

Hayden P. Melton

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PROFESSIONAL INTERESTS My main interest is in improving software structure. I favour approaches to this that can be immediately adopted by practitioners of software engineering. The research I have done towards Ph.D. exemplifies this interest and my favoured approach to it. The thesis of my Ph.D. research is that quantitative, empirical studies of real software systems can give us many new insights towards improving software structure. By gathering a large number of commercial and open-source Java programs into a software corpus, and collecting metrics from these programs through automated analysis of their source code, I have shown this thesis to be true in at least three respects. First, at the level of individual programs, such studies can help us to quickly identify modules (e.g., classes, packages and methods) that are structurally anomalous, and are good candidates for refactoring. Second, at the level of all programs in the corpus, such studies can help us to identify design principles that, in general, are not widely-followed by software developers and ought to be better supported. Third, the use of metrics in such studies can help us to formalise fundamental concepts in software design, like modularity, that to this date have remained only fuzzily-defined in the literature.

RESEARCH AREAS Object-oriented design, software metrics, empirical software engineering.

EDUCATION **University of Auckland**, Auckland, New Zealand
Ph.D. Candidate, Computer Science, September 2004 (expected completion date: Feb-2008).
Dissertation Topic: *Improving Software Structure: An Empirical Approach*
Advisor: Associate Professor Ewan Tempero
Bachelor of Engineering (First Class Honours), Software Engineering, November 2003.

HONOURS AND AWARDS Top Achiever Doctoral Scholarship, 2004–2007
ACM SIGSOFT CAPS Travel Grant, 2007
Department of Computer Science Graduate Student Travel Grant 2006, 2007
Royal Society of New Zealand Travel Grant, 2006
Best Paper Award, Australasian Computer Science Conference, 2006.
IEE Senior Prize in Software Engineering, 2003
NZVCC Tower Corporation Scholarship, 2000–2003

EXPERIENCE **University of Auckland**, Auckland, New Zealand
Ph.D. Candidate **September, 2004 – present**
During my time as a graduate student I have had numerous papers published in journals and in international conference proceedings (see the list below). I have given presentations about my research at these conferences, in undergraduate courses at the University of Auckland, and to industry professionals at several local software companies. I have collaborated with these software companies (they cannot be named due to confidentiality agreements) to help them to understand and improve the structure of the products they develop. I have been involved in the open-source community by posting findings about the structure of specific projects to their mailing lists, and participating in subsequent discussions about these findings (for some examples see the mailing lists of Azureus, JEdit, ArgoUML, Soot and projects hosted by the Apache Software Foundation).

Orion Health Systems, Auckland, New Zealand

www.orionhealth.com

Software Engineer

December 2003 – August 2004

During my time as a professional software engineer I worked on several large J2EE applications that are used in hospitals throughout the world. I wondered why many software engineers (including myself) found working on these applications so difficult. Seeking to answer this question I returned to university to pursue a Ph.D. in the area.

PUBLICATIONS

1. Hayden Melton and Ewan Tempero. *Identifying Refactoring Opportunities by Identifying Dependency Cycles*. In Proceedings of the Twenty-Ninth Australasian Computer Science Conference, Hobart, Australia, January 2006.
2. Hayden Melton. *On the Usage and Usefulness of OO Design Principles*. In OOPSLA 2006 Companion, Portland, Oregon, USA, October 2006.
3. Gareth Baxter, Marcus Freat, James Noble, Mark Rickerby, Hayden Smith, Matt Visser, Hayden Melton and Ewan Tempero. *Understanding the Shape of Java Software*. In OOPSLA 2006 Proceedings, Portland, Oregon, USA, October 2006.
4. Hayden Melton and Ewan Tempero. *The CRSS Metric for Package Design Quality*. In Proceedings of the Thirtieth Australasian Computer Science Conference, Ballarat, Australia, January 2007.
5. Hayden Melton and Ewan Tempero. *JooJ: Real-time Support for Avoiding Cyclic Dependencies*. In Proceedings of the Thirtieth Australasian Computer Science Conference, Ballarat, Australia, January 2007.
6. Hayden Melton and Ewan Tempero. *Towards Assessing Modularity*. In Proceedings of the First Workshop on Assessment of Contemporary Modularization Techniques (co-located with ICSE 2007), Minneapolis, Minnesota, USA, May 2007.
7. Hayden Melton and Ewan Tempero. *An Empirical Study of Cycles among Classes in Java*. In Empirical Software Engineering: An International Journal, vol. 12, num. 4, August 2007.
8. Hayden Melton and Ewan Tempero. *Static Members and Cycles in Java Software*. In Proceedings of the First International Symposium on Empirical Software Engineering and Measurement, Madrid, Spain, September 2007.
9. Ewan Tempero, James Noble and Hayden Melton. *An Empirical View of Inheritance in Java Software*. Submitted to ICSE 2008.
10. Hong Yul Yang, Ewan Tempero and Hayden Melton. *An Empirical Study into Use of Dependency Injection in Java*. Submitted to the Australian Software Engineering Conference 2008.

PAPERS IN PREPARATION

11. Hayden Melton and Ewan Tempero. *On the Meaning of “Modularity”*.
This paper builds on and extends the ideas that appear in the *Towards Assessing Modularity* paper. It attempts to unify what has been said about modularity in 50-odd years worth of software engineering literature, and describes an approach for objectively and quantitatively assessing a software system’s modularity.
12. Hayden Melton and Ewan Tempero. *A Type-safe, Acyclic Subset of Java*.
This paper discusses techniques, challenges and implications for “language subsetting” Java in this way.

TECHNOLOGICAL EXPERTISE

Java

I’ve been using Java continually since 2000. Part of my Ph.D. research has involved building tools to collect metrics from Java source code and byte code. In building these tools I have gained an intimate knowledge of the Java Language Specification and the Java Virtual Machine Specification. I do all my Java development in Eclipse. I also know a good deal about its inner

workings through building a plugin for it called “JooJ” (see my publications). I’ve also used the J2EE suite of technologies in industry and for coursework as an undergraduate.

Other

As an undergraduate I took courses that exposed me to Haskell, Prolog, C, MIPS assembly language and VHDL. In industry I’ve also used C# and Visual Basic. I’m comfortable in both the Windows and Unix environments. I’ve also used a variety of development tools (e.g., Eclipse, Visual Studio, CVS, SVN, SourceSafe, Ant, Maven and PMD) and libraries (e.g., JUnit, BFOGraph, Struts, GraphViz, JUNG and BCEL).

REFERENCES

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