ICCT 2014
"The 4th International Conference on Convergence Technology 2014"

Vol.4 No.1

- Date: July 2-5, 2014
- Place: Manila Diamond Hotel, Philippines
- Co-organized by:
  Korea Convergence Society
  Korea Institute of Science and Technology Information (KISTI)
  De La Salle University, Philippines
  Bulacan State University, Philippines
  The Korea Society of Digital Policy & Management
- Sponsored by:
  KISTI NTIS Division & GSDC Center, Selim Technical Service Group (Co.), Donggok Precision Co., Ltd.
  Kyungbong Co., Ltd., Korea IT Consulting Co., Ltd., Intormade Co., Ltd., Altorland Co., Ltd., RZsoft Co., Ltd.
  GFT Co., Ltd., Daou Technology Co., Ltd., Daewoo Information System Co., Ltd.
  LG CNS, LOTTE Data Communication Company, LG hirachi Co., Ltd., Duplex Co., Ltd., Sane Co., Ltd.
  MA Information Technology Co., Ltd., icway Co., Ltd., Lohestechn Co., Ltd., Bimsys Co., Ltd.
  Neighbor system Co., Ltd., SMT Co., Ltd., Polypia Co., Ltd.

KOREA CONVERGENCE SOCIETY
http://www.kcons.or.kr
01. W-20-07_A Study on Evaluation of Baby Boomer’s Life Redesign Educational Program / 137
   HyunJung Kang(Hanseo University, Korea)

02. W-20-09_Experience of relationship between mother-in-law and daughter-in-law among Korean rural
    married immigrant women With a focus on daughter-in-laws from China, Vietnam and the Philippines
    who live with their mother-in-laws in Korea / 139
   MinJung Kim(Hanseo University, Korea), YunJeong Kim(Hanseo University, Korea)

03. W-20-12_Relative Levels of Parents’ Life Satisfaction and their Relationship with Children’s Self-esteem,
    Stress and Parenting Attitude in Multicultural Elementary Schools of Rural Areas / 141
   ChangSeok Lee(Hanseo University, Korea)

04. W-20-16_A Study on Cultural Consumption of Korean Adults in the first decade of the 21st Century
    / 143
   EunHee Park(Ewha Womans University, Korea), HyeKyong Choi(Ewha Womans University, Korea)

05. W-20-18_A study on Needs for the Elderly Education of the Baby Boom Generation / 145
    Hee Yang(Hanseo University, Korea), Jungran Han(Hanseo University, Korea)

06. W-20-19_The effect of cultural values on caregiving by each generation / 147
    YunJeong Kim(Hanseo University, Korea), HyunJung Kang(Hanseo University, Korea)

01. IT-32_A Study on the Effect of Mobile Shopping Application Information offering on Shopping Application
    Preference and Repurchase Intention : Focusing on Frequency of Utilization / 149
   Yim Ki-heung(Gwang-Ju Women University, Korea), Kwon Jin-Hee(Chung-Ang University, Korea)

02. IT-36_A Stereoscopic Conversion Method Based on Image Focus-Defocus Analysis / 151
    SeungKap Lee(Kwangwoon University, Korea), SangHun Lee(Kwangwoon University, Korea),
    YeongPyo Hong(International University of Korea, Korea), JongYong Lee(Kwangwoon University, Korea)

03. IT-45_Robust Feedback Extended Linearization Control for The Time-Varying Nonlinear System with
    Disturbance / 153
    Jong-Yong Lee(Kwangwoon University, Korea), Kye-dong Jung(Kwangwoon University, Korea),
    Young Soo Park(Kwangwoon University, Korea), Sang-Hun Lee(Kwangwoon University, Korea)

04. IT-49_Sensor Data Processing for Ubiquitous Systems / 155
    Min-Soo Kang(Chaju Tourism College, Korea), Young-Sik Noh(Regional Industry Evaluation Agency, Korea),
    Yung-Cheol Byun(Seoul National University, Korea)
05. IT-52_Abstract Syntax Tree Metamodel for SW Visualization / 157
  Hyun Seung Son(Hongik University, Korea), Young Soo Kim(NIPA, Korea), Young B.Park(Dankook University, Korea),
  Woo Yeol Kim(Daegu National University of Education, Korea), Young Chul Kim(Hongik University, Korea)

06. IT-55_Processing Spatial Data Using Hadoop for Urban Planning / 159
  Seung Hyun Park(Kumoh National Institute of Technology, Korea), Byoung-Woo Oh(Kumoh National Institute of
  Technology, Korea)

07. W-25-01_A miniaturization method for a printed UHF RFID antenna / 161
  Gyoo-Soo Chae(Baekseok University, Korea), Joong-soo Lim(Baekseok University, Korea),
  Martin Weaver(Ampenol-Mobile, USA)

08. W-25-02_Propagation Characteristics in IEEE802.15.6 Environment / 163
  Jinkeun Hong(Baekseok University, Korea)

Session 2-C  Chair Kiseok Choi(KISTI)

- 13:00-14:20  Thursday July 3, 2014

01. W-1-01_A Method of Extraction of Non-text Contents for Extending the Applicability of National R&D
    Reports / 165
    Kiseok Choi(KISTI, Korea), kwangnam Choi(KISTI, Korea), Jaesoo Kim(KISTI, Korea)

02. W-1-02_Study on The Definition of Standard Metadata and Its Quality Management Method for Facilitation
    of Scientific and Technical Big Data Sharing / 167
    Sang Gi Lee(Seoul & KISTI, Korea)

03. W-1-09_Recursive Detection of Abnormal Data based on Data Flow Traceback / 169
    HeeSeok Jeong(Korea Institute of Science & Technology Information, Korea), Youngjoon Yoon(Korea Institute of Science
    & Technology Information, Korea), Kangryul Shon(Korea Institute of Science & Technology Information, Korea)

04. W-1-10_Study on Analysis of Utilization of Science & Technology Statistics Indicators / 171
    Jungho Seok(Korea Institute of Science & Technology Information, Korea), JaeSoo Kim(Korea Institute of Science &
    Technology Information, Korea), Yong-Ki Kim(Korea Institute of Science & Technology Information, Korea),
    Kwang-Nam Choi(Korea Institute of Science & Technology Information, Korea)

05. W-1-15_A study on a verification and certification process for analysis result of the R&D information
    / 173
    Min-Woo Park(KISTI, Korea), Nam-Gyu Kang(KISTI, Korea), Won-Kyun Joo(KISTI, Korea), Tae-Hyun Kim(KISTI, Korea),
    Kyung-Seok Yang(KISTI, Korea), Kwang-Nam Choi(KISTI, Korea)

06. W-1-16_Automatic Subject Classification of Korean Journals based on KSCD / 175
    MuYeong Kang(KISTI, Korea), Byungkyu Kim(KISTI, Korea), Jae-Do Shin(ChungNam National University, Korea)
    Seon Heui Choi(KISTI, Korea)
Abstract Syntax Tree Metamodel for SW Visualization

Hyun Seung Son, Young Soo Kim, Young B. Park, Woo Yeol Kim, Young Chul Kim
Hongik University, Korea, {son, bob}@selab.hongik.ac.kr
NIPA, Korea, ysgold@nipa.kr
Dankook University, Korea, ybpark@dankook.ac.kr
Daegu National University of Education, Korea, john@dnue.ac.kr

Abstract In the previous approaches, for syntax analysis of a program code such as C, C++, or Java, it needs to use a particular parser. The parser generates Abstract Syntax Tree (AST) during compiling the program code. At that time, it analyzes the statements & expressions of functions and classes, and also the definition and declaration of variables through static analysis of the program code with the AST. But the existing ASTs are not compatible with other AST due on the specific parser. For this reason, most of industry companies defines OMG’s standard named Abstract Syntax Tree Metamodel (ASTM). This means to define metamodel of the AST within any compiler, which can represent diverse programming languages with just an ASTM. This paper shows the specification of ASTM based on OMG standard, and a case study about the ASTM. Then we suggest a whole procedure for SW visualization with the ASTM.

Keywords: Abstract Syntax Tree (AST), Metamodel, Visualization, Reverse Engineering

1. Introduction
Most companies and ventures develop the software code with any design due on time and cost. They just release SW product quickly, but may spend more cost at the maintenance stage. This approach may be the low quality of SW product. Therefore, the companies need to show inside of the developing code for the SW visualization. The visualization is able to reverse the architecture from a program code through reverse engineering [1]. For the SW visualization, diverse tools are required such as Source Navigator [2], Graphviz [3], and a parser. The parser generates Abstract Syntax Tree (AST) during compiling the program code. But the existing ASTs are not compatible with other AST due on the specific parser.

Industry companies defines OMG’s standard named Abstract Syntax Tree Metamodel (ASTM) [4], which is metamodel of abstract syntax tree with the existing compiler. The main purpose of the ASTM easily exchanges the metadata repository between the software in such as software modernization, platforms, and distributed heterogeneous environment. The ASTM consists of the defined elements to represent the AST from the existing programming languages such as C, C++, C#, Java, Ada, VB/.Net, COBOL, FORTRAN, Jovial, and so on.

But OMG’s ASTM has defined and complicated with 193 elements of metamodel, but just specifications without any implementation. This paper shows the specification of ASTM based on OMG standard, and a case study about the ASTM.

2. A Procedure of SW Visualization
In order to develop SW visualization tools, it is required that 1) the parser generates the abstract syntax tree and 2) the visualizer needs to generate a graph. The figure 1 shows a whole structure for SW visualization. The parser generates ASTM from a program code such as C, C++, or Java. The visualizer generates the graph from the ASTM. Through this process, we can reverse the architecture from the program code.

![Figure 1. The strategy of SW Visualization](image)

It is very useful for reuse the existing visualizer better than to develop a new parser. Therefore, we will use the existing parsers as C/C++
Development Tooling (CDT) [5] and Java Development Tools (JDT) [6]. The CDT is a tool in Eclipse platform to develop C/C++ application. It supports to create the project, to build the program, to edit the C/C++ code, to analyze the static code, and to debug & refactor functions. The JDT is a tool to develop Java application. It supports the same function like the CDT.

In the future, we will apply the existing parser such as CDT and JDT. Using them, we will develop new tools for SW visualization.

3. A Case Study
To show the metamodel elements of ASTM, we use the program code like figure 2. For example, the code is as C++ which consists of a class, one member variable, and three functions.

```cpp
class Figure {
private:
    int x;
public:
    Figure();
    virtual ~Figure();
    virtual int getArea();
};
```

Figure 2. The example of a code on C++

This code shows the ASTM in figure 3.

In the figure 3, a SAST Model in a top line is a root that has one more Project. The Project has on more Compilation. The internal Compilation includes actual program statements. The Compilation also consists of the definition and declaration of functions and classes. In these elements of the Compilation, the class “Figure” in the figure 2 is translated as an Aggregate Type Definition. The Aggregate Type Definition has one more Member Object. In the Member Object, the statements within C++ are translated as the elements such that a variable is Variable Definition, and a function is Function Definition.

4. Conclusions
The Abstract Syntax Tree Metamodel (ASTM) is useful to convert from the diverse program codes to Abstract Syntax Tree (AST), which is good for interoperability but has a complex structure of 193 elements with just specifications. This paper shows the specification of ASTM based on OMG standard, and a case study about the ASTM. Then we suggest a whole procedure for SW visualization with the ASTM.

Acknowledgments. This work was supported by the IT R&D Program of MKE/KEIT [10035708, “The Development of CPS (Cyber-Physical Systems) Core Technologies for High Confidential Autonomic Control Software"] and Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2013R1A1A2011601)

References

158