

Software evolution is inevitable. When a system evolves, there are certain relationships among software artifacts that must be maintained. Requirement traceability is one of importance factor in facilitating software evolution since it maintains the artifacts relationship before and after a change is performed. Requirements traceability can be expensive activities. Many researchers have addressed the problem of requirements traceability, especially to support software evolution activities. Yet, the evaluation results of those approaches show that most of them typically provide only limited supports to software evolution. Based on the problems of requirement traceability, we have identified three directions that are important for traceability to support software evolution, i.e. process automation, procedure simplicity, and best results achievement. Those three directions are addressed in our multifaceted approach of requirement traceability. This approach utilizes three facets to generate links between artifacts, i.e. syntactical similarity matching, link prioritization, and heuristic-list based processes. This research proposes the utilization of multifaceted approach to traceability generation and recovery in facilitating software evolution process. We describe our new approach in traceability called Multifaceted Requirement Traceability Approach (MRTA) to support software evolution in this thesis.

### **Thesis abstract**

## **Multifaceted Requirement Traceability Approach to Support Software Evolution**

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## Curriculum Vitae

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**Formal Education:**

1974 – 1980	SD Muhammadiyah Boyolali
1980 – 1984	SMP 1 Boyolali
1984 – 1987	SMA 1 Boyolali
1987 – 1992	Undergraduate Programs Department of Informatics Bandung Institute of Technology (ITB)
1994 – 1997	Master Programs Department of Informatics Bandung Institute of Technology (ITB)
2006 – at present	Doctoral Programs Department of Software Engineering Universiti Teknologi Malaysia (UTM)

**Training Experience:**

1990 ITB	Course on Introduction to Microcomputer
1990 ITB	Course on Introduction to VAX 6000-310
1991 ITB	Course on Teacher Development Workshop for Computer Related Courses
1992 Bandung	Adventish English Conversation School
1992 Bandung	Executive English Programs Course
1994 Jakarta	Advanced Training Course on Software Design Techniques
1994 ITB	Course on Logic and Algebra Teaching Method

Seminar/ Conference:	
1996	Cooperation Manager Training Course
1996	Workshop and Reconstruction on Applied Approach
1999	Students' Textbook Understanding Training Course
1999	Object-Oriented Software Engineering using UML
2001	Requirement Specification Training Course
2003	UML with Rational Unified Process Training
2005	Wi-Fi Applications
1995	1995 ITB The Second Indonesia-Japan Joint Meeting on Acoustics & Data Processing
1998	1998 ITB Curriculum Seminar
1998	New Technology in the Field of Environment, Energy Efficiency and Renewable Energy
1999	1999 ITB International Seminar & Tutorial on Real Time Software Engineering
1999	1999 ITB International Seminar on Photogrammetry and Remote Sensing
2003	2003 ITS-Surabaya National Seminar on Computer Science and Information Technology (SNIKTI)
2004	2004 Brawijaya Univ Electric, Control, Communication, and Information Seminar (EECIS)
2004	2004 ITS-Surabaya 4 <sup>th</sup> Seminar of National Postgraduate Programme
2005	2005 ITS-Surabaya 6 <sup>th</sup> Seminar on Intelligent Technology and Its Applications (SITIA)
2005	2005 Petra Univ National Seminar on Soft Computing, Intelligent Systems & Information Technology (SITIT2005)
2005	2005 ITS-Surabaya Industrial and Electronics Seminar 2005 (IES2005)
2007	2007 UTM-Malaysia 3 <sup>rd</sup> Postgraduate Annual Research Seminar (PARS'07)
2007	2007 France 2 <sup>nd</sup> International Conference on Software Engineering Advances (ICSEA'07). IEEE Computer Society
2007	2007 Malaysia 3 <sup>rd</sup> Malaysian Software Engineering Conference (MYSEC'07)
2008	2008 UTM-Malaysia 4 <sup>th</sup> Postgraduate Annual Research Seminar (PARS'08)
Organizational Experience:	
1990 – 1992	Instructor Coordinator in Software Development at Center for Computer Science and Information Systems
1990	Committee member of Unix Operating System: Workshop, Tutorial, and Exhibition at Center for Computer Science and Information Systems – ITB

1990	Committee member of 4 <sup>th</sup> Generation Language: Workshop at Center for Computer Science and Information Systems – ITB
1991	Committee member of Seminar on Information System Engineering at Department of Informatics - ITB
1991	Committee member of UNIX Tutorial and Seminar at Center for Computer Science and Information Systems
1993	Committee member of The 100 Hours Integrated Training of Pancasila's Comprehension and Implementation Guidance (P-4) for 1993 ITB New Students
1993	Committee member of Course on Introduction to Computer for 1992 ITB First Year Students
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1996	Member of Computer Science Curriculum Construction Team for University of Trisakti Jakarta
1996	Committee member of Department of Informatics Graduation Day for Bachelor and Magister
1997	Committee member of The 45 Hours Integrated Training of Pancasila's Comprehension and Implementation Guidance (P-4) for 1997 ITB New Students
1997	Committee leader of Selection for Department of Informatics Chairman Candidates Period 1998 – 2001
1997	Committee member of Selection for New Students in Real Time Software Engineering Graduate Program
1998	Team member of 1998 Curriculum Development for Department of Informatics ITB
1999	Inspector of Government Final Examination for Bachelor Degree in Computer Science
1999	Committee member of Accreditation for Graduate Program Department of Informatics ITB
1999	Examining-board of Government Final Examination in

- the field of Software Engineering
- 1999 Operational-board of Quality for Undergraduate Education at Department of Informatics ITB
- 2000 Member of Computer Science Curriculum Construction Team for Susqa National Islamic Institute at Riau
- 2001 Committee member of Selection for Department of Informatics Chairman Candidates Period 2001 – 2005
- 2004 - 2006 Coordinator Secretary of Informatics Graduate Programs at Sepuluh Nopember Institute of Technology (ITS)
- 2006 – at present Member of Indonesian Student Association at Universiti Teknologi Malaysia, Johor Bahru, Malaysia
- Research Publication:
- [1] Siti Rochimah, "Finding the Solution of Facility Layout Problem with Improved Delahedron Algorithm and Class Method", Bachelor Final Project Research, Bandung Institute of Technology, 1992.
  - [2] Oerip S. Santoso, Siti Rochimah, "Finding the Solution of Facility Layout Problem with Improved Delahedron Algorithm and Class Method", Operational Project Funding (OPF), ITB Research Center Limited Publication, 1994.
  - [3] Siti Rochimah, Bayu Hendradjaya, Mewati Ayub, "SIJ-ITB: Inter Department Information Systems", Software Engineering Laboratory Research, 1995.
  - [4] Siti Rochimah, Mewati Ayub, "Application of Lifecycle Testing Method to Software Development using SQA TeamTest", Software Engineering Laboratory Research, 1996.
  - [5] Siti Rochimah, Sri Purwanti, "Lecture Notes: Logics", ITB Publisher, 1996.
  - [6] Siti Rochimah, "Application of Object-Oriented Methods to the Scheduling Problems", Master of Science Thesis, Bandung Institute of Technology, 1997.
  - [7] Siti Rochimah, Bayu Hendradjaya, "Standard Document Development for Software Engineering Stages", Operational Institution Fund (DIK), ITB Research Center Limited Publication, 1998.
  - [8] Hira Laksmiwati, Siti Rochimah, Widayashanti P, "Application of Effective Software Engineering in Indonesian Industries", Asian Development Bank Loan EEDP-DIKTI, 1998.
  - [9] Sri Yudawati, Siti Rochimah, "The Importance of Information Technology for Coral Reef Management: An Overview", Proceeding of International Seminar on Photogrammetry and Remote Sensing, ISPRS Journal, 1999.
  - [10] Siti Rochimah, Alex S. Wibowo, "RPG-Sys: City-Transport Route Guide Prototype", Software Engineering Laboratory Research, Bandung Institute of Technology, 2002.

- [11] Siti Rochimah, "Application of Object-Oriented Methods to the Scheduling Problems", Proceeding of National Seminar on Computer Science and Information Technology IV, Surabaya, 2003.
- [12] Bayu Nurcahyono, Siti Rochimah, "PaTra: Online Bargaining System Prototype in Virtual Traditional Market", Proceeding of National Seminar on Computer Science and Information Technology IV, Surabaya, 2003.
- [13] Siti Rochimah, "Software Project as a Subject to Minimize Gaps between Theory and Practice in Undergraduate Level", Journal of Information Technology, Faculty of Information Technology, Sepuluh Nopember Institute of Technology, July, 2003.
- [14] Siti Rochimah, "Reengineering for Online Registration Systems at Faculty of Information Technology Sepuluh Nopember Institute of Technology", Proceeding of Electric, Control, Communication, and Information Seminar, Brawijaya University, Malang, 2004.
- [15] M.U.H.A.Rasyid, Siti Rochimah, D. H. Murti, "ASPWebGen: Automatic Homepage Generator", Proceeding of 4<sup>th</sup> National Graduate Seminar, Surabaya, 2004.
- [16] E. Fabianto, R. Sarno, Siti Rochimah, "Development of Extended Weighted Tree Similarity Method with Ratio", Proceeding of 4<sup>th</sup> National Graduate Seminar, Surabaya, 2004.
- [17] F J Atletiko, A Dewabarta, Siti Rochimah, "Implementation of Indonesian League Scheduling with Genetic Algorithms", Proceeding of 6<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2005.
- [18] D H Murti, S H Putra, Siti Rochimah, "Empirical Study on Application of J2EE Technology on the Strust Frameworks and Oracle ADF Faces Frameworks", Proceeding of 6<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2005.
- [19] Siti Rochimah, Astri K E Nur, "Evaluation on Reusability Level of Design Pattern Applications in Online Voting Domains", Proceeding of 6<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2005.
- [20] Siti Rochimah, Alexander Romy, "Development of Component-based Multilingual Thesaurus", Journal of Information Technology, Faculty of Information Technology, Sepuluh Nopember Institute of Technology, July, 2004.
- [21] I. Kuswardayan, T Y Maharika, Siti Rochimah, "SiteLoader: Automatic Website Loader using Regular Expression", Proceeding of National Seminar on Soft Computing, Intelligent Systems & Information Technology, Petra Chatolic University, Surabaya, 2005.
- [22] U L Yuhana, H Indriasar, Siti Rochimah, "Development of Simple HTML Web Designer Application", Proceeding of National Seminar on Soft Computing, Intelligent Systems & Information Technology, Petra Chatolic University, Surabaya, 2005.

- [23] S Lili, I G Sutarsa, Siti Rochimah, "Mue: Multuser UML Diagram Editor", Proceeding of 1<sup>st</sup> Annual International Information and Communication Technology Seminar, Sepuluh Nopember Institute of Technology, Surabaya, 2005.
- [24] Siti Rochimah, Dhevy Indriarsi, "Integration of Nonfunctional Requirement into Conceptual Modeling in the Software Development", Proceeding of Industrial and Electronics Seminar 2005, Sepuluh Nopember Institute of Technology, Surabaya, 2005.
- [25] Umi L Yuhana, Miemiek Rachmawati, Siti Rochimah, "Comparative Study on Structural Approach using SSADM, STRADIS, and YSM Methodologies: Case Study on Program Pena Bangsa Yayasan Dana Sosial Al-Falah Information Systems", Proceeding of 7<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2006.
- [26] Siti Rochimah, Sigit Pramono, "Program Structures Reconstruction using Hammock Graph: Case Study on C Programming Language", Proceeding of 7<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2006.
- [27] Siti Rochimah, Siti Kustiarshih, "Aspect Oriented Software Modeling in UML Notation", Proceeding of 7<sup>th</sup> Seminar on Intelligent Systems and Its Applications, Surabaya, 2006.
- [28] Siti Rochimah, Ciptian R Vitanito, "A Study on Delocalization Inspection in Java Programming Language using Abstraction Driven Technique", Proceeding of Electric, Control, Communication, and Information Seminar, Brawijaya University, Malang, 2006.
- [29] Siti Rochimah, RR Kunti P, Imam Kuswardayan, "Re-engineering on ITS-Faculty of Information Technology BBS Systems", Proceeding of Electric, Control, Communication, and Information Seminar, Brawijaya University, Malang, 2006.
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- [32] Siti Rochimah, W.M.N. Wan Kadir, and A.H. Abdullah, "An Evaluation of Traceability Approaches to Support Requirement Management", Proceeding of 3<sup>rd</sup> Malaysian Software Engineering Conference (MYSEC'07), Malaysia, 2007.
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- [34] Siti Rochimah, W.M.N. Wan Kadir, and A.H. Abdullah, "A Case Study on Multifaceted Requirement Traceability", Proceeding of 4<sup>th</sup> Postgraduate Annual Research Seminar (PARS'08), Faculty of Computer Science and Information Systems, Universiti Teknologi Malaysia, Malaysia, 2008.

#### Teaching Experience:

- 1990 – 1992 Instructor for Computer Related Courses at Center for Computer Science and Information System ITB.  
 1992 – 2002 Lecturer at Department of Informatics Bandung Institute of Technology, for lessons:  
 Concepts of Technology  
 Basic Programming  
 Algorithm and Programming  
 Declarative Programming  
 Logics  
 Model and Simulation  
 Software Engineering  
 Object-Oriented Analysis and Design  
 Applied Software Engineering  
 Structured Oriented Analysis and Design  
 Software Testing  
 Software Quality Assurance  
 Software Project

- 1993 Parttime lecturer at SFB School of Technology at Bandung.  
 1997 Instructor of Computer Training for Indonesia National Land Bureau.  
 1997 Instructor of Computer Course for Automatic Traffic Control System Operators at Bandung.  
 1997 Parttime lecturer at Department of Computer Science, Parahyangan Catholic University Bandung.  
 1997 – 1999 Instructor of Three Years Diploma Computer Course for PT. Pos Indonesia (Indonesian Mail Post Company).  
 2000 Instructor of Software Development using UML Training Course for Astra Honda Motor Company, Jakarta.  
 2000 Instructor of Logic Subject at Bridging Program between Bandung Institute of Technology and Twente University, Nederland  
 2002 – at present Lecturer at Department of Informatics, Sepuluh Nopember Institute of Technology, Surabaya.

#### Project Experience:

- 1993 System Analyst Database Design for National Electricity Company  
 1993-1994 System Analyst Telkom's Technical Information Systems



1994-1995	System Analyst	Dikmenum Administration Systems Project for Department of Education and Culture
1995-1996	System Analyst	Digital Mapping Project for National Electricity Company, Gambir Jakarta
1996-1997	System Analyst	Router Automation for Detecting Customer Project for National Electricity Company
1998-1999	Senior Syst. Analyst	BITT2000 Y2K Team Development
1999	Senior Syst. Analyst	Indonesian Central Bank Y2K Readiness Evaluation
1999	Executive Auditor	Y2K Compliance Certification for Bank Dagang Negara (BDN Bank)
1999	Executive Auditor	Y2K Compliance Certification for PT. Marein (Indonesian Re-Insurance Co.)