Daejun Park

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Research Interests

I am interested in the technology that helps to develop reliable software, especially using formal methods.

Education & Professional Experience

University of Illinois at Urbana-Champaign Aug 2013 – Present
Ph.D. Student in Computer Science
Advisor: Prof. Grigore Rosu

ROSAEC Center, Seoul National University Jan 2012 – Jul 2013
Research Associate
Director: Prof. Kwangkeun Yi

Program Analysis Division, Fasoo.com, Inc. Sep 2008 – Dec 2011
Associate Research Engineer

Seoul National University Mar 2006 – Aug 2008
Master of Science in Computer Science and Engineering
Thesis: Parameterized Procedural Summaries: How to Achieve Scalable and Context-sensitive Buffer-overrun Static Detection for C Programs[4]
Advisor: Prof. Kwangkeun Yi

Seoul National University Mar 2001 – Feb 2006
Bachelor of Science in Computer Science and Engineering
Thesis: Type System for Strong Updates[7]
Advisor: Prof. Kwangkeun Yi

Research Activities

ROSAEC Center, Seoul National University Jun 2012 – Jul 2013
Research Associate Director: Prof. Kwangkeun Yi

- **Analysis of Samsung Semiconductor Manufacturing Process Software**
  Designed and implemented static analyzer to find semantic difference between two versions of programs of Samsung semiconductor manufacturing process software, a highly safety critical system whose failure would lead to tremendous losses for the company. Conducting symbolic execution, our analyzer compares two symbolic memory states so as to find semantically different parts. The target system is written in PL/SQL, an SQL language equipped with procedural extensions. Joint work with Dongok Kang, Youngseok Lee, and Prof. Kwangkeun Yi (SNU).

- **Encrypted Program Execution**
  Designed a cryptographic protocol, so-called "encrypted execution"[1], in which an encrypted program is evaluated without decryption. This work is an answer for the question: "Can we delegate execution of our program without revealing it?" We propose a protocol how to encrypt a given program and how to execute the encrypted program without decryption. Our encrypted execution protocol guarantees that 1) encrypted programs are totally secure, in the sense that attackers can never reconstruct any piece of original programs from encrypted programs, and 2) execution results are correct, whose decryption yields the very results of execution of original programs. Joint work with Jeehoon Kang, Kihong Heo, Sungkeun Cho, Yongho Yoon, and Prof. Kwangkeun Yi (SNU).

- **Generalized Sparse Analysis Framework**
  Designed (and formally proved) a more generalized sparse analysis framework[2], based on the previous sparse analysis framework. Sparse analysis framework is a general principle of all existing sparse analysis techniques. While the previous sparse analysis framework is confined to C-like languages, our new framework can be applicable to arbitrary programming languages—even functional language. Joint work with Hakjoo Oh, Kihong Heo, Jeehoon Kang, and Prof. Kwangkeun Yi (SNU).

- **Unstaging Translation of Multi-Staged Calculus**
  Designed (and formally proved) a semantic-preserving unstaging translation of multi-staged calculus[3]. Multi-staged programming is a general principle of code-generation systems, such as macro expansion, partial evaluation, program manipulation, and runtime code generation. Our semantic-preserving unstaging translation enables static analysis of multi-staged language by 1) unstaging the source program, 2) analyzing the unstaged program using the conventional static analysis techniques, and 3) projecting the analysis result back to the source language. Joint work with Joonwon Choi, Jeehoon Kang, and Prof. Kwangkeun Yi (SNU).

Program Analysis Division, Fasoo.com, Inc. Sep 2008 – Dec 2011
Associate Research Engineer

- **Commercial Static Analyzer, Sparrow**
  Designed and implemented commercial static analyzer Sparrow for C, a semantic-based static analyzer pointing to memory errors in C programs, including null dereference, memory leaks, double free, and buffer overrun, etc. It is highly scalable (analyzing millions lines of code in several hours) and accurate (path-/context-sensitive analysis). Major customers are software developers in embedded systems such as mobile phones, TVs, set-top boxes, network equipments, etc. Sparrow's usefulness has already been proved in this field by our customers including Samsung Electronics.

  With Sparrow experience, I am highly skilled at whole process of source code analysis, including parsing source code, transforming AST into IR(Intermediate Representation), analyzing IR, and explaining analysis results.

Seoul National University Mar 2006 – Aug 2008
M.S. Student in Programming Research Laboratory Advisor: Prof. Kwangkeun Yi

- **LiSA: Lightweight Static Analysis for Buffer Overrun Errors of C programs**
  Designed and implemented lightweight static analyzer for buffer overrun errors of C programs, using summary-based bottom-up analysis technique[4].

- **Reason Chain: Alarm Explanation in Sparrow: Toward Finding the Origin of Alarms**
  Designed and implemented alarm explanation module in Sparrow, using backward analysis technique.

Publications

[1] **Daejun Park**, Jeehoon Kang, Kihong Heo, Sungkeun Cho, Yongho Yoon, and Kwangkeun Yi. Encrypted Execution. *Manuscript*, 2012.
http://ropas.snu.ac.kr/~pudrife/paper/encrypted.pdf

[2] Hakjoo Oh, Kihong Heo, **Daejun Park**, Jeehoon Kang, and Kwangkeun Yi. Global Sparse Analysis Framework. *Submitted to TOPLAS(Transactions on Programming Languages and Systems).*
http://ropas.snu.ac.kr/~pudrife/paper/sparse.pdf

[3] Joonwon Choi, Jeehoon Kang, **Daejun Park**, and Kwangkeun Yi. Unstaging Translation of Cross-Stage Persistent Multi-Staged Programs. *Technical Report*, 2012.
http://rosaec.snu.ac.kr/publish/2012/techmemo/ROSAEC-2012-015.pdf

[4] **Daejun Park** (Supervisor: Prof. Kwangkeun Yi). Master's Thesis: Parameterized Procedural Summaries: How to Achieve Scalable and Context-sensitive Buffer-overrun Static Detection for C Programs. *School of Computer Science and Engineering, Seoul National University*, Aug 2008.
http://ropas.snu.ac.kr/~pudrife/paper/ms_thesis.pdf

[5] Hakjoo Oh, Yungbum Jung, Minsik Jin, Deokhwan Kim, Yikwon Hwang, **Daejun Park**, Heejong Lee, Soonho Kong, and Kwangkeun Yi. Sparrow: The source code analyzer. *KIISE(Korean Institute of Information Scientists and Engineers) Conference 2007*, 34(1C):500–504, 2007.
http://ropas.snu.ac.kr/~pudrife/paper/sparrow.pdf

[6] **Daejun Park** and Kwangkeun Yi. Constructive Least Fixpoint of Monotone Function on Complete Partial Order. *KIISE(Korean Institute of Information Scientists and Engineers) SIGPL(Special Interest Group on Programming Languages) Transactions on Programming Languages*, Vol.20, No.1, pp.1-7, Sep 2006.
http://ropas.snu.ac.kr/~pudrife/paper/fixpoint.pdf

[7] **Daejun Park** (Supervisor: Prof. Kwangkeun Yi). Bachelor's Thesis: Type System for Strong Updates. *School of Computer Science and Engineering, Seoul National University*, Feb 2006.

Presentations

- **Sparse Analysis Framework**. The 1st workshop on Analysis and Verification of Dependable Cyber Physical Software, Changsha, China. October 25, 2012.
- **Bug-finder from the Reality: Toward Pragmatic Bug-finder**. The 2nd ROSAEC(Research on Software Analysis for Error-free Computing) Center Workshop, Paju, Korea. July 10, 2009.
- **Parameterized Procedural Summaries: How to Achieve Scalable and Context-sensitive Buffer-overrun Static Detection for C**. The 29th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2008) Student Research Competition, Tucson, Arizona. June 10, 2008.

Honors & Awards

Outstanding Employee Award Feb 2011
Fasoo.com, Inc.

Outstanding Employee Award Feb 2010
Fasoo.com, Inc.

Honors Scholarship Sep 2003 – Aug 2005
Seoul National University, Korea

Honors at Entrance Scholarship Mar 2001
Seoul National University, Korea

Bronze Medal of National High School Mathematics Competition Jun 2000
Chungnam National University, Korea

Teaching Experience

Teaching Assistant – SNU 4541.664A Program Analysis (graduate) Spring 2007
Teaching Assistant – SNU 4190.310 Program Languages Fall 2006
Teaching Assistant – SNU 4190.210 Principles of Programming Spring 2006

Professional Activities

External Reviewer: FoSSaCS 2013, POPL 2013, APLAS 2007, SAS 2007

References

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