to guarantee 100% coverage with minimal test cases. The problem requires manual input of requirement sentences. To solve this problem, we propose automatic requirement sentence extraction from byproducts on issue tracking in our visualization system. The practitioners easily manage the requirements using the Issue Tracking System in the software visualization environment. As a result, this method supports the automatic generation of test cases from requirements in the practical environment.

## KEYWORDS

Software Visualization, Automatic Sentence Extraction, Metamodel, Issue Tracking System, Software Requirement

## 1 INTRODUCTION

Today, the importance of software testing continues to increase year by year. Major enterprises perform verification and validation of their software through many tests. However, small and medium enterprises are difficult to test their software products because of insufficient development time and cost. To resolve these problems, we research our automatic test case generation method with a cause-effect graph from a natural language requirement sentence.

Even though this method can guarantee 100% requirement coverage using minimal test cases, we should manually input the requirements sentence. That is, our approach doesn't fully automate to the input of requirement sentences.

We propose an automatic requirement sentence extraction method from heterogeneous Issue Tracking System (ITS) products (Redmine [3], Jira [4], etc.) used in the software visualization environment. This method contains 1) modeling the Database (DB) of ITS products, 2) metamodeling each DB model 3) automatically generating a sentence model from DB models using model transformation rules. This method modularizes the model information and transformation rules. If we will plug & play a new ITS, we just add the new one into the SW engine by executing the model transformation and rules. As a result, we easily manage information from heterogeneous issue tracking models with our automatic requirement sentence extraction.

This paper is organized as follows. Section 2 mentions related works. Section 3 mentions our automatic requirement sentence extraction method. Section 4 mentions the conclusion.

## 2 Related Works

In our previous research, we visualize all processes for the software development lifecycle in the software visualization environment, which divides into 1) software process visualization, 2) software architecture visualization, and 3) automatic document generation [5]. The second one visualizes all processes including software

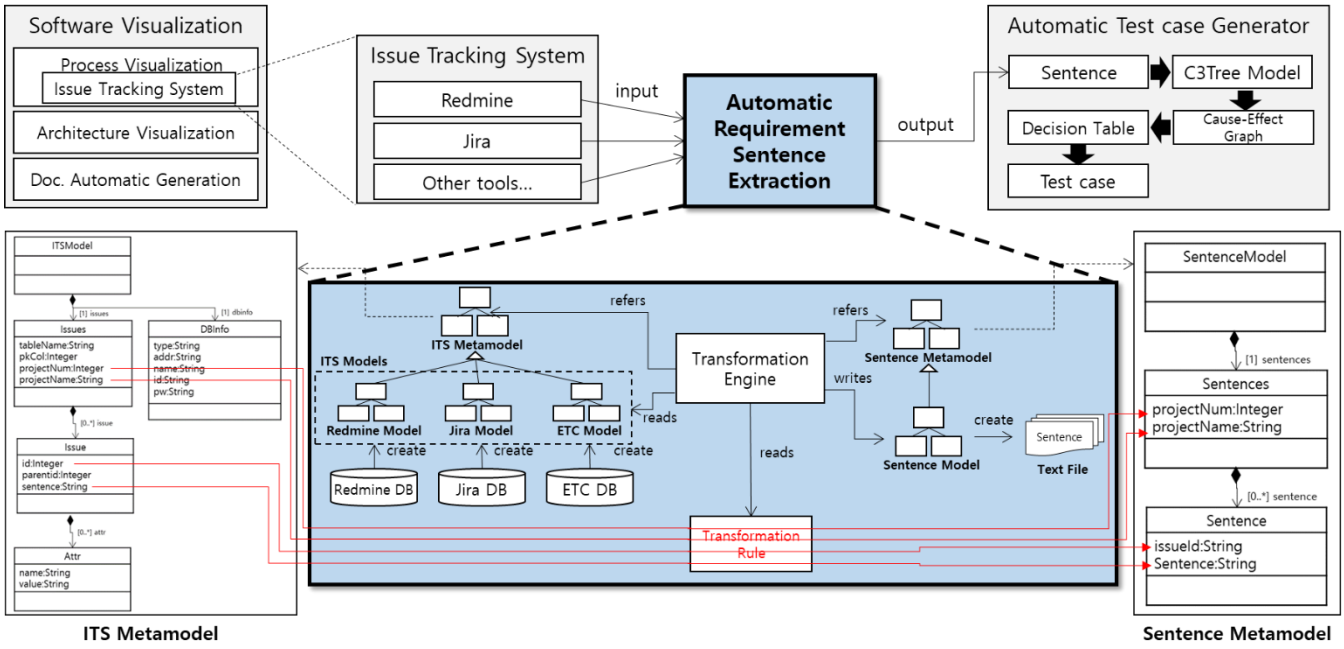


**Figure 2: Automatic requirement sentence extraction method with metamodeling on software visualization environment**

development and operation. And these processes use ITS tools for the storage and management of information. The ITS is an issue management tool for requirements analysis issues, design issues, implementation issues, testing issues, etc. Requirement analysis issues include information on requirement sentences. We automatically generate test cases from natural language requirement sentences in various ITS tools.

Figure 1 shows a method for automatically generating test cases from natural language requirements [2]. The C3Tree Model is automatically generated from requirements. The cause-effect graph model is automatically generated from C3Tree Model. The test case is automatically generated with the decision table via the cause-effect graph. The C3Tree Model is an intermediate model to express the process of slicing and simplifying complex requirement sentences [6]. The cause-effect graph is a model to identify causes and effects in sentences [7]. The decision table is a model to express the combination of inputs and outputs of all functions [7].

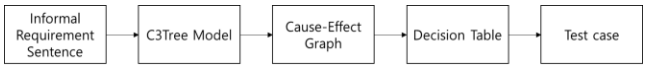


**Figure 1: Test case automatic generation with informal requirement sentence**

## 3 Automatic Requirement Sentence Extraction Method

In a software visualization environment, we include various open source tools such as ITSs in the process visualization environment. The ITS products include Redmine, Jira, etc. our test case generator automatically creates test cases with requirement sentences. We propose an automatic requirement sentence extraction method from heterogeneous ITS DBs which automatically delivers it to the Test case Automatic Generator. Figure 2 shows a requirement sentence automatic extraction method in a software visualization environment.

Our automatic process consists of ITS Models(Redmine Model, Jira Model, ETC Model), ITS Metamodel, Transformation Engine, Transformation Rule, Sentence Model, and Sentence Metamodel.

1) ITS models (Redmine Model, Jira Model, etc.) are created heterogeneous ITS DBs with issue information. 2) The ITS Metamodel is designed from the meta information of each heterogeneous ITS model. 3) The Sentence Model is a model to store natural language sentence information. 4) The Sentence Metamodel is designed from the meta information of the Sentence Model. 5) A transformation engine automatically transforms ITS models (Redmine Model, Jira Model, etc.) based on ITS Metamodel into Sentence Model based on Sentence Metamodel using Transformation Rule. 6) Transformation Rule defines the rule to change each element of ITS Metamodel to an element of Sentence Metamodel. Finally, natural language sentences are extracted from the sentence model.

(a) XMI Code of Redmine Model

```
<itsmodel>
<dbinfo type="redmine" addr="..." name="redmine" id="root" pw="..."/>
<issues tablename="issue" pkcol="4" projectnum="1" projectname="project1">
  <issue id="1" parentid="" sentence="If a input then..." />
  <issue id="2" parentid="" sentence="If b input then..." />
</issues>
</itsmodel>
```

Automatic Transformation

(b) XMI Code of Sentence Model

```
<sentencemodel>
  <sentences>
    <sentence issueid="1" sentence="If a input then ..."/>
    <sentence issueid="2" sentence="If b input then ..."/>
</sentences>
</sentencemodel>
```

**Figure 3: Transformed Results**

Figure 3 is an example of the Sentence Model automatic generation result from the Redmine Model. Each model is represented by an XMI code. As a result, the requirement sentence information is extracted from the sentence attribute of the sentence tag in the Sentence Model.

## 4 CONCLUSIONS

We propose an automatic requirement sentence extraction method from heterogeneous ITS tools within a software process visualization environment. By automatically transforming ITS models into Sentence Models, we can automatically input requirement sentences in the ITS DBs into the Test case Automatic Generator. As a result, we can easily add a new ITS tool to our system if creating only the metamodel and transformation rules for a new tool. The source code of the engine is not modified. As a result, maintenance of the engine software is increased.

## ACKNOWLEDGMENTS

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# Venue

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