【Grant-in-Aid for Scientific Research(S)】

Integrated Science and Innovative Science (Comprehensive fields)

Title of Project： Architecture Oriented Formal Approaches to
High Quality Software Development

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Research Area：Informatics - Software
Keyword：Specification/Verification of specification, Software engineering, Software lifecycle

【Purpose and Background of the Research】

System faults of IT systems often cause serious problems in this modern society. The everyday life of the people is deeply dependent on a variety of IT systems widely connected through the Internet. The effects and damages by such faults sometimes propagate much more widely and rapidly than human understanding. Some of those faults arise from system errors while some are caused by human errors of the operators. Therefore, it has been highly and strongly required to realize reliable and dependable IT systems.

Formal methods for software and system development are regarded as promising approaches to realize reliable and dependable IT systems. However, at the actual development sites at IT companies (especially in Japan), formal methods are introduced in very limited cases even though company engineers and managers are interested in formal methods. We aim to propose effective and usable formal methods to cover the whole software lifecycle including operation and maintenance phases.

【Research Methods】

Under the collaboration between industry and academia, we propose practically effective formal approaches to model, analyze, verify, operate, and maintain complicated IT systems. We accumulate case studies of applying formal methods into conventional software development processes, and present as process models effective to real development projects. We also develop tools which embody our approaches and support system developers and users to realize high quality and dependable IT systems.

Our research topics include the following: (1) Proposal of effective formal techniques applicable to model and analyze complicated IT systems and case studies of their applications, (2) Reference models of software development processes based on formal methods, (3) Architecture oriented formal approaches to treat complicated systems of systems including environment and operation phases, and (4) Development of support tools.

Formal Approach Effective at Each Stage in Software Lifecycle
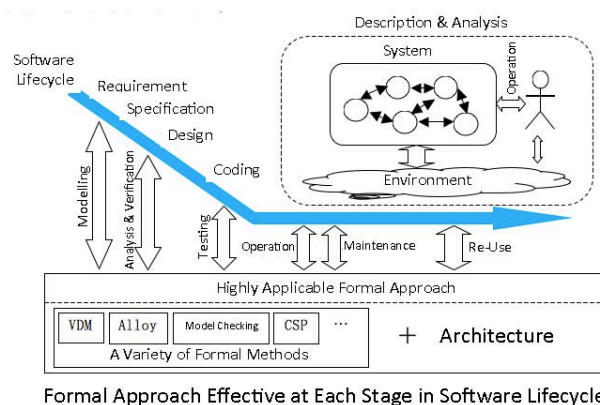
【Expected Research Achievements and
Scientific Significance】

We show practice and experience of architecture oriented formal methods applicable through the whole software lifecycle. E.g., (1) Engineering cases of software development projects to share and reuse, (2) Education and training materials and courses for high-quality and dependable IT systems, (3) Systematic software lifecycle model based on architecture orientation to realize high quality and dependable IT systems, and (4) Software process improvement through support tools which embody our research results.

【Publications Relevant to the Project】
(1) Keijiro Araki: Introducing Formal Methods to Actual Development Sites, SEC journal, Vol.6, No.2, pp.104-107, June 2010. (in Japanese)
(2) Yoichi Omori and Keijiro Araki: Toward a Quality Improvement of Specification in Natural Language based on the Semi-Equivalent Formal Models, Trans. Information Processing Society of Japan, Programming, Vol.3, No.5, pp.18-28, Dec. 2010. (in Japanese)

【Term of Project】 FY2012-2016

【Budget Allocation】 122,200 Thousand Yen

【Homepage Address and Other Contact
Information】

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