Prasad Kulkarni

General Information

Contact:

Associate Professor
Department of Electrical Engineering and Computer Science
University of Kansas
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Education:

- Ph.D. in Computer Science, August 2007
  Dissertation: *Fast and Effective Solutions to the Phase Ordering Problem*
  Advisor: Dr. David Whalley
  Florida State University, Tallahassee, FL 32306.
- M.S. in Computer Science, August 2003
  Thesis: *Performance Driven Optimization Tuning in VISTA*
  Advisor: Dr. David Whalley
  Florida State University, Tallahassee, FL 32306.
- B.E. in Computer Engineering, August 2001
  Poona University, MH, India.

Appointments:

- Associate Professor, Department of Electrical Engineering and Computer Science, University of Kansas, Lawrence, KS. August 2013 – Present
- Assistant Professor, Department of Electrical Engineering and Computer Science, University of Kansas, Lawrence, KS. August 2007 – August 2013
- Research Intern, Dynamic Optimization Group, IBM T.J. Watson Research Center, Hawthorne, NY. August – December 2006

Honors and Awards:

- NSF CAREER award, duration: 03/01/2010 – 02/28/2015.
- Harry Talley Teaching Excellence Award (awarded by graduating EECS seniors), 2012.
- IBM Ph.D. Fellowship, 2006-07.
- Florida State University Featured Student, November 2006.
- Finalist in the Florida State University Research and Creativity Awards, April 2006.

Research

Research Experience:

- *Faculty Researcher* August 2007 – Present
  Information and Telecommunication Technology Center (ITTC), University of Kansas, Lawrence, KS 66045
  Director – Computer Systems Design Laboratory (CSDL) at ITTC
  Group Leader – Compilers, Architecture, and Runtime Systems (CARS) Group
  Research interests include Compilers, Architecture, Virtual Machines, and Embedded Systems.

- *Research Intern* August – December 2006
  Dynamic Optimization Group, IBM T. J. Watson Research Center, Hawthorne, NY 10532
  Mentor: Dr. Matthew Arnold (Manager: Dr. Michael Hind)
  Researched performance issues for IBM's J9/TR and JikesRVM JIT compilers for single-threaded and multi-threaded applications, on single-processor and multi-processor machine platforms.

- *Graduate Research Assistant* August 2003 – August 2006
  Advisor: Dr. David Whalley
  Duties included researching exhaustive and heuristic approaches to address the phase ordering problem in optimizing compilers, providing support for the VISTA system, and doing other tasks directly related to my Ph.D. dissertation.

- *Graduate Research Assistant* August 2001 – August 2003
  Advisor: Dr. David Whalley
  Duties included enhancing the VISTA system for performance oriented tasks, and doing research directly related to and coinciding with my M.S. thesis.

Research Group:

- CARS (Compilers, Architecture, and Runtime Systems)
  http://www.ittc.ku.edu/ kulkarni/CARS/

Publications (*with student advisees in '*'*):

1. Michael Jantz* and **Prasad Kulkarni**, *Analyzing and Addressing False Interactions During Compiler Optimization Phase Ordering* to be published in Software Practice & Experience (**SP&E**), article first published online on January 22, 2013.

2. Michael Jantz* and **Prasad Kulkarni**, *Exploring Best Single and Multi-Level JIT Compilation Policy for Modern Machines* published in the ACM Transactions on Architecture and Code Optimization (**TACO**), 10(4):22:1–22:29, December 2013.

3. Michael Jantz* and **Prasad Kulkarni**, *Exploiting Phase Inter-Dependencies for Faster Iterative Compiler Optimization Phase Order* published in the ACM/IEEE International Conference on Compilers, Architectures, and Synthesis for Embedded Systems (**CASES '13**), pp. 7:1–7:10, September 29–October 4, 2013.

4. Hemaiyer Sankaranarayanan* and **Prasad Kulkarni**, *Source-to-Source Refactoring and Elimination of Global Variables in C Programs* published in the Journal of Software Engineering and Applications (**JSEA**), Vol.6 No.5, pp. 264–273, May 2013.

5. Michael Jantz* and **Prasad Kulkarni**, *Performance Limits of Optimization Phase Selection During Dynamic JIT Compilation* published in the ACM SIGPLAN international conference on Virtual Execution Environments (**VEE '13**), pp. 131–142, March 16-17, 2013.

6. Marianne Jantz* and **Prasad Kulkarni**, *Understand and Categorize Dynamically Dead Instructions for Contemporary Architectures* published in the IEEE 16th Workshop on Interaction between Compilers and Computer Architectures (**INTERACT '12**), February 25th, 2012.

7. **Prasad Kulkarni**, *JIT Compilation Policy for Modern Machines* published in the ACM international conference on Object oriented programming systems languages and applications (**OOPSLA '11**), pp. 773–788, October 22-27, 2011.

8. Adam Smith* and **Prasad Kulkarni**, *Localizing Globals and Statics to Make C Programs Thread-Safe* published in the ACM/IEEE International Conference on Compilers, Architectures, and Synthesis for Embedded Systems (**CASES '11**), pp. 205–214, October 9-14, 2011.

9. **Prasad Kulkarni** and Jay Fuller*, *JIT Compilation Policy on Single-Core and Multi-Core Machines* to be published in the IEEE 15th Workshop on Interaction between Compilers and Computer Architectures (**INTERACT '11**), February 12th, 2011.

10. Michael Jantz* and **Prasad Kulkarni**, *Eliminating False Phase Interactions to Reduce Optimization Phase Order Search Space* published in the ACM/IEEE conference on Compilers, Architectures and Synthesis for Embedded Systems (**CASES '10**), pp. 187-196, October 25-27, 2010.

11. **Prasad Kulkarni**, Michael Jantz*, and David Whalley, *Improving Both the Performance Benefits and Speed of Optimization Phase Sequence Searches* published in the ACM conference on Languages, Compilers, and Tools for Embedded Systems (**LCTES '10**), pp. 95-104, April 11-14, 2010.

12. Manjiri Namjoshi* and **Prasad Kulkarni**, *Novel Profiling for Virtual Machines* published in the ACM conference on Virtual Execution Environments (**VEE '10**), pp. 133-144, March 2010.

13. **Prasad Kulkarni**, David Whalley, Gary Tyson, and Jack Davidson, *Practical Exhaustive Optimization Phase Order Exploration and Evaluation* published in the ACM Transactions on Architecture and Code Optimization (**TACO**), 6(1):1–36, March 2009.

14. Chris Zimmer, Stephen Hines, **Prasad Kulkarni**, Gary Tyson, and David Whalley, *Facilitating compiler optimizations through the dynamic mapping of alternate register structures* published in the ACM conference on Compilers, Architecture, and Synthesis for Embedded Systems (**CASES '07**), pp. 165-169, October 2007.

15. **Prasad Kulkarni**, Matthew Arnold, and Michael Hind, *Dynamic Compilation: The Benefits of Early Investing* published in the ACM SIGPLAN/SIGOPS Conference on Virtual Execution Environments (**VEE '07**), pp. 94-104, June 2007.

16. **Prasad Kulkarni**, David Whalley, Gary Tyson, and Jack Davidson, *Evaluating Heuristic Optimization Phase Order Search Algorithms* published in the IEEE/ACM International Symposium on Code Generation and Optimization (**CGO '07**), pp. 157-169, March 2007.

17. **Prasad Kulkarni**, Wankang Zhao, Steve Hines, David Whalley, Xin Yuan, Robert van Engelen, Kyle Gallivan, Jason Hiser, Jack Davidson, Baosheng Cai, Mark Bailey, Hwashin Moon, Kyunghwan Cho, Yunheung Paek, and Douglas Jones, *VISTA: VPO Interactive System for Tuning Applications* published in the ACM Transactions on Embedded Computing Systems (**TECS**), 5(4):819 - 863, November 2006.

18. **Prasad Kulkarni**, David Whalley, Gary Tyson, and Jack Davidson, *In Search of Near-Optimal Optimization Phase Orderings* published in the ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (**LCTES '06**), pp. 83-92, June 2006.

19. Matt Kleffner, Douglas Jones, Jason Hiser, **Prasad Kulkarni**, Julie Parent, Steve Hines, David Whalley, Jack Davidson and Kyle Gallivan, *On the Use of Compilers in DSP Laboratory Instruction* published in the IEEE Conference on Acoustics, Speech, and Signal Processing (**ICASSP '06**), pp. II-977- II-980, May 2006.

20. **Prasad Kulkarni**, David Whalley, Gary Tyson, and Jack Davidson, *Exhaustive Optimization Phase Order Space Exploration* published in the IEEE/ACM Symposium on Code Generation and Optimization (**CGO '06**), pp. 306-318, March 2006.

21. Steve Hines, **Prasad Kulkarni**, David Whalley, and Jack Davidson, *Using De-optimization to Re-optimize Code* published in the Fifth ACM International Conference on Embedded Software (**EMSOFT '05**), pp. 114-123, September 2005.

22. **Prasad Kulkarni**, Steve Hines, David Whalley, Jason Hiser, Jack Davidson, and Douglas Jones, *Fast and Efficient Searches for Effective Optimization Phase Sequences* published in the ACM Transactions on Architecture and Code Optimization (**TACO**), 2(2):165-198, June 2005.

23. **Prasad Kulkarni**, Steve Hines, Jason Hiser, David Whalley, Jack Davidson, and Douglas Jones, *Fast Searches for Effective Optimization Phase Sequences* published in the ACM SIGPLAN Conference on Programming Language Design and Implementation (**PLDI '04**), pp. 171-182, June 2004.

24. Wankang Zhao, **Prasad Kulkarni**, David Whalley, Chris Healy, Frank Mueller, and Gang-Ryung Uh, *Tuning the WCET of Embedded Applications* published in the 10th IEEE Real-Time and Embedded Technology and Applications Symposium (**RTAS '04**), pp. 472-481, May 2004.

25. **Prasad Kulkarni**, Wankang Zhao, Hwashin Moon, Kyunghwan Cho, David Whalley, Jack Davidson, Mark Bailey, Yunheung Paek, and Kyle Gallivan, *Finding Effective Optimization Phase Sequences* published in the ACM SIGPLAN Conference on Languages, Compilers and Tools for Embedded Systems (**LCTES '03**), pp. 12-23, June 2003.

Research Funding:

1. Perry Alexander (PI), Prasad Kulkarni, and Andy Gill, *Armored Software*, US Department of Defense. Project duration: 09/27/2013 – 09/25/2017, Amount: $2,708,071. **(Co-PI)**

2. Prasad Kulkarni, *Research Experience for Undergraduates (REU) supplement* for project titled, CAREER: Implementing a New Parallelization Model for Virtual Machines, NSF Division of Computer and Network Systems. Project duration: 03/01/2010 – 02/28/2015, Amount: $16,000.00. **(PI)**

3. Prasad Kulkarni, *Implementation and Evaluation of a Moving Target Defense System*, KU General Research Fund (GRF) award, Period: FY 2013, Amount: $8,320. **(PI)**

4. Prasad Kulkarni, *Research Experience for Undergraduates (REU) supplement* for project titled, CAREER: Implementing a New Parallelization Model for Virtual Machines, NSF Division of Computer and Network Systems. Project duration: 03/01/2010 – 02/28/2015, Amount: $15,864.00. **(PI)**

5. Prasad Kulkarni, *System Tools for Heterogeneous Computing Architectures*, KU General Research Fund (GRF) award, Period: FY 2012, Amount: $8,320. **(PI)**

6. Prasad Kulkarni, *Research Experience for Undergraduates (REU) supplement* for project titled, CAREER: Implementing a New Parallelization Model for Virtual Machines, NSF Division of Computer and Network Systems. Project duration: 03/01/2010 – 02/28/2015, Amount: $16,000.00. **(PI)**

7. Prasad Kulkarni, *Improving Java Startup Performance*, Kansas Technology Enterprise Corporation (KTEC) FY2011 Technology Development Funding, Period: 07/01/2010 – 06/30/2011, Amount: $24,000 (approx.) **(PI)**

8. Prasad Kulkarni, *CAREER: Implementing a New Parallelization Model for Virtual Machines*, awarded by the Faculty Early Career Development (CAREER), NSF Division of Computer and Network Systems. Project duration: 03/01/2010 – 02/28/2015, Amount: $420,749.00. **(PI)**

9. Prasad Kulkarni, *Improving Java Startup Performance*, Kansas Technology Enterprise Corporation (KTEC) FY2010 Technology Development Funding, Period: 07/01/2009 – 06/30/2010, Amount: $24,000 (approx.) **(PI)**

10. Prasad Kulkarni, *Techniques Towards Improved Software Reliability and Safety*, New faculty general research program, Period: 07/01/09 – 06/30/11, Amount: $8,000 **(PI)**

11. Prasad Kulkarni, *Improving Java Startup Performance*, Kansas Technology Enterprise Corporation (KTEC) FY2009 Technology Development Funding, Period: 08/05/2008 – 06/30/2009, Amount: $24,000 (approx.) **(PI)**

Presentations:

1. *CARS Research Group at KU* at Perceptive Software, May 24, 2013.

2. *CARS (Compilers, Architectures, and Runtime Systems) Research Overview* at the CSDL open house, Nichols Hall (ITTC), March 1, 2012.

3. *Understand and Categorize Dynamically Dead Instructions for Contemporary Architectures* at the IEEE 16th Workshop on Interaction between Compilers and Computer Architectures (INTERACT '12), February 25th, 2012.

4. *JIT Compilation Policy for Modern Machines* at the ACM international conference on Object oriented programming systems languages and applications (OOPSLA '11), October 27, 2011.

5. *Localizing Globals and Statics to Make C Programs Thread-Safe* at ACM/IEEE International Conference on Compilers, Architectures, and Synthesis for Embedded Systems (CASES '11), October 13, 2011.

6. *JIT Compilation Policy on Single-Core and Multi-Core Machines* at the IEEE 15th Workshop on Interaction between Compilers and Computer Architectures (INTERACT '11), February 12th, 2011.

7. *Eliminating False Phase Interactions to Reduce Optimization Phase Order Search Space* at the ACM/IEEE International Conference on Compilers, Architectures, and Synthesis for Embedded Systems (CASES '10), October 27, 2010.

8. *Research in Computer Systems* at the ITTC Advisory Board Meeting, Nichols Hall (ITTC), June 10, 2010.

9. *Improving Both the Performance Benefits and Speed of Optimization Phase Sequence Searches* at the ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES '10) April 2010.

10. *Novel Online Profiling for Virtual Machines* at the ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE '10) March 2010.

11. *Improving Java Startup Performance* at the KTEC advisory board review meeting, Nichols Hall (ITTC), September 18, 2009.

12. *Exhaustive Phase Order Search Space Exploration and Evaluation* at Microsoft Research Lab, April 18, 2007.

13. *Dynamic Compilation: The Benefits of Early Investing* at the ACM SIGPLAN/SIGOPS Conference on Virtual Execution Environments (VEE '07), June 14, 2007.

14. *Evaluating Heuristic Optimization Phase Order Search Algorithms* at the IEEE/ACM International Symposium on Code Generation and Optimization (CGO '07), March 12, 2007.

15. *In Search of Near-Optimal Optimization Phase Orderings* at the Los Alamos Computer Science Institute's Workshop on Automatic Tuning of Libraries and Applications, October 16, 2006.

16. *In Search of Near-Optimal Optimization Phase Orderings* at the ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES '06), June 15, 2006.

17. *Exhaustive Optimization Phase Order Space Exploration* at the IEEE/ACM Symposium on Code Generation and Optimization (CGO '06), March 29, 2006.

18. *Fast Searches for Effective Optimization Phase Sequences* at the ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI '04), June 10, 2004.

19. *Finding Effective Optimization Phase Sequences* at the ACM SIGPLAN Conference on Languages, Compilers and Tools for Embedded Systems (LCTES '03), June 11, 2003.

Teaching

Teaching Experience (*with student evaluation scores out of a max. of 5.0*):

- **Associate/Assistant Professor** August 2007 – Present
  EECS Department, University of Kansas, Lawrence, KS 66045
  1. **EECS 268 – Programming II**: Fall 2012 (*4.77*)
  2. **EECS 665 – Compiler Construction**: Fall 2013 (*4.78*), Fall 2012 (*4.93*), Fall 2011 (*4.91*), Fall 2010 (*4.78*), Fall 2009 (*4.82*), Fall 2008 (*4.92*), Fall 2007 (*3.33*)
  3. **EECS 678 – Introduction to Operating Systems**: Spring 2013 (*4.97*), Spring 2012 (*4.82*), Fall 2010 (*4.92*), Spring 2010 (*4.90*), Spring 2009 (*4.67*)
  4. **EECS 700 – Security and Performance**: Fall 2009 (*4.79*)
  5. **EECS 768 – Virtual Machines**: Fall 2013 (*5.00*), Spring 2012 (*5.00*), Spring 2011 (*4.93*), Spring 2009 (*5.00*), Spring 2008 (*4.86*)

- **Graduate Teaching Assistant**
  Computer Science department, Florida State University, Tallahassee, FL 32304.
  Duties included conducting recitation lectures, holding office hours and grading assignments.
  1. **CDA5155 – Computer Architecture**: Fall 2002
  2. **CGS3408 – C for Non-specialists**: Fall 2001

Students:

- **Graduated as Lead Advisor:**
  1. Goutham Selvakumar (M.S.), *Constructing an Environment and Providing a Performance Assessment of Androids Dalvik Virtual Machine on x86 and ARM*, defended on 06/07/2013.
  2. Marianne Jantz (M.S.), *Explore Dynamically Dead Instructions for Contemporary Architectures*, defended on 05/16/2013.
  3. Sridhar Balasubramanian (M.S.), *Precise Computation Control using Discovered Computation Structure and Behaviour*, defended 11/16/2012.
  4. Hemaiyer Sankaranarayanan (M.S.), *Source-to-Source Refactoring Framework for Local and Global Variables*, defended 03/08/2012.
  5. Divya Iyer (M.S.), *Exploring the Suitability of Existing Tools for Constructing Executable Java Slices*, defended 01/26/2012.
  6. Michael Jantz (M.S.), *Understanding Optimization Phase Interactions to Reduce the Phase Order Search Space*, defended 07/30/2010.
  7. Manjiri Namjoshi (M.S.), *Towards Future Method Hotness Prediction for Virtual Machines*, defended 12/11/2009.
  8. Adam Smith (M.S.), *Compiler Transformations to Generate Reentrant C Programs to Assist Software Parallelization*, defended 06/15/2009.

- **Current Advisees:**
  1. Michael Jantz (Ph.D.), expected Summer 2014.
  2. Surya Tej Nimmakayala (Ph.D.), expected Summer 2016.
  3. Jason Gevargizian (Ph.D.), expected Summer 2016.
  4. Bradley Stevenson (M.S.), expected Spring 2014.
  5. Ranjith Krishnan (M.S.), expected Spring 2014.
  6. Ansu Joys (M.S.), expected Summer 2014.
  7. Dane Mitchell (M.S.), expected Summer 2015.
  8. Katherine Wu (B.S.), expected Spring 2014.
  9. Jamie Robinson (B.S.), expected Spring 2015.
- **Other Graduate Student Committees:**
  1. Evan Austin (Ph.D. candidate)
  2. Daniel Hein (Ph.D. candidate)
  3. Wenrong Zeng (Ph.D. candidate)
  4. Yuhao Yang (Ph.D. candidate)
  5. Hariprasad Sampathkumar (Ph.D. candidate)
  6. Andrew Farmer (Ph.D. candidate)
  7. Muthu Pitchaimani (Ph.D. candidate)
  8. Meeyoung Park (Ph.D.), defended 10/31/2013.
  9. Maryam Mahani (Ph.D.), defended 08/31/2012.
  10. Nicholas Frisby (Ph.D.), defended 08/28/2012.
  11. Wesley Peck (Ph.D.), defended 12/14/2011.
  12. Mark Snyder (Ph.D.), defended 07/27/2011.
  13. Sandhya Beldona (Ph.D.), defended 12/05/2008.
  14. William Dinkel (M.S.), defended 07/18/2013.
  15. Brigid Halling (M.S.), defended 05/03/2013.
  16. Srinivas Palghat (M.S.), defended 05/07/2013.
  17. Annette Tetmeyer (M.S.), defended 04/24/2013.
  18. Zhi Li (M.S.), defended 04/08/2013.
  19. Megan Peck (M.S.), defended 08/30/2012.
  20. Manogna Thimma (M.S.), defended 07/19/2012.
  21. Karthik Poduval (Expected M.S.)
  22. Hemanth Narra (M.S.), defended 07/20/2011.
  23. Tyrian Phagan (M.S.), defended 06/23/2011.
  24. Sandeep Kakarla (M.S.), defended 09/02/2010.
  25. Bhargav Adagarla (M.S.), defended 08/30/2010.
  26. Michael Steve Stanley (M.S.), defended 08/24/2010.
  27. Ashwini Nadig (M.S.), defended 04/26/2010.
  28. Supriya Vasudevan (M.S.), defended 11/20/2008.
  29. Andrew Kannenberg (M.S.), defended 10/20/2008.
  30. Abhinav Peddi (M.S.), defended 09/26/2008.
  31. Mark Sonen (M.S.), defended 07/18/2008.
  32. Witold Rzepnicki (M.S.), defended 03/27/2008.
  33. Kumar Goundan (M.S.), defended 03/27/2008.
  34. Jayanth Venkataraman (M.S.), defended 02/20/2008.

Service

Professional Activities:

- **Conference Program Committees:**
  1. Program committee Chair, ACM International Conference on Languages, Compilers, and Tools for embedded systems, 2014.
  2. Program committee member, ACM International Conference on Principles and Practices of Programming on the Java platform, 2014.
  3. Program committee member and session chair (2011), Annual IEEE Workshop on the Interaction between Compilers and Computer Architecture, 2012 and 2011.
  4. Guest Reviewer, 21st Euromicro Conference on Real-Time Systems, July 2011.
  5. Program committee member, ACM International Conference on Languages, Compilers, and Tools for embedded systems, 2010, 2009, and 2008.
  6. Program committee member, 4th Workshop on Statistical and Machine Learning Approaches to Architectures and Compilation, 2010.
  7. External reviewer, ACM International Conference on Object Oriented Programming, Systems, Languages, & Applications, 2009.
- **Journal Reviews:**
  1. Reviewer, IEEE Transactions on Parallel and Distributed Systems, 2014.
  2. Reviewer, ACM Transactions on Architecture and Code Optimization, 2013 (3), 2012, 2011, 2009, and 2008.
  3. Reviewer, Springer-Verlag Journal on Software and System Modeling, 2013.
  4. Reviewer, Inderscience International Journal of Sustainable Design, 2013.
  5. Reviewer, ACM Transactions on Embedded Computing Systems, 2011 and 2009.
  6. Reviewer, International Journal on Artificial Intelligence Tools, 2011.
  7. Reviewer, International Journal of High Performance Computing and Networking, 2010.
  8. Reviewer, International Journal of Parallel, Emergent and Distributed Systems, 2010.
  9. Reviewer, International Journal of Circuits, Systems, and Computers, 2010.
- **Proposal Review Panels:**
  1. Expert guest reviewer, Swiss National Science Foundation, 2011 and 2010.
  2. NSF guest reviewer, OCI-Strategic Technologies for Cyber Infrastructure, 2011.
  3. Review Panel, National Science Foundation, CISE Cyber-Infrastructure, 2009.

University of Kansas Service:

1. Director, Computer Systems Design Laboratory, ITTC, 2011-present.
2. Chair of faculty hiring committee, EECS department, 2014 and 2013.
3. Graduate committee, EECS department, 2008-present.
4. Ph.D. Qualifier exam committee, EECS department, 2011-2012.
5. Equipment committee, EECS department, 2010-2011.
6. Faculty hiring committee, EECS department, Fall 2009.
7. Library committee representing the EECS department, Spring 2008.

Outreach and Other Activities:

1. EECS volunteer for KU School of Engineering's Weekend of Engineering, Spring 2012 and Fall 2011. Weekend of Engineering is camp for *high school girls* that "blends fun educational activities and a glimpse of the KU college experience".

2. Attended the Workshop on *Representing Teaching in a Narrative*, at the KU Center for Teaching Excellence, September 22, 2011.
3. Attended the Workshop on *Creating Assignments That Maximize Learning*, at the KU Center for Teaching Excellence, February 5, 2008.