Software Engineering Laboratory

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The main directions in research conducted by the Software Engineering Lab members were

- Semantic Methods for Information Retrieval,

- Technologies for Internet Applications

- Computer Security

- Intelligent Systems and Learning Technologies

Prof. Klyuev leads the Semantic Methods for Information Retrieval, Technologies for Internet Applications, and Computer Security directions. The focus of the research by Prof. Hamada is on Intelligent Systems and Learning Technologies.

Semantic Methods for Information Retrieval

This year, we studied the opinion mining methods applicable to the different type of on-line services offering goods to the clients. We focused on the Japanese language. The focuses of the research is on an opinion dictionary as a collection of specific keywords and key phrases. This opinion dictionary models a standardized better review to extract patterns of trustworthy reviews. In this study, a simple corpus of several different categories of goods is composed. It consists of noun and adjective keywords. Our students were involved in this research. Results were presented at the IWAIT 2015 and ICACT 2016 international forums.

Technologies for Internet Applications

Nowadays, application running on the Web is the main trend in Software Engineering. We continued our study the Go language and the tools related to it. A schedule management system is a results of this research. A responsive design is

a main trend in modern Web application development. A new lab Web site is a results on our investigations in this area. It attracted visitors from many countries. The Web site is available at: http://web-ext.u-aizu.ac.jp/labs/is-se/ Lab students played key role in these two projects. Results of the investigations conducted together with the students were presented at the iCAST 2015 and ICACT 2016 international conferences.

Computer Security

Two topics were in the focus of our interest: evaluation of Web vulnerability scanners and personal data leakage in Android-based systems. Hard work of the lab students resulted in successful presentation of the obtained results at the IDAACS 2015 and IWAIT 2015 international forums.

Intelligent Systems and Learning Technologies

Prof. Hamada continued his research on intelligent systems and learning technologies. This year there was two main projects in our lab. *1. Recommender Systems* Recommender systems are useful in many real life applications in e-business and e-learning. In our recommender systems project we apply machine-learning algorithms, neural networks, and genetic algorithms. We focus on multi-criteria recommender systems. Students are deeply involved in this project. The results were published in international conferences such as: IEEE ISMS 2015, etc. *2. Learning Style Index* Learning preferences can help learners to find their most effective way to learn. It can also help teachers to adopt suitable learning materials for efficient learning. This project is concerned with the study, implementation, and application of a web-based learning style index. The results were published in international conferences such as: IEEE TALE 2015, etc.

International Relations Prof. Hamada was invited professor at the African University of Science and Technology, Abuja, Nigeria during Sept. 2015.

International conferences and workshops

Our lab in cooperation with the Active Knowledge Lab organized the 4rd International Workshop on Advances in Semantic Information Retrieval as an event of the 2014 Federated Conference on Computer Science and Information Systems (Poland, 2015). We involved in this activity since 2011. This workshop is gained popularity among researchers from Europe and Asia.

Since 2014, we have been running The International Workshop on Applications in Information Technology. The workshop is organized in cooperation with the Active Knowledge Lab.

This event is a place for the first scientific presentations of the best students of the University of Aizu and our partner universities. This workshop is a good school for Japanese and foreign students on their way to become scientists. The

Workshop on Applications in Information Technology discovers new names of the next generation of scientists. This workshop creates the necessary conditions to keep international scientific contacts at the student level. We do hope, some of students participating in this workshop will work in tight cooperation in the future. We welcomed 5 Russian students from our partner universities: Saint-Petersburg State University, Peter the Great Saint-Petersburg State Polytechnic University, and Novosibirsk State University. On-line sessions were organized to connect Aizu with Germany, Spain, and India. The workshop Web site is available at: http://kspt.icc.spbstu.ru/conf/iwait-2015/ .

Study abroad From October 2015 to March 2016, master student Mr. Kato studied abroad at Indian Institute of Technology (IIT) Bombay under Prof.Krithi Ramamritham's supervision. This is the first time that student of the University of Aizu studied in India.

Exchange of Undergraduate Students

Undergraduate university student Ms. Yamada and Mr. Vatter, who is an exchange students from Rose-Hulman Institute of Technology, visited Saint Petersburg State University, Russia in April 2015 and presented his paper at the XLVI Conference on Control Processes and Stability. Our Russian partners covered local expenses during their stay in Saint-Petersburg.

In autumn, we welcomed students of Saint-Petersburg State University Ms. Korotkova and Mr. Popkov and student of the Peter the Great Saint-Petersburg State University Mr. Baratynskii at our The International Workshop on Applications in Information Technology. Their local expenses during their stay in Aizu were covered by our university.

Achievements

At the AY2015 Degree Conferment Ceremony, for the first time in the history of Software Engineering Lab, master student Mr. Naohiro Togashi received the Award of Excellence from the President of the University of Aizu in recognition of superior academic performance and research results.

This year, papers of undergraduate students Mr. Otsuka and Mr. Kikuchi were accepted for presentations at two high rank conferences. They have appeared in the prestigious proceedings published by IEEE. These papers discuss the results of undergraduate research of these students.

It is become a good tradition that results of the research done by graduate students are presented at the high rank conferences. Master student Mr. Togashi presented his results at iCAST 2015.

Other activities Prof. Hamada and other students of our lab was involved in developing many iOS and Android based Apps. Among such applications is the

university of Aizu application, which is now available in Apple App store for free download. The app is an effort to introduce the university of Aizu domestically and internationally as a top global university. Another app is the iAizu app which is an effort to collaborate with Aizuwakamatsu city to promote local community collaboration and introduce Aizu city to the world as a historical Japanese city.

Refereed academic journal

[hamada-310-010-01:2015] Mohamed Hamada and Mohamed Hassan. An Interactive Learning Environment for Information and Communication Theory. *EURASIA Journal of Mathematics, Science and Technology Education*, 2016.

The paper introduces an interactive multimedia system for information and communication theory.

[hamada-310-010-02:2015] M. Hasan and M. Hamada. A Framework for Recommending Learning Peers to Support Collaborative Learning on a Social Network. *International Journal of Simulation Systems, Science and Technology*, 2016.

The paper introduces a framework for recommending learning system to support collaborative learning on social networks.

Refereed proceedings of an academic conference

[hamada-310-010-03:2015] M. Hasan and M. Hamada. Learning System and Analysis of Learning Style for African and Asian Students. In *IEEE TALE2015*. IEEE, 2015.

The paper introduces a learning system and its analysis for students from different countries.

[hamada-310-010-04:2015] M. Hasan and M. Hamada. Recommending Learning Peers for Collaborative Learning Through Social Network Sites. In *IEEE ISMS2016*. IEEE, 2015.

The paper introduces a collaborative learning system through social networks.

[vkluev-310-010-01:2015] Shohei Otsuka, Keisuke Kato, and Vitaly Klyuev. Academic Laboratory Website Development. In *the 17th IEEE International Conference on Advanced Communications Technology (ICACT2015)*, pages 768–771. IEEE, IEEE, July 2015.

The Internet is an important source to get information about everything in human lives. Developing websites is one of the best ways to give information to people. Nowadays, there is a rapidly growing number of websites for many purposes. The websites of university laboratories are the examples. Usually

university laboratories have websites to provide information to students, laboratory members, visitors, etc. Our research goal is to investigate a methodology of the high quality development of an academic laboratory website by a small number of developers in a short period of time. In this paper, we discuss approaches, methods, and technologies used in this development. We illustrate utilized methods by samples of the code. Key findings in this research include bilingual support without reloading pages, multi-device support and a technique of the second server usage to avoid restrictions for the official web server. Our findings were used to develop a new website of the software engineering laboratory of the University of Aizu. Our created from scratch website within two months would attract visitors.

[vkluev-310-010-02:2015] Vitaly Klyuev Naohiro Togashi. A Novel Approach for Web Development: A Schedule Management System using GAE/Go. In *the IEEE 7th International Conference on Awareness Science and Technology (iCAST 2015)*, page 5 pp. IEEE, IEEE, September 2015.

In this paper, we discuss an approach used to develop a schedule management system which is manageable at low cost. It is designed using Google App Engine (GAE) and the Go programming language. The system is available for general purposes. GAE provides the execution environment, database called BigTable, and development tools. Developers can concentrate on writing applications because they can skip traditional construction of the development environment. GAE supports Python, Java, Go and PHP. Python and Java are in common use. Go is considered as a promising language because it is designed for ease of programming, and has modern features such as a garbage-collector and built-in support for concurrency. Employing this approach, we developed the system in a short span of time because server or database management are not necessary. System development on the cloud environment is still not common compared to traditional way, but this technology has many advantages, crucial for modern IT business.

[vkluev-310-010-03:2015] Yuma Makino and Vitaly Klyuev. Evaluation of Web Vulnerability Scanners. In *the 2015 IEEE 8th International Conference on Intelligent Data Acquisition and Advanced Computing Systems:Technology and Applications (IDAACS)*, pages 399–402. IEEE, IEEE, September 2015.

In recent yeas a lot of web applications have been released in the world. At the same time, cyber attacks against web application vulnerabilities have also increased. In such a situation, it is necessary to make web applications more

secure. However checking all web vulnerabilities by hand is very difficult and time-consuming. Therefore, we need a web application vulnerability scanner. In this work, we evaluate two open source vulnerability scanners OWASP Zed Attack Proxy (OWASP ZAP) and Skipfish using vul- nerable web applications Damn Vulnerable Web Application (DVWA) and The Web Application Vulnerability Scan- ner Evaluation Project (WAVSEP).

[vkluev-310-010-04:2015] Yoichi Saito and Vitaly Klyuev. Personal Data Leakage: Android Case Study. In E. Pyshkin and V. Klyuev, editors, *the International Workshop on Applications in Information Technology*, pages 107–108. the Universit yof Aizu, University of Aizu Press, October 2015.

Android has gained popularity explosively in these days. Android has many security problems. Because of this, various incidents have occurred. A typical example is the leakage of personal information. This incident occurred in the Skype application. Android security features are important to prevent the leak of sensitive information. This study characterizes security issues in Android OS.

[vkluev-310-010-05:2015] Kentaro Murai and Vitaly Klyuev. Developing Google Chrome Extensions: Case Study. In E. Pyshkin and V. Klyuev, editors, *the International Workshop on Applications in Information Technology*, pages 94–96. the Universit yof Aizu, University of Aizu Press, October 2015.

There are many Web browsers on the Internet. Although any OS has a pre-installed browser, some people use another. They choose more functional and convenient browsers. A browser extension is a key feature which enhances its functionality. In this paper, we review publications on browser extensions and fundamental issues on the Google Chrome extension.

[vkluev-310-010-06:2015] Jun Kikuchi and Vitaly Klyuev. Data Collection for Investigation of Reliable Reviews. In E. Pyshkin and V. Klyuev, editors, *the International Workshop on Applications in Information Technology*, pages 104–106. the Universit yof Aizu, University of Aizu Press, October 2015.

Nowadays the Internet is growing quickly. People use for many different purposes, mainly for online shopping. However, there is a large number of websites, which offer similar products and features. It makes a choice for customers difficult. As a result, they refer to online reviews. The main purpose of this research is to improve a reliability of a review. Increasing reliability is useful and helpful for customers decision, and it can also filter out spam reviews. We are detecting

a pattern by morphological analysis. Obtaining a reliable review pattern could be used to collect useful reviews automatically. Results of this study can be applied to any kinds of reviews and opinions.

[vkluev-310-010-07:2015] Jun Kikuchi and Vitaly Klyuev. Gathering User Reviews for an Opinion Dictionary. In E. Pyshkin and V. Klyuev, editors, *the 18th IEEE International Conference on Advanced Communications Technology (ICACT2016)*, pages 424–427. IEEE, IEEE, February 2016.

Nowadays, people purchase a lot of products from online shopping sites. To support customers in decision making, some sites collect and provide user reviews on products. However, contents of the user reviews are too abundant for customers to analyze them in a short period of time. The automatic analysis of reviews is important to provide users with valuable information about goods of any category. The objective of this research is to improve the usefulness of reviews for consumers. This research focuses on an opinion dictionary as a collection of specific keywords and key phrases. This opinion dictionary models a standardized better review to extract patterns of trustworthy reviews. In this study, a simple corpus of three different categories of goods is composed. It consists of noun and adjective keywords. This research is successful to obtain essential features and relations among three different categories in the opinion dictionary. Moreover, this opinion dictionary will be applied to supervised learning methods, such as a support vector machine to create a review evaluation system. The findings from this study can contribute to assist user decisions to evaluate reliable and useful reviews.

Writing a textbook or technical book

[hamada-310-010-05:2015] Mohamed Hamada. *Mobile Learning: Trends, Attitudes and Effectiveness*. NOVA Science Publisher, 2015.

Writing a part of textbook or technical book

[hamada-310-010-06:2015] Aree M. M. Hamada and K. Tufan. *An Example of a Multimedia Mobile-Based Framework*, chapter Chapter 10. NOVA Science Publisher, 2015.

[hamada-310-010-07:2015] Ogbonna A. and M. Hamada. *Recommendation of Web*

Content Using Mobile and Web Technology, chapter Chapter 6. Nova Science Publishing, 2015.

[hamada-310-010-08:2015] Tiako F. and M. Hamada. *Interactive Multimedia Mobile Learning Based on Cloud Computing*, chapter Chapter 5. Nova Science Publishing, 2015.

[hamada-310-010-09:2015] M. Hamada and A. Tabot. *Introduction to Mobile Learning*, chapter Chapter 1. NOVA Science Publisher, 2015.

Academic society activities

[hamada-310-010-10:2015] Mohamed Hamada, 2015.

IEEE Senior member

[hamada-310-010-11:2015] Mohamed Hamada, 2015.

ACM Senior member

[vkluev-310-010-08:2015] V Klyuev, Apr. 2014.

Member

Advisor for undergraduate research and graduate research

[hamada-310-010-12:2015] Mohamed Hasan. Recommender Systems for Social network, PhD program Graduate School, 2015.

[hamada-310-010-13:2015] Mohamed Hassan. Multi crietera recommender systems, PhD Program Graduate School, 2016.

[hamada-310-010-14:2015] Gai Kumada. An Enhanced iOS Application for University Promotion, Graduation research undergraduate school, 2015.

[hamada-310-010-15:2015] Tatsuma Itou. A Bilingual App for City Introduction, Graduation research undergraduate school, 2015.

[hamada-310-010-16:2015] Yutaro Asano. Learning Technical Japanese with iPhone, Graduation research undergraduate school, 2015.

[vkluev-310-010-09:2015] Naohiro Togashi. Master Thesis: Cloud Programming with Go for a Schedule Management System, University of Aizu, 2016.

> Thesis Advisor: V. Klyuev

[vkluev-310-010-10:2015] Shohei Otsuka. Graduation Thesis: Analyzing GitHub Commit Messages for JavaScript Frameworks, University of Aizu, 2016.

> Thesis Advisor: V. Klyuev

[vkluev-310-010-11:2015] Jun Kikuchi. Graduation Thesis: Exploring the Features of Customer Reviews for an Opinion Dictionary, University of Aizu, 2016.

> Thesis Advisor: V. Klyuev

[vkluev-310-010-12:2015] Takuya Igarashi. Graduation Thesis: Manifest Analysis for Android Malware Detection, University of Aizu, 2016.

> Thesis Advisor: V. Klyuev

[vkluev-310-010-13:2015] Munehisa Ichikawa. Graduation Thesis: Tampering Attacks in RFID Networks: Risk Reduction, University of Aizu, 2016.

> Thesis Advisor: V. Klyuev

Contributions related to syllabus preparation

[hamada-310-010-17:2015] Contribute in Syllbus preparation for the following undergraduate courses: 1. Java Programming 1 2. Information Theory 3. Automata Theory 4. Language Processing Systems

[hamada-310-010-18:2015] Contribute in Syllbus preparation for the following undergraduate courses: 1. Computational Models 2. Formal Languages and Compiler 3. Theory of Automata and Languages

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[hamada-310-010-19:2015] Mohamed Hassan. A Framework for Recommending Learning Peers to Support Collaborative Learning on a Social Network. *International Journal of Simulation Systems, Science and Technology*, 2016.

[hamada-310-010-20:2015] Mohamed Hassan. Learning System and Analysis of Learning Style for African and Asian Students. *IEEE TALE*, 2015.

[hamada-310-010-21:2015] Mohamed Hassan. Recommending Learning Peers for Collaborative Learning Through Social Network Sites. *IEEE ISMS*, 2015.

[vkluev-310-010-14:2015] Shohei Otsuka, Keisuke Kato, and Vitaly Klyuev. Academic Laboratory Website Development. *the 17th IEEE International Conference on Advanced Communications Technology (ICACT2015)*, pages 768–771, July 2015.

[vkluev-310-010-15:2015] Vitaly Klyuev Naohiro Togashi. A Novel Approach for Web Development: A Schedule Management System using GAE/Go. *the IEEE 7th International Conference on Awareness Science and Technology (iCAST 2015)*, page 5 pp., September 2015.

[vkluev-310-010-16:2015] Yuma Makino and Vitaly Klyuev. Evaluation of Web Vulnerability Scanners. *the 2015 IEEE 8th International Conference on Intelligent Data Acquisition and Advanced Computing Systems:Technology and Applications (IDAACS)*, pages 399–402, September 2015.

[vkluev-310-010-17:2015] Yoichi Saito and Vitaly Klyuev. Personal Data Leakage: Android Case Study. *the International Workshop on Applications in Information Technology*, pages 107–108, October 2015.

[vkluev-310-010-18:2015] Kentaro Murai and Vitaly Klyuev. Developing Google Chrome Extensions: Case Study. *the International Workshop on Applications in Information Technology*, pages 94–96, October 2015.

[vkluev-310-010-19:2015] Jun Kikuchi and Vitaly Klyuev. Data Collection for Investigation of Reliable Reviews. *the International Workshop on Applications in Information Technology*, pages 104–106, October 2015.

[vkluev-310-010-20:2015] Jun Kikuchi and Vitaly Klyuev. Gathering User Reviews for an Opinion Dictionary. *the 18th IEEE International Conference on Advanced Communications Technology (ICACT2016)*, pages 424–427, February 2016.

Contribution related to on-campus/off-campus publicity work

[hamada-310-010-22:2015] Offering off-campus public lectuer on Egyptian culture

[hamada-310-010-23:2015] Public lecture: Try-on series of iOS (iPhone and iPad) program development

[hamada-310-010-24:2015] Open lab in Open campus August 2015 and October 2015

[hamada-310-010-25:2015] Open Lecture for Super Global University Project on International Cooperation

Other significant contribution toward university planning, management, or administration

[hamada-310-010-26:2015] Member of the Super Global University project

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[hamada-310-010-27:2015] Contribute in students recruiment by inviting a deligation from IDC Frontier Inc. to give an introduction to the company to my students. One of my studnts is currenty a staff member in this company.

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[hamada-310-010-28:2015] Attended faculty development lecturs

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[hamada-310-010-29:2015] Open lab in opne campus August 2015

[hamada-310-010-30:2015] Open lab in opne campus October 2015

[hamada-310-010-31:2015] Public lecture on international coopeartion for Super Global University project Oct. 2015

Summary of Achievement

[hamada-310-010-32:2015] Public lecture on Hands-on Try series: iOS (iPhone and iPad) App Development Oct. 2015