

University of Massachusetts
Enhancing Learning Through the Use of Technology

Project title: Art and Engineering Synergy in Computer Game Development

Project Category: Scholarship of Teaching and Learning

Principal Investigator: Iren Valova, Associate Professor, Computer and Information Science, Dartmouth campus

Other Investigators: Harvey Goldman, Chancellor Professor, Design Department, Dartmouth Campus

Contact Information: University of Massachusetts Dartmouth, 285 Old Westport Rd., North Dartmouth, MA 02747

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Total Funds Requested: \$23,900.00

Project Abstract: This work will focus on bridging the visual arts curriculum with computer science for purposes of game development teaching. Our goal is to develop a pilot course across the two disciplines, research and establish suitable pedagogical tools through use of necessary technology and along with the publishing of the results, initiate and establish a sound and successful multidisciplinary minor on Game Development bridging College of Visual and Performing Arts and College of Engineering at UMD.

Computer and Information Science Department Chair _____	Design Department Chair _____
Boleslaw Mikolajczak	Laura Franz
College of Engineering Dean _____	College of Visual and Performing Arts Dean _____
Robert Peck	Adrian Tio

Anthony Garro, Provost



UMass

Dartmouth

COLLEGE OF ENGINEERING

Computer and
Information Science
Department

1/29/08

COVER LETTER

for proposal “Art and Engineering Synergy in Computer Game Development”
submitted to Enhancing Teaching and Learning through the Use of Academic Technology

With this letter we are introducing our proposal on bridging the visual arts curriculum with computer science for purposes of game development teaching. Our goal is to develop a pilot course across the two disciplines, research and establish suitable pedagogical tools through use of necessary technology and along with the publishing of the results, initiate a multidisciplinary minor on Game Development at the UMD campus.

The nature of game development requires multidisciplinary approach and team work. Our goal in this project is to stress on the necessity of team work and the development of interpersonal skills. These qualities are essential in a demanding industry such as game design and development. Teaming up students with various backgrounds presents the unique opportunity to organize “companies” which will compete, but share information, knowledge and experiences.

The PI has participated in pedagogical studies and has published a journal paper with the findings (N.Gueorguieva, **I.Valova**, G.Georgiev, Effects of Hierarchical Comprehensive Models on University Students’ Studies of Object-Oriented Paradigms, Journal of Computing Sciences in Colleges, vol. 22, number 1/October 2006, pp 162 - 178.). Another paper on cognitive models of understanding object-oriented programming has been submitted for consideration with the Journal of Education and Information Technologies, Springer.

The PI has piloted other courses in demand with the industry, e.g. Data Mining and Knowledge Discovery (sponsored by Board of Higher Education grant), Neural Computing (graduate level), and recently Computer Game Design. The last course was introduced also as an answer to overwhelming student interest. The PI serves as a mentor to the student Game Design Club. One of the notable accomplishments is an educational jeopardy-like game which is not only successfully applied in the classroom but has also been published by the student author. The PI has also served as a Guest Editor for ACM Crossroads Special Issue on Computer Graphics and Game Design.

The PI is also a participant in the Teaching and Learning Community for Accomplished Faculty, a year-long discussion group organized by the Center for Teaching Excellence. This group focuses on positive learning environment to reinforce our core values related to teaching and learning, creating multidisciplinary learning collaborations in agreement with the mission of UMD.



COLLEGE OF ENGINEERING

The PI intends to utilize her experience and focus energy on finding the right mix of technology, conventional lectures and laboratory assignments to produce students with portfolios of at least two games. This cannot be achieved without the visual storytelling component supplied by the co-PI Harvey Goldman.

The PI's responsibilities will include development of lecture materials on the engineering side of the course, research on applicable teaching methodologies and reporting and analysis of the results in the anticipated publications, planning of laboratory assignments and software components to be developed by the research assistants requested in the budget section. The PI will also, in collaboration with the co-PI, work on and maintain a course web site with the latest news, applicable links and materials pertaining to the topics discussed in class.

Iren Valova



285 Old Westport Rd.
N. Dartmouth, MA 02747

TO: Enhancing Learning Through the Use of Technology Grant Committee
FROM: Harvey Goldman, Professor, Department of Design
DATE: January 28, 2008
SUBJECT: letter of intent Grant Proposal

As a participant and co investigator on the "Art and Engineering Synergy in Computer Game Development" grant proposal I certify my support for the grant application and the project.

I am a member of the Design Department at UMass Dartmouth. My field of specialization is digital imaging with an expertise in 3D modeling and animation. Within the context of this project, I will assist in developing the described course.

I will develop components that address storytelling, 2D and 3D digital imaging, modeling and animation. These skills are core to the creation of content and imagery for digital game development. My intent is to develop and teach lecture components that would address both the aesthetic, technical and ethical approaches to game development. In the 2D area lectures would include specifics such as vector vs bit mapped imagery, file formats, as well as the use of Adobe Flash in game development. In the 3D area lectures would include an introduction to 3D modeling, surfacing and animation.



January 28, 2008

Professor Iren Valova
Department of Computer and Information Science
University of Massachusetts Dartmouth
285 Old Westport Rd.
N. Dartmouth, MA 02878

Dear Professor Valova:

The project you are proposing for the Enhancing Learning Through the Use of Technology Grant (Art and Engineering Synergy in Computer Game Development) provides an excellent opportunity for students to engage in multidisciplinary study. Clearly, this is relevant to particular needs in the business community in that gaming is a high growth industry. The proposal appears complete, and it seems that you have already begun the efforts to make this project a success.

I hope that you and Professor Harvey Goldman will be willing to present the results of your effort to the campus community.

Sincerely,

Susanne G. Scott
Associate Professor of Management
Director of the Center for Teaching Excellence
University of Massachusetts Dartmouth
285 Old Westport Rd.
N. Dartmouth, MA 02747
508-999-8735

Project Narrative: My older brother is no longer embarrassed to say he is playing computer games with his son. Games are no longer perceived being “just for kids”. This new form of communication relies on the art of visual storytelling as much as it relies on the technical software and hardware of the game. The game consumers are looking at games as the new form of expression, not the mindless shooting from years ago, but a developing story told in artful execution which will immerse the player in a virtual world.

The gaming industry revenues have been growing in the past years at a double-digit rate, but while providing lucrative jobs, it also represents one of the most demanding areas of industry. The product of this industry needs to closely reflect the consumer demand and also keep in track with the available cutting-edge technology.

The academia has responded quickly to the industrial demand with programs, minors and courses on game design. There are some publications outlining the pedagogical approaches and the difficulties encountered in making these programs successful. While in [1], the game development exists as separate options in computer science and art, the authors bring together the students for joint projects, although with separate grading policies. There have been other publications on the inclusion of game development in the academia [2, 3, 4, 5] outlining approaches to tailoring the academic curriculum to consumer and industrial needs.

Most courses are based in computer science departments, thus not fully exploring the art side of game design. Our proposal aims to bridge that gap by outlining the following goal.

Goals: The goal of this project is to develop a pilot multidisciplinary course on game development for students with arts and computer science backgrounds. The curriculum of this course needs to reflect the real-world process of game design. In order to achieve this goal, we have to research the pedagogical methods of game design programs [6] offered throughout the

country, then we need to study the discipline-related issues in learning and use of technology. Finally, the course will conduct case studies of innovative teaching with students engagement producing software to be used in the university, K-12 educational system as well as games targeting specific groups in the community. After the pilot course, it is our intention to continue to offer the course and use it as a base for multidisciplinary minor on Game Development. The goal is, with every offering of the course, to produce games geared towards specific needs, e.g. educational, activity-stimulating games for the elderly, rehabilitation games, etc. The course will require teaming students from Computer Science and Design/ Digital Media Departments into mock companies with the final outcome of creating a game geared towards the respective semester theme. Every final product, i.e. game, will be assessed on two levels - regular grading within the course setting and campus-wide testing by UMD students. A longer-term goal is to offer a minor on Game Development in the UMD campus. This is conjectured to be feasible based on the case studies and assessment from the first two to three offerings of the proposed multidisciplinary course. While academic programs on game development exist, a minor offered in the Dartmouth campus will fill a void on academic and employment levels in the area. It will be unique in its drawing on computer science, software engineering and arts programs offered in UMD. Another feature is the projected collaboration with the community, i.e. work with minority youth programs and juvenile crime prevention organizations; work with programs for elderly for stimulation of their activities through playing games; work on rehabilitation-related gaming products (possible collaboration with the SHARE program established by a UMD faculty - Dr. Les Cory). In other words, we will be learning to play, playing to educate, educating to learn.

In keeping with our goal, we propose to develop and pilot a one-semester senior level course open to majors in computer science, digital media and design, and computer engineering. The course will be conducted in a laboratory, utilizing resources available in the Computer and Information Science Department and additional building up with technological tools, such as high-end game-oriented PC, Xbox machines to ensure portability and software packages currently in use in the CIS or EI or Design Departments relating to computer graphics, animation and 3D modeling. By organizing the necessary equipment in a laboratory, the students will gain hand-on experience with the tools of the trade and will be able to begin a portfolio required in majority of the specialized gaming schools and programs in the country.

The product of the course (set of fully functional games) will be advertised to UMD. The games developed during the course will be made available to UMD students, who commit to a month of testing and assessment of the product. Weekly reports will be required of any student who downloads a game on their experience, improvements and other comments on the various aspects of the said game. The feedback will be used to assess the teaching methods and adjust the course material as well as the requirements for the final course product - the games. Several companies in the Boston area will be consulted not only to provide the course with guest speakers, but also to participate in the evaluation of the produced games. The results from the pilot course along with the assessment of the games will be published in an appropriate journal, with emphasis on game design education. It is our conjecture that the results will be useful to other academic communities which either have full game-gearred programs or dabble in a course or two. Every consecutive offer of the pilot course will produce games targeting specific community or educational needs. These will also be formulated into papers to be published in appropriate forums.

Participants and qualifications: Appreciating student demand, the PI has designed and proposed a Computer Game Design Course as a senior year technical elective in the Computer and Information Science Department. The course is offered for the first time in Spring 2008 and will provide this project with unique glimpse into the engineering side of game development. The outcomes of the class projected to be fully functional games will serve as starting points into our research on pedagogical strategies, technology which needs to be involved and the engineering side to be fed into the multidisciplinary course.

Harvey Goldman has an expertise in 2D and 3D digital imaging, modeling and animation. These skills are core to the creation of imagery for digital game development. Professor Goldman would develop and teach lecture components that would address both the aesthetic, technical and ethical approaches to game development. In the 2D area lectures would include specifics such as vector vs bit mapped imagery, file formats, as well as the use of applicable software packages such as OpenGL, DirectX, Adobe Flash, etc. in game development. In the 3D area lectures would include an introduction to 3D modeling, surfacing and animation.

Project Deliverable: We are looking for: a) Fully developed course geared towards students majoring in digital media and design, computer science and computer engineering - course materials, lectures, labs, assignments and assessment tools; b) Preparation of publication(s) on the methodologies used, the synergy between the arts and computer science disciplines and the utilized technology; c) Development of a web site to monitor the progress, deliver the produced games for assessment, and disseminate information pertaining to the project.

Project Budget:

The project investigators will be responsible to research and develop the teaching strategies, prepare the course materials and assignments. The research assistants (one from Design, one

from Computer Science) will be responsible for the web site design and maintenance, course material supporting demonstrations and fundamental building blocks for the proposed assignments. The requested technology is essential for quality delivery of the course material.

High-end game PC - with appropriate tools (monitor, graphics card, processor) for testing, quality control and development verification.	2 x \$3,000	\$6,000
PI and co-PI summer stipends	2 x \$2,000	\$4,000
Research assistants, Summer, Fall semesters	2 x 2 x \$3,000	\$12,000
Applicable software		\$1,000
Xbox machines	3 x \$300	\$900
	Total	\$23,900

Project Timetable:

Activity	Timeline	Who
Assessment of PI's Game Design class, research of available and pertinent literature	1 month	PI, co-PI
Design of web site, collection and posting of related information	Continuously	RA, PI, co-PI
Design class materials - lectures, game concepts, assignments	2 months	PI, co-PI
Testing of the materials and amendments	2 months	RA, PI, co-PI
Piloting the multidisciplinary course, Spring 2009	4 months	RA, PI, co-PI
Assessment of games, gathering and analysis of results, publication preparation	2 months	RA, PI, co-PI

References:

- [1] I.Parberry, M.Kazamzadeh, T.Roden, The Art and Science of Game Programming, Technical Symposium on Computer Science Education, Proceedings of the 37th SIGCSE technical symposium on Computer science education, pp: 510 - 514, 2006
- [2] J. C. Adams. Chance-It: An object-oriented capstone project for CS-1. In Proceedings of the 29th SIGCSE Technical Symposium on Computer Science Education, pp: 10–14. ACM Press, 1998.
- [3] K. Becker. Teaching with games: The minesweeper and asteroids experience. The Journal of Computing in Small Colleges, 17(2):23–33, 2001.
- [4] IGDA Curriculum Framework. Report Version 2.3 Beta, International Game Developer's Association, 2003.
- [5] R. M. Jones. Design and implementation of computer games: A capstone course for undergraduate computer science education. In Proceedings of the 31st SIGCSE Technical Symposium on Computer Science Education, pages 260–264. ACM Press, 2000.
- [6] Computer And Video Games - A New Tool For Learning In The 21st Century, Entertainment and Leisure Software Publishers Association, <http://www.elspa.com/>, 2006