

# Eelke Folmer

Assistant Professor

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## EDUCATION

**Doctor of Philosophy**, Software Engineering, University of Groningen, The Netherlands

Primary Fields: Software Engineering and Human Computer Interaction

Thesis: Software Architecture Analysis of Usability

Advisor: Dr. Jan Bosch

Completion Date: September 26, 2005

**Master of Science**, Technical Computer Science, University of Groningen, The Netherlands

Depth Areas: Software Engineering, Networks, Real Time Systems.

Thesis: An Analysis of Distributed Database Performances for a Trunked Radio System

Minor: Econometrics

Advisor: Dr. Ben Spaanenburg

Completion Date: July 12, 2001

## APPOINTMENTS

**Assistant Professor**, University of Nevada, Reno, NV

Department: Computer Science and Engineering

Research laboratory: Player-Game-Interaction lab

Appointment Duration: September 1, 2006, to present

**Postdoctoral Research Fellow**, University of Alberta, Edmonton, Alberta

Department: Computing Science

Advisor: Dr. Paul Sorenson

Appointment Duration: October 1 2005, to June 30, 2006

**Research Assistant**, University of Groningen, Groningen, The Netherlands

Department: Mathematics and Computer Science

Research Project: Software Architecture that Supports Usability (STATUS)

Advisors: Dr. Jan Bosch / Dr. Jilles van Gorp

Appointment Duration: September 2001, to July 2005

## AWARDS

Junior Faculty Research Award, University of Nevada, 2007

Graduate Student Award, University of Groningen, 2005

## JOURNAL ARTICLES

Bei Yuan, Eelke Folmer, Frederick C. Harris, Jr. Game Accessibility: a Survey. Accepted for Universal Access in the Information Society, August 2009.

Eelke Folmer and Jan Bosch. Experiences with Software Architecture analysis of Usability. *International Journal of Information Technology and Web Engineering*. Volume 3(4):1-29, December 2008.

Eelke Folmer and Jan Bosch. A Pattern Framework for Software Quality Assessment and Tradeoff Analysis. *International Journal of Software Engineering and Knowledge Engineering*. Volume 17(4): 515-538, June 2007.

Eelke Folmer, Martijn van Welie and Jan Bosch. Bridging Patterns - an approach to bridge gaps between SE and HCI. *Journal of Information and Software Technology*. Volume 48(2):69-89, February 2006.

Eelke Folmer, Jan Bosch. Architecting for Usability; a Survey. *Journal of Systems and Software*. Volume 70 (1):61-78, January 2004.

Eelke Folmer, Jilles van Gorp and Jan Bosch. A Framework for capturing the relationship between usability and software architecture *Software Process: Improvement and Practice*. Volume 8(2):67-87, June 2003.

## PEER-REVIEWED CONFERENCE PAPERS

Tony Morelli, Eelke Folmer, John Foley, Luis Columna, and Lauren Lieberman. VI Tennis: a Vibrotactile/ Audio Exergame for Users who are Visually Impaired, Submitted to CHI: Conference on Human Factors in Computing Systems, 2010.

Bei Yuan, Manjari Sapre and Eelke Folmer. Seek-n-Tag: Labeling Virtual World Objects with a Virtual World Game, Submitted to CHI: Conference on Human Factors in Computing Systems, 2010.

Eelke Folmer, Bei Yuan, Dave Carr, Manjari Sapre. TextSL: A Command-Based Virtual World Interface for the Visually Impaired, In Proceedings. 11th international ACM SIGACCESS conference on Computers and Accessibility, Pages 59-66, Pittsburgh PA. October 2009.

Bei Yuan and Eelke Folmer. Blind hero: Enabling Guitar Hero for the Visually Impaired. In Proceedings. 10th international ACM SIGACCESS conference on Computers and Accessibility, pages 169-176, Halifax, Nova Scotia, Canada, October 2008.

Eelke Folmer. Component Based Game Development. In Proceedings 10th International ACM SIGSOFT Symposium on Component-Based Software Engineering, pages 65-73, Medford, USA, July 2007.

Eelke Folmer. Usability Patterns in Games. In Proceedings Futureplay 2006 conference, London, Ontario, Canada, October 2006.

Eelke Folmer, Jan Bosch, Case studies on Analyzing Software Architectures for Usability, Proceedings of the 31st EUROMICRO Conference on Software Engineering and Advanced Applications, Porto, Portugal, September 2005.

Eelke Folmer and Jan Bosch. Cost Effective Development of Usable Systems; Gaps between HCI and Software Architecture Design. In *Advances in information systems development: bridging the gap between academia and industry*. Volume 1, pages 337-349, Karlstad, Sweden. August 2005.

Eelke Folmer, Jilles van Gorp and Jan Bosch. Scenario-Based Assessment of Software Architecture Usability. In Proceedings of the 9th IFIP Working Conference on Engineering for Human-Computer Interaction, Pages 321-339 Hamburg, Germany, July 2004.

Eelke Folmer, Jan Bosch, Usability patterns in Software Architecture, In Proceedings of the 10th International Conference on Human-Computer Interaction Volume I, pages 93-97, Crete, Greece, June 2003.

## **POSTERS & DEMONSTRATIONS**

Tony Morelli and Eelke Folmer. Exergames for Individuals who are Visually Impaired. Doctoral Consortium, 11th international ACM SIGACCESS conference on Computers and Accessibility, Pittsburgh PA. October 2009.

Navid Fallah and Eelke Folmer. Navatar: A Mixed Reality Navigation System. Doctoral Consortium, 11th international ACM SIGACCESS conference on Computers and Accessibility, Pittsburgh PA. October 2009.

Bei Yuan and Eelke Folmer. Blind Hero. Accessibility Arcade, Games for Health Conference, Boston, MA June 11-12, 2009.

Eelke Folmer, Game Accessibility Arcade. International Game Developers Association, Special Interest Group on Game Accessibility, Game Developer Conference, San Francisco, California, 2008.

Eelke Folmer, One Switch Games. International Game Developers Association, Special Interest Group on Game Accessibility, Entertainment for All Expo, Los Angeles, California, October 18, 2007.

## **TALKS & SEMINARS**

Game not Over - Barriers to Access for Video Games and Virtual Worlds. Invited talk, University of Nevada's College of Engineering Advisory Board meeting, Reno, Nevada. October 16, 2009.

Game Accessibility Research. Invited talk, Accessibility Workshop, Games for Health Conference, Boston, Massachusetts, June 11-12, 2009.

Accessible Online Workplaces and Communities. Panelist, IEEE Accessing the Future Conference. Northeastern University, Boston, Massachusetts, July 20-21, 2009.

Game not Over: Accessibility Issues in Video Games. Invited talk. Woman Studies Program' Faculty Lecture Series on Gender, Race, and Identity, University of Nevada, November 12, 2008.

A Guitar Playing Game for Visually Impaired. Invited talk, Nevada Federation of the Blind State Convention, Grand Sierra Resort, Reno Nevada, November 1, 2008.

Trends in Computer Game Development. Invited talk, Workshop Transcending Gaming Technology, University of Nevada, Reno Nevada, March 10, 2008.

Game Development. Invited talk, International Gaming Technology Spring Seminar, IGT campus, Reno , Nevada, May 15th, 2008.

Accessibility Idol. Judge, International Game Developers Association, Special Interest Group on Game Accessibility, Game Developer Conference 2007.

Improving game Accessibility with Interaction Design Patterns, IGDA Accessibility Workshop. Develop Conference, Brighton, UK, July 11, 2006.

Game Engineering, Invited talk, Department of Computer Science and Engineering, University of Nevada, Reno, Nevada, April 27, 2006.

Software Architecture Assessment of Usability & Game Engineering, Invited Seminar, Department of Computer Science, University of Calgary, Calgary, Alberta, Canada. November 15, 2005.

Software Architecture Assessment of Usability, IPA Spring days on Software Architecture. Made, The Netherlands. March 31, 2005.

Software Architecture Analysis of Usability, Doctoral Defense, Department of Mathematics and Computer Science. University of Groningen, The Netherlands. September 26, 2005.

Cost Effective Development of Usable Systems; Gaps between human computer interaction and software engineering. Workshop, Bridging the Gaps Between Software Engineering and Human-Computer Interaction-II, IEEE International Conference on Software Engineering (ICSE), Edinburgh, Scotland. May 23 2004.

Interaction Design Patterns in Games, Workshop Player Centered Game Design, Conference on Human Factors in Computing Systems (CHI), Montreal, Quebec, Canada. April 22, 2006.

Boundary objects in Architecture Design for Usability. Workshop on Identifying Gaps between Human Computer Interaction and Software Engineering and Design and boundary objects to bridge them, Conference on Human Factors in Computing Systems, Vienna, Austria, April 24, 2004.

Architectural Sensitive Usability Patterns, Technical Talk. Viking Pattern Languages of Programs workshop (VPloP), Bergen, Norway. September 2003.

Scenario based assessment of software architecture usability, Workshop Bridging the Gaps Between Software Engineering and Human-Computer Interaction, International Conference on Software Engineering, Portland, Oregon, May 2003.

## **FUNDING**

HCC-Small: TextSL: A Virtual World Interface for Visually Impaired, National Science Foundation Human-Centered Computing Award #0917362 to Eelke Folmer (PI), University of Nevada. Amount: \$499,332. July 1st, 2009 through June 30, 2012.

Developing an Accessible Client for Second Life, National Science Foundation Human-Centered Computing Small Grant for Exploratory Research (SGER) Award #0738921 to Eelke Folmer (PI), University of Nevada. Amount: \$90,488. August 1st 2007 to January 31st, 2009.

Sponsored Senior Student Project in Computer Science and Engineering. Bally Technologies. Award to Sergiu Dascalu(PI) and Eelke Folmer(Co-PI). Amount: \$12,383. December 1st, 2008 through June 15, 2009.

Exploration of research Directions to Provide Solutions for Improving Quality Assurance at Bally Technologies. Bally Technologies. Award to Sergiu Dascalu (PI) and Eelke Folmer (Co-PI). Amount: \$62,972. June 1st 2007 to January 31st, 2008

ARI- Exploration of research Directions to Provide Solutions for Improving Quality Assurance at Bally Technologies. Nevada System of Higher Education. Award to Sergiu Dascalu (PI) and Eelke Folmer (Co-PI). Amount: \$50,000. June 1st 2007 to December 1st, 2007.

Improving the Accessibility of Video Games, University of Nevada, Junior Faculty Research Award, Award to Eelke Folmer (PI). Amount: \$15,000. July 1st, 2007 through July 1st, 2008.

## RESEARCH INTERESTS

human-computer-interaction software engineering games interaction design pattern accessibility  
haptics Health software architecture virtual worlds motor impaired visually impaired multimodal  
feedback human navigation exergaming cognitive impairment surface devices usability switch access

## THESES SUPERVISED

Manjari Sapre, **MS**. A Framework for making Virtual Worlds accessible to Visually Impaired, August 2009.

Dave Carr, **MS**. Towards Automatic Parallel Game Engine Architectures, May 2009.

Bei Yuan, **Ph.D**. Towards Generalized Accessibility of Video Games for the Visually Impaired, May 2009.

Chris Franklin **MS**. Less is More! less Interaction, more Accessibility, May 2008.

## GRADUATE ADVISOR

Buğra Oktay, **Ph.D**. Accessibility of Virtual Worlds, May 2012.

Tony Morelli, **Ph.D**. Exergaming for Individuals who are Visually Impaired, May 2011.

Navid Fallah, **Ph.D**. Mixed Reality Navigation System, December 2010.

## TEACHING

### **CS491/691: Design Patterns**, University of Nevada

Fall 2009                      15 students

Course creator and Professor. CS 491/691 is a senior level course that can also be taken by graduate students. This class teaches one of the fundamental concepts in software engineering: design patterns. Students learn different design patterns and their underlying object oriented concepts. Students learn to implement design patterns in Java to solve real world software design problems. Student work includes homework assignments, weekly readings, oral paper presentations and a programming project. Graduate students present a pattern not discussed in class. I envision this class to be taught at the 300 (junior) level in the future.

### **CS791: Game Interaction Design**, University of Nevada

Spring 2009                      7 students                      3.54/5.0 instructor rating (3 respondents)

Course creator and Professor. CS 791 is a graduate-level course. I designed this class to cover a wide range of topics in the field of human computer interaction but specifically focusing on the design of video games and virtual worlds. Topics included: usability and accessibility of games, interaction design patterns, playability studies and player modeling. Student work includes homework assignments, weekly readings, oral paper presentations and projects. One project involved collectively harvesting and refining a game interaction design pattern through analysis of a number of commercial games. For their final project students had to create and evaluate an accessible game. These projects lead to an online pattern collection (<http://www.helpyouplay.com>) and conference publications.

**CS709: Software Architecture Design**, University of Nevada

Fall 2008	14 students	3.86/5.0 instructor rating (7 respondents)
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Course creator and Professor. CS 709 is a graduate-level course. I designed this class to cover a wide range of topics in the field of software architecture, from architecture descriptions, architecture analysis, software product lines and architecture styles and patterns. Student work includes homework assignments, weekly readings, oral paper presentations and projects. For their final project students had to design and evaluate a game engine architecture based on a specific set of quality requirements.

**CS281: Introduction to Game Development**, University of Nevada

Fall 2007	19 students	4.43/5.0 instructor rating (14 respondents)
Spring 2008	22 students	4.20/5.0 instructor rating (15 respondents)
Fall 2008	20 students	4.50/5.0 instructor rating (18 respondents)
Spring 2009	21 students	4.09/5.0 instructor rating (12 respondents)
Fall 2009	26 students	

Course creator and Professor. CS 281 is an freshman-level introduction course in game development that was created as part of the department's minor in digital interactive games. This class is open to any major and typically consists of 50% computer science students. I designed this class to cover a variety of topics including game design, the history of games, the business of games and interaction design for games -including game accessibility. Students also learn the basics of game programming as I teach them how to create arcade-style two dimensional games using an intuitive visual programming tool called Gamemaker. Student work includes homework assignments, weekly readings, projects and project presentations. Students create games individually as well as larger games in teams and in both cases games are presented in class where students receive criticism on their games from their peers. Every summer I teach a simplified one week version of this class to about 25, eight to ten year olds for the college of Engineering's summer camp.

**CS480/680: Computer Graphics**, University of Nevada

Fall 2006	16 students	2.75/5.0 instructor rating (12 respondents)
Fall 2007	7 students	4.17/5.0 instructor rating (6 respondents)

Professor. CS 480/680 is a senior level introduction course in computer graphics. Students learn the underlying concepts, algorithms, and design principles of generating 2D and 3D computer graphics and gain practical experience in graphics programming with OpenGL. Students are evaluated through quizzes, midterms and programming projects. Graduate students taking this class are required to give a lecture on a specific advanced graphics topic. When I taught this class I arranged for all programming assignments to be game related, e.g. for one of the programming projects students had to program a three dimensional pinball game.

**CS135: Computer Science I**, University of Nevada

Fall 2006	50 students	3.04/5.0 instructor rating (24 respondents)
Spring 2007	39 students	3.87/5.0 instructor rating (30 respondents)

Professor. CS 135 is an freshman-level class which is an introduction to modern problem solving and programming methods. Emphasis is placed on algorithm development and students learn programming in C++. The course consists of lecture and lab sessions. Each week students must take in class quizzes and work through the programming assignments in the lab in pairs. Though assisted by teaching assistants, I participated actively in the lab sessions to allow for interactions with all of the students. I added a game component to this class where students had to create a Pong game for their final project.

## WORK EXPERIENCE

**STATUS project**, University of Groningen, The Netherlands Fall 2001- Fall 2004  
Researcher. Worked on the STATUS (Software Architecture that supports Usability) project. STATUS was an ESPRIT project (IST-2001-32298) financed by the European Commission. My research identified that the level of usability of a system, to a certain extent, is restricted and determined by software architecture design. However, software engineers and architects are often not aware of this constraint nor are there any techniques that explicitly focus on analyzing software architectures for their support of usability. As a result, avoidable rework is frequently necessary. This rework leads to high costs, and because tradeoffs need to be made during design, for example between cost and quality, often leads to systems with less than optimal usability. I studied the relationship between software architecture and the usability of a software system, identifying the characteristics of software architectures that improve software usability. I collaborated with the two industrial partners (Information Highway Group and LogicDIS) as well as with our academic partners (Imperial College London and University Polytechnica Madrid) in this project. Within this project I managed to take a leading role in the development and definition of a number of project deliverables. The three main results of my research (and deliverables of the project) were:

- A collection of architecture sensitive usability patterns.
- A framework that describes the relationship between software architecture and usability.
- A scenario based architecture assessment technique for usability (SALUTA).

In addition to presenting the results of my research at various conferences, I gave project progress reports at the annual project reviews at the European Union in Brussels.

**Rohill Technologies**, Hoogenveen, The Netherlands Fall 2000- Spring 2001  
Researcher. Studied GSM and TETRA standards and identified possible database transactions. I investigated different distributed database performance strategies for keeping user data synchronized in multi-node trunked radio networks. Developed a simulation tool in C++ to simulate and analyze the performance of different replication strategies for different network topologies. I wrote a research report for upper management providing advice on which replication strategies to use.

**Notenbomer Internet Center**, Groningen, The Netherlands Fall 1997- Spring 2000  
Programmer. Developed various e-commerce bookshops, including developing components such as a search engine and a secure shopping cart using ASP and SQL. I also developed a website traffic collection and analyzer in Perl. I interacted with customers to identify custom requirements.

**Vertis Technologies**, Veendam, The Netherlands Spring 1997  
Programmer. Led a team of five student software developers. Co-developed and tested three Java applications (car registration, hours registration and a function point analysis program for estimating project budgets) for the Vertis intraweb. I frequently interacted with Vertis employees that were intended to use our applications to collect and refine the requirements. I gave a presentation to their developers on the benefits and possibilities of using the Java programming language.

## PROFESSIONAL AFFILIATIONS

Association for Computing Machinery (ACM).

ACM Special Interest Group on Accessible Computing (SIGACCESS).

The Alliance for Access to Computing Careers (AccessComputing).

International Game Developers Association' Special Interest group on Game Accessibility (GA-SIG)

## SERVICE ACTIVITIES

### **Assorted Journals, Conferences, and Funding Agencies**

Ongoing

Technical reviewer. Activities include evaluating submitted journal articles, conference papers, and grant proposals on the basis of relevance, technical soundness, references, and readability. Recommending revisions and acceptance/funding decisions. Primary journal reviews include organizations such as the IEEE (Software) and Elsevier (Journal of Systems and Software). Primary funding agency is the National Science Foundation. I have been a program committee member of the following conferences: IFIP conference on Human-Computer interaction: INTERACT (2009), the 1st International Workshop on Collaborative Games, (2008), IADIS International Conference on Gaming (2008), The 13th International Computer Games Conference: AI, Mobile, Interactive Multimedia (2008), Educational and Serious Games, (2008) and the International Conference on Information Technology (2007). I have reviewed papers for the Conference on Human Factors in Computing Systems (2008, 2009).

### **CampAbilities, State University of New York, Brockport**

Summer 2009 - Present

Volunteer. I participate annually in CampAbilities; a non-profit, one-week, comprehensive, developmental sports camp for children between the ages of 9 and 19 who are visually impaired, blind, or deaf/blind. See <http://www.campabilities.org>. Camp Abilities has been in operation since 1995 and is held annually at the College at Brockport led by Dr. Lauren Lieberman. Activities include assisting children in playing video games and participating in various sports related activities.

### **IGDA special Interest Group on Game Accessibility**

Fall 2005 - Present

Research committee. I have been involved in the organization of workshops and accessibility arcades at games related conferences such as the Game Developers Conference, Future Play and Entertainment for All Expo. I have demoed several of my accessible games at booths at conferences trying to raise awareness within the game industry of making video games accessible.

### **Student Advising, University of Nevada**

Fall 2007 – Present

Academic advisor. Formal and informal advising of students at academic levels at UNR; formal advisees are undergraduates department of computer science and engineering. Activities include helping students choose courses and plan their academic career paths.

### **Summer Camp, University of Nevada**

Summer 2008 - Present

Teacher. I participate in the College of Engineering's annual Summer camp. For a number of days I teach students from the ages 8 to 10 how to make simple video games, such as Pong or Breakout using a tool called Gamemaker.

### **Department Committees, University of Nevada**

Fall 2007 - Present

Member. I participate in several department committees. I'm a member of the Game Engineering Curriculum committee, activities included developing a minor in Digital Interactive Games as well as curriculum development for the proposed game major. I'm a member of the graduate committee where I reviewed graduate student applications. I'm a member of the IGT Spring seminar committee, which involved organizing the annual seminar by inviting speakers and panelists and making local arrangements.

### **University Committees, University of Nevada**

Fall 2007 - Present

Member/ Advisor. At the University level I am a faculty associate for Gender, Race and Identity committee which is part of UNR's woman studies program. My activities included participating in seminars and giving a seminar. I'm also a club advisor for several game related student clubs.