Game and Interactivity in Computer Science Education

Esteban Clua, Catholic Univ. of Rio de Janeiro

Bruno Feijó, Catholic Univ. of Rio de Janeiro

Jason Rocca, IGDA, director

Jon Schwartz, Morrison Schwartz, Inc.

Maria das Graças, Catholic Univ. of Rio de Janeiro

Ken Perlin, New York University

Romero Tori, University of São Paulo

Tiffany Barnes, University of North Carolina

Abstract

Interactive computer graphics and games are powerful tools that can be used in the educational process. Much research shows that the learning process is highly enhanced when this kind of approach is used in computer science teaching, not only because of the motivation they engender, but also because high end results can be easily generated with relatively little effort.

In fact, both interactive and game tools are growing in importance for supporting computer science learning, since they are capable of covering many of the typical topics included in the curriculum: Linear Algebra, Artificial Intelligence, Computer Graphics, Network, Real Time Simulations, Human Computer Interaction, Software Engineering, among other important topics.

Professor Esteban Clua has started with other professors and educators a Brazilian network for game in education. That community is growing fast and there are now a large number of professionals researching how to develop tools to be used by the educational community, particularly in computer science.

1 Purpose and Premise

The main goal of this panel is to discuss and present different solutions and educational tools being used or developed by professors, researchers and companies, based on game and/or interactive technologies. The presenters will show examples from their own experience and also survey of different existing programs and tools being used at various institutions around the world.

In addition, other related activities and their results will be presented and discussed, including Microsoft Imagine Cup, RoboCup and the Independent Games Festival, from the Game Development Conference.

This panel will be useful for many professionals, but especially for computer science educators, video game research and teaching centers, developers of interactive and virtual reality tools and companies interested in improving the quality of the computer science educational process.

As complementary material, the panelist will generate a rich document, containing their experiences, their teaching process and a list of most of the tools presented in this panel. This document also will contain descriptions for the process of teaching with games and interactive tools, in order to facilitate professors and academics to implement this educational system.

2 The Panelists

Esteban Clua [moderator] is professor at the Catholic University of Rio de Janeiro and research manager of VisionLab, an important laboratory for research and development of digital entertainment content. The Computer Science department of the Catholic University of Rio de Janeiro was considered in 2005 as the best research center in the filed at the country. Esteban is also one of the creators of SBGames (Brazilian Symposium of Games), an important and large conference in digital entertainment and member of the council for the Entertainment committee of Brazilian Computer Society. Esteban has been teaching introduction to computer science for first year engineering students using game engines and defends that the principles of algorithmic can be more motivated and easily understood when using scripts languages of game engines. Beside this, Esteban has being working in teaching team development among these students using typical game production workflow.

Bruno Feijó is professor at the Catholic University of Rio de Janeiro and general manager of VisionLab. He is the president of the council for the Entertainment committee of Brazilian Computer Society and one of the most important names in the academic fields related to digital entertainment research and teaching. Bruno was the advisor of the first PhD and master students that made thesis directly related to games in South America. Bruno defends the idea of using game tools, frameworks and middleware to teach specific fields in computer science. From more than 5 years professor Bruno teaches Artificial intelligence and Animation using different game tools.

Jason Della Rocca is the executive director of the International Game Developers Association (IGDA), a professional society committed to advancing the careers and enhancing the lives of game developers. Jason and the IGDA focus on connecting developers with their peers, promoting professional development, and advocating on issues that affect the developer community -- such as quality of life, creative freedoms, workforce diversity and credit standards. As the spokesperson for the IGDA, Jason has appeared in countless news outlets (e.g., Wired, Nightline, LA Times, NPR, Wall Street Journal, G4, etc) and has spoken at conferences around the world (e.g., GDC, E3, TGS, SIGGRAPH, ChinaJoy, DiGRA, etc). Jason has been a member of the game development community for over a decade, and has spent time at Matrox Graphics, Quazal and Silicon Graphics. Jason can be reached at jason at igda dot org.

Jon Schwartz is a founder or Morrison Schwartz, Inc., a software development and consulting company. In 2005 Morrison Schwartz created and released the Kid's Programming Language (KPL), a freeware programming environment that engages beginners by emphasizing game development, graphics, sounds and animation. In the first six months after release, with only word-of-mouth marketing, KPL was downloaded over 45,000 times, volunteers translated it to 15 additional languages, and volunteers contributed dozens of high-quality open source KPL games and example programs. Global interest in and enthusiasm for KPL is very high and growing, based on the effectiveness of using games to encourage interest in Computer Science, and based on the need for a true programming environment designed for beginning programmers.

Ken Perlin, founding director of the Media Research Laboratory, is a Professor in the CS Department at NYU. He received an Academy Award for his procedural texturing algorithms (widely used in movies), NYC Mayor's award for Excellence in Science and Technology, Sokol award for outstanding NYU Science

faculty, and an NSF PYI Award. Perlin directed the NYU Center for Advanced Technology (1994-2004). He received his PhD in CS from NYU, BA in theoretical mathematics from Harvard, headed software development at R/Greenberg Associates and MAGI, and worked on various films, starting with TRON. He serves on the Board of Directors of NYSIA. He is currently Principal Investigator, together with Professor Mary Flanagan of Hunter College, on a three year NSF funded project that designs computer animated constructivist dance games to motivate middle school girls to learn Java programming. He believes that computer games will some day lead to universal programming literacy.

Romero Tori is Associate Professor at University of Sao Paulo (USP), a Full Professor at SENAC University, and general manager of Interlab (Interactive Technologies Laboratory) at USP. Romero was one of the pioneers in researching Computer Graphics in Brazil, and he's been teaching Computer Graphics in computer engineering undergraduate and graduate programs since 1984. Romero's approach for teaching computer graphics is based on game technology and in customized software tools, including a Java 3D game engine, called "enJine", and an interactive learning tool, called "Interlab 3D", both of them developed at his research lab. Recently Romero was the General Chair of VII Symposium on Virtual Reality and the Program Chair of WJogos (Brazilian Game Technology Symposium).

Maria das Graças Chagas works as Computer Graphics and Game Design Lecturer at the Art and Design Department, at the Catholic University of Rio de Janeiro (PUC-Rio), Brazil. In 2002 she implemented a pioneer interdisciplinary game design course in Brazil, gathering together in the same classroom undergraduate students from Art/Design and Computing/Engineering courses working in complementary tasks and roles of a common electronic game project. Four years after its implementation, the experience has been very successful in developing a teaching methodology that leads the students to develop both creative and technical skills. Computer Science/Engineering students have found through this course a path to become creative programmers, as they encountered motivation to learn the necessary basics of computing programming in a environment they find far more interesting than the traditional computing science class. The course's interdisciplinary approach has also helped them to understand the relationship between the roles of Artists, Designers and Programmers when developing a game or any other interactive piece of work. Maria is also the Computer Graphics Supervisor of the Art and Design Department, and head of Multimedia Division of PUC-Rio. For the last 14 years she has been teaching Computer Graphics and Coordinating Projects for development of Multimedia and Interactive applications. Her research work has been dedicated to improve the teaching of Game Design in Brazil. In 2004 she was chair of GameArt, the biggest academic event in Brazil for Game Art and Design.

Tiffany Barnes, founding director of the Game2Learn Research Laboratory, is an Assistant Professor in the Department of Computer Science at the University of North Carolina at Charlotte. She received her PhD in computer science, and Masters degrees in mathematics and computer science from North Carolina State University. Dr. Barnes has taught summer game programming camps for middle school, high school, and college students, where a creative context has inspired students to learn more and see computing in a different light. She began teaching Computer Game Design in Fall 2004, and is working to create both graduate and undergraduate Certificates of Game Development at UNC Charlotte. She recently received a National Science Foundation "Broadening Participation in Computing" grant, for building the STARS Alliance, a partnership to engage more young people, and particularly underrepresented minorities, in computing. A member of the North Carolina Serious Games Initiative, Dr. Barnes believes that the real power of game and entertainment technologies is people: these technologies have the potential to allow people to create, communicate, visualize, learn, and solve problems more quickly and intuitively. Her Game2Learn Research Lab is developing an interactive role-playing game to teach computer science, where students must solve computing problems, and create new game behaviors and content, to achieve game-related goals. Our first game quest is designed for learning introductory programming, but game quests centered on learning other computing topics including Artificial Intelligence are planned. One of our major goals is to develop a game that is motivational, fun, and effective, for a diverse population of students.