Terence John Parr

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Research Interests

My interests include programming language design, language implementation, language translation, and developer tools. For over 20 years, I have developed, maintained, and distributed open-source programming language tools such as ANTLR and StringTemplate.

Education

Ph.D., School of Electrical Engineering, Purdue University; 1993
Thesis: "Obtaining Practical Variants of $LL(k)$ and $LR(k)$ for $k > 1$ By Splitting the Atomic k-Tuple". Invented useful approximation to interesting, but intractable parsing-related computation; reduced space and time complexity from $O(n^k)$ to $O(nk)$.

MS in Engineering, School of Electrical Engineering, Purdue University; 1990

BSCS, School of Science, Purdue University; West Lafayette Indiana, 1987

Expert Witness Activity

Oracle v Google. July 2011 - May 2012. Defended Google on 2 of 7 patent infringement allegations, 1 of which went to trial (US patent 6,061,520). Testified May 11, 2012. Jury found in favor of Google. Ars Technica: "*Parr, a polished witness, seemed fresh and tireless on the stand.*"

Ajaxo, Inc. v Bank Of America Corporation. July-August, 2008. Defended Bank Of America against copyright infringement allegations. Settled in favor of Bank Of America.

Employment

University of San Francisco; associate professor of computer science; 2008-present. Graduate program director Summer 2004-present.

University of San Francisco; assistant professor of computer science; 2003-2008.

jGuru.com. Cofounder and Chief Scientist San Francisco, CA; 1995-2004 jGuru.com was a well-respected and large independent site for Java developers. Solicited and received $5M private investment, managed 20+ people (10 Ph.D.s) when doing business as MageLang Institute, and implemented 110k-line jGuru server using Java/XML/RDBMS. *Sold in 2004 to Jupiter Media.*

Parr Research Corporation; President and Founder Minneapolis, Minnesota; August 1994 - 1995 Software developement and consulting firm. Clients included NeXT Computer, Army Research Lab (Aberdeen Proving Grounds), Tandem, Computing Devices International, Berkeley Systems, Pencom.

Army High-Performance Computing Research Center; Postdoctoral Research Fellow Minneapolis, Minnesota; August 1993 - 1994 Research interests: language translation tools and their role in parallel supercomputing.

Army High-Performance Computing Research Center; Predoctoral Fellow Minneapolis, Minnesota; September 1991 - August 1993 Involved in the formulation of portable, application-specific programming language (Fortran-P) and compiler for supercomputers (e.g. MasPar MP-1 and Thinking Machines CM-200, CM-5).

IBM; Software Engineer Lexington, Kentucky; June 1990 - December 1990 Developed translator that generated a proprietary IBM language from C++

Renault Automation; Engineer Paris, France; Direction des Techniques Avancees; January - June 1988. Completed work on compiler, interpreter, and debugger for KAREL (robot-control language), ported to industrial robot controller; continuation of work from Cybotech.

Cybotech Corporation; Software Engineer West Lafayette, Indiana; May 1986 - December 1987 Principle developer of compiler, debugger and environment for KAREL, a robot control language; supervised work of two other employees.

Lockheed Missiles and Space Company; Summer Technical Hire Sunnyvale, California; May - August 1984, 1985 Assistant system administrator for network of 45 Apollo workstations. Developed program to schedule calibration of fleet ballistic missile test consoles.

Purdue University Psychology Department; Software developer West Lafayette, Indiana; January - April 1984; September 1984 - May 1985 Created library of routines to control and monitor hardware functions required for psychological experimentation.

Kaman Sciences Corporation; Junior Programmer Colorado Springs, Colorado; May - August 1983 Developed graphics package for representation of data from nuclear tests.

Bio-Analytical Systems; Software Engineer West Lafayette, Indiana; September 1982 - May 1983 Developed software to collect and display data from chemical analysis hardware.

Grants and Awards

Awarded $5k research grant from Sun Microsystems entitled, "C/C++ Parser Generator for NetBeans C/C++ Development Pack," period September, 2006 – June, 2007.

Received $8,800 software grant for Jira (bug tracking) and Confluence (wiki) from Atlassian, 2005 and 2006, respectively.

Received $73,500 software grant from Perforce (revision control system) for 100 seat license; yearly since 2002.

Awarded $70k Army SBIR (Small Business Innovation Research) contract to develop languages for process simulation and 3D visualization based upon VRML, 1994.

Faculty development fund awards:

$1,790.00 Travel to present paper "Enforcing strict model-view separation and template engines". April 2004.

$355.00 Travel to present "LL(*) parsing and code generation in ANTLR 3.0". December 2004.

$762.00 Travel to present "The role of template engines in translation". December 2004.

$1,301.98 Travel to attend "Generative programming and component engineering (GPCE2006)"; co-located with OOPSLA2006. December 2006.

$385.70 Travel to serve on program committee for conference and present paper "The internationalization and localization of web applications in action". December 2006.

Significant Projects

ANTLR. Designer and project lead. ANTLR is a very popular, well-respected parser generator that almost single-handedly diverted attention from $LR(k)$ to $LL(k)$ and introduced numerous (now standard) parsing/translation techniques and ideas. *Impact*: The software is included in all RedHat Linux distributions and Mac OS X developer distributions. There are over 5000 ANTLR downloads a month. The project website has 180,000 page views a month and attracts 45,000 visitors a month (70% of which originate from outside the US); data provided by *Google Analytics* site statistics service.

StringTemplate. Co-designer (with Thomas Burns) and project lead. StringTemplate is a java template engine (with ports for C# and Python) for generating source code, web pages, emails, or any other structured text output. StringTemplate is particularly good at retargetable code generators, multiple website skins, and website internationalization/localization. The project website has 11,000 page views a month and attracts 5,000 visitors a month (70% of which originate from outside the US); data provided by *Google Analytics* site statistics service.

ANTLRWorks. Co-designer (with graduate student Jean Bovet, the primary implementor). ANTLRWorks is a novel GUI grammar development environment for ANTLR grammars that combines an excellent grammar-aware editor with an interpreter for rapid prototyping and a language-agnostic debugger for isolating grammar errors. ANTLRWorks helps eliminate grammar nondeterminisms, one of the most difficult problems for beginners and experts alike, by highlighting nondeterministic paths in the syntax diagram associated with a grammar.

Mantra programming language. Co-designer (with graduate student Jean Bovet) and project lead. Mantra is essentially Java with some of the weight dropped off and some features from functional programming added for data manipulation. In a sense Manta combines the rapid development aspects of the new class of scripting languages with the static types and efficiency of Java.

Books

"Language Implementation Patterns", Terence Parr, Pragmatic Bookshelf, Dallas Texas, 2009. ISBN 978-1-93435-645-6.

"The Definitive ANTLR Reference: Building Domain-Specific-Languages," Terence Parr, Pragmatic Bookshelf, Dallas Texas, 2007. ISBN 0-9787392-5-6.

Section in "Lucene in Action", Erik Hatcher and Otis Gospodnetic. Manning 2005.

"Language Translation Using PCCTS AND C++", Terence John Parr, Automata Publishing; San Jose, CA 1997 ISBN 0-9627488-5-4.

Papers in Refereed Journals

"ANTLRWorks: an ANTLR grammar development environment," Jean Bovet and Terence Parr. Software Practice and Experience. Volume 38, No. 12 (Oct. 2008), pp 1305-1332.

"The Fortran-P Translator: Automatic Translation of Fortran 77 Programs for Massively Parallel Processors," Matthew O'Keefe, Terence Parr, B. Kevin Edgar, Steve Anderson, Paul Woodward, and Hank Dietz; Journal of Scientific Programming, Vol. 4, pp 1-21, 1995.

"ANTLR: A Predicated-LL(k) Parser Generator," T.J. Parr and R.W. Quong; Journal of Software Practice & Experience, Vol. 25, No. 7; July, 1995.

Papers at Refereed Conferences

"*LL(*)*: The foundation of the ANTLR parser generator," Terence Parr, Kathleen Fisher, Programming language design and implementation (PLDI), San Jose, CA 2011.

"Web Application Internationalization and Localization in Action," Terence Parr, International Conference on Web Engineering, Palo Alto, CA July 2006.

"Chronica: A Temporal Web Search Engine," Deniz Efendioglu, Chris Fraschetti, and Terence Parr, Poster paper, International Conference on Web Engineering, Palo Alto, CA July 2006. *Written with two USF graduate students.*

"Enforcing Strict Model-View Separation in Template Engines", WWW2004 conference, NYC May 2004. *Nominated for best paper (acceptance rate for WWW2004 was 14%).*

"A Language for Creating and Manipulating VRML", Terence Parr and Tim Rohaly, First Annual Symposium on the Virtual Reality Modeling Language, San Diego, 1995.

"Adding Semantic and Syntactic Predicates to LL(k): pred-LL(k)," Terence J Parr and Russell W. Quong; International Conference on Compiler Construction 1994; Edinburgh, Scotland; April 1994.

"An Overview of SORCERER-A Simple Tree-Parser Generator," Terence John Parr; Poster paper; International Conference on Compiler Construction 1994; Edinburgh, Scotland; April 1994.

Non-peer-reviewed Publications

"The Reuse of Grammars with Embedded Semantic Actions," Terence Parr, Keynote presentation at International Conference on Program Comprehension 2008. Amsterdam, Netherlands.

"LL and LR Translators Need $k > 1$ Lookahead," Terence J. Parr and Russell W. Quong; SIGNPLAN Notices, Vol. 31, No. 2, February 1996.

"PCCTS 1.00: The Purdue Compiler Construction Tool Set," T.J. Parr, H.G. Dietz, W.E. Cohen; SIGPLAN Notices, February 1992.

Web Publications

"The Importance of Model-View Separation", Terence Parr and Bill Venners, 2008
`http://www.artima.com/lejava/articles/stringtemplate.html`

"Learn the essentials of debugging," Terence Parr, IBM DeveloperWorks, 2004
`http://www-128.ibm.com/developerworks/web/library/wa-debug.html`

"Humans should not have to grok XML," Terence Parr, IBM DeveloperWorks, 2001
`http://www-128.ibm.com/developerworks/xml/library/x-sbxml.html`

"Why we care about Java," Terence Parr, JavaWorld Magazine, 1997
`http://www.javaworld.com/javaworld/jw-11-1997/jw-11-portability.html`

Workshops

"Implementing parsers and state machines in Java," JVM language summit. September 16-18, 2009. Santa Clara, CA.

ANTLR2009; co-organizer and presenter; USF, June 6-7, 2009.

ANTLR2005; co-organizer and presenter; BEA Systems, San Francisco, October, 2005.

"The Role of Template Engines in Translation", Source-to-source 2004 workshop co-located with OOPSLA 2004; Vancouver, Canada; October 25, 2004.

ANTLR2004 (in cooperation with ACM); co-organizer and presenter; University of San Francisco, October 7-8, 2004.

PCCTS workshops; organizer and presenter at NeXT Computer July 1994, SGI July 1995, and Sun Microsystems August 1997.

"An Overview of SORCERER," SGI Compiler Summit; San Jose CA; June 26-28, 1994.

"Object-Oriented ANTLR Parsers," (Presented by R.W. Quong) "OO Compilation–What are the Objects?" workshop at OOPSLA 94; Portland OR.

Invited Presentations

"Why program by hand in 5 days what you can spend 5 years of your life automating?", Keynote presentation at Code Generation conference 2011, Cambridge, England, June 2011.

"Implementing parsers and state machines in Java," Java VM Summit, Sept, 2009; http://wiki.jvmlangsummit.com/Parsers_in_Java

"A Taste of StringTemplate," Netflix Inc. August 2009.

"The Reuse of Grammars with Embedded Semantic Actions," Aachen Institute for Advanced Study in Computational Engineering Science (AICES); Aachen, Germany; June 16, 2008.

"The Reuse of Grammars with Embedded Semantic Actions," Centrum Wiskunde & Informatica Amsterdam, Netherlands; June 10, 2008.

"ANTLR v3, ANTLRWorks, and StringTemplate", BEA Systems; April, 2005. *With partial presentation by USF grad student Jean Bovet*

"The Evolution of The StringTemplate Engine", Harmonia Research group, UC Berkeley; December 2004.

"The ANTLR Parser Generator, Present and Future", University of Quebec at Montreal; November 12, 2004.

"The Role Of Template Engines in Code Generation", Microsoft Research; Seattle, Washington; July 2004.

"Language Translation, Domain Specific Languages, and ANTLR" with Loring Craymer, NASA JPL IT Symposium, October 2002.

"The ANTLR Parser Generator," Apple Computer; Cupertino, CA; February 1995.

"Language Translation with ANTLR and SORCERER," Sun Laboratories; Mountain View, CA; November 1994.

"PCCTS and It's Application to C++ Parsing," Lawrence Livermore National Lab; Livermore, CA; April 1994.

"An Overview of SORCERER," Argonne National Laboratories, Chicago Illinois; November 1994.

"An Introduction to PCCTS," IBM; Rochester, MN; April 1994.

"Parsing and Translation with ANTLR and SORCERER," Xerox Design Research Institute; Cornell University, Ithaca, NY; November 1993.

"Linear Approximation to Exponential LL(k) and LR(k) Lookahead," SUNY Albany; Albany, NY; November 1993.

"Translation with SORCERER," NeXT, Inc.; Redwood City, California; October 1993.

"Language Tools and Their Role in Scientific Computing," Konrad Zuse Institute of Berlin (ZIB); Berlin, Germany; September 1993.

"PCCTS," Technical University of Dresden; Dresden, Germany; September 1993.

"Advanced Parsing Strategies Using PCCTS," Argonne National Lab; Chicago, Illinois; July 1993.

"Advanced Parsing Strategies Using PCCTS: The ANTLR Parser Generator," Cray Research Inc.; Eagan, Minnesota; March 1993.

"The Role of Language Tools in Supercomputing," Army High-Performance Computing Research Center; Minneapolis, Minnesota; March, 1993.

Teaching

CS245 Data Strutures and Algorithms (lower division); Spring 2007.

CS345 Programming Language Paradigms (lower division); Spring 2006.

CS385 Special Lecture Series (upper division); Fall 2004

CS342 Software Engineering (upper division); Spring 2004, Spring 2005, Spring 2006, Spring 2007, Spring 2008, Fall 2008, Spring 2009

CS414 Compiler; Spring 2009

CS601 Object-Oriented Software Development (graduate); Fall 2002 (part-time position), Fall 2003, Fall 2004, Fall 2004, Fall 2005, Fall 2006, Spring 2006 (met with CS342), Spring 2007 (met with CS342), Spring 2008, Fall 2008, Spring 2009.

CS652; Programming Languages (graduate) Spring 2003 (part-time position), Spring 2004, Spring 2006, Spring 2008, Spring 2009

CS690; Masters Project (graduate) Fall 2003, Fall 2004, Spring 2005, Fall 2005

CS698; Directed Research Courses

- ANTLR Performance, Spring 2009
- Grammar Diff Tool, Fall 2009
- ANTLR Works Improvement, Fall 2008
- ANTLR Morph Rewrite Tool, Fall 2008
- Software Data Recorder, Summer 2008
- Prototype Grammars, Summer 2008
- Rewrite Engine, Summer 2008
- Mantra Application, Fall 2008
- ANTLRWorks, Jean Bovet, Fall 2005, Spring 2006
- Chronica, Chris Fraschetti, Fall 2005
- Chronica, Deniz Efendioglu, Fall 2005
- Flashmob, John Witchel, Summer 2004

- Flashmob, John Witchel, Fall 2004

Service

Program Committee Activity

SAC2010 Conference Object-Oriented Programming Languages and Systems. Lausanne, Switzerland, March 2010.

SAC2009 Conference language track, Hawaii March 2009.

First Workshop on Advances in Programming Languages (WAPL 2007), Wisla, Poland, October 2007.

Seventh Workshop on Language Descriptions, Tools and Applications (LDTA 2007), Braga, Portugal, March 2007.

International Conference on Web Engineering (ICWE 2006), served on program committee and acted as sponsorship chair. Palo Alto, CA July 2006. *Secured US$20,000 in sponsorship from Google, BEA, Adobe, and SAP; covered nearly half the expenses.*

Co-organized ANTLR workshops: co-sponsored by BEA Systems 2005, USF 2004, Sun Microsystems 1997, SGI 1995, NeXT Computer 1994.

Referee activity

Software Practice & Experience Journal

Programming Language Design and Implementation (PLDI) Conference

The Eighth Workshop on Language Descriptions, Tools and Applications (LDTA 2008)

Standards Body Activity

Invited to join expert group for Java Specification Request (JSR) for adding closures to Java, April 2007.

Service to the Department of Computer Science at the University of San Francisco

Graduate program director; Summer 2004 - Present.

Currently advising over 50 students and reviewing 150 graduate applications per year.

Doubled number of graduate applications (comparing 2005 to 2007); Fall 2006 was largest ever entering graduate class while schools across America see declining enrollment.

Developed Entrepreneurship emphasis (students take their electives in the business school); 5 entered first year, Fall 2006.

Created Practicum option (allowing Int'l students can work while going to school).

Created bridge program (allowing Int'l students with three-year degrees to get an MS).

Developed an international student representative program; existing students greet and guide prospective and incoming students.

Instigated formal graduate student orientation (with Chris Brooks).

Traveled to India to recruit graduate students, Summer 2004.

Travel to China to recruit graduate students, Fall 2007, Spring 2009.

Travel to China, Korea, Japan to recruit graduate students, Fall 2009.

Helped design and organize the MS Internet Engineering (MSIE) program (worked with Dave Wolber and Chris Brooks), 2002.

"How to get a job" workshops and "How to write a resume" workshops; Spring 2005, 2006, 2007.

Acquire nearly $60,000 per year in academic software licenses

- perforce revision control: $27,250.00
- intellij: site license; $499/person with about 50 students / year = $24,950
- clover code coverage tool; 250$ per workstation with 30 students per year = $7,500.

Built the FlashMob web site server, Spring of 2004.

Service to the College of Arts and Sciences at the University of San Francisco

"Mock lecture" for prospective students; Feb 2004, Feb 2006, April 2007.

Spoke at Research Opportunities in Science Luncheon for Women In Science group, March 2005.

Service to the University of San Francisco

Participated in Career Services review meeting, November, 2006.
Spoke at the International Student Orientation (Faculty Perspectives), August, 2006
Security Task Force (asked to serve by USF president, Father Privett), Fall 2005.
Open house for incoming freshmen, Spring 2005.
Major/minor fair volunteer, November 2003, February 2004.
Sang with the (student) men's *a cappella* group, 2004-2005.

Memberships

Association for Computing Machinery (ACM); member since 1990