Final Report for Period: 03/2008 - 02/2009	**Submitted on:** 02/25/2009
Principal Investigator: Bruckman, Amy S.	**Award ID:** 0326325

Organization: GA Tech Res Corp - GIT

Submitted By:
Bruckman, Amy - Principal Investigator

Title:
ITR Collaborative Research: Indexing, Retrieval, and Use of Large Motion Databases

Project Participants

Senior Personnel

> **Name:** Bruckman, Amy
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**

Post-doc

Graduate Student

> **Name:** Zagal, Jose
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Jose is the lead graduate student on the project. This forms the basis for his PhD dissertation. He is involved with all aspects of the project.

> **Name:** Inman, Lee
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Lee is a master's student who is working on both web design and curriculum development.

> **Name:** Luther, Kurt
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Kurt took over primary responsibility for this project in September 2006.

> **Name:** Griffith, Pam
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Pam is studying people creating animations and sharing them online as her master's thesis.

Undergraduate Student

> **Name:** Kinnaird, Peter
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Peter is an undergraduate researcher who is working on database and web programming.

> **Name:** Piper, Anne Marie
>
> **Worked for more than 160 Hours:**   Yes
>
> **Contribution to Project:**
> Helped design and conduct pilot study.

> **Name:** Atrash, Zeina

Worked for more than 160 Hours: Yes

Contribution to Project:

Helped design and conduct pilot study.

Name: Ziegler, Kevin

Worked for more than 160 Hours: Yes

Contribution to Project:

Kevin has been programming and also doing data analysis.

Technician, Programmer

Other Participant

Research Experience for Undergraduates

    Name: Holloman, Jeffrey

    Worked for more than 160 Hours: Yes

    Contribution to Project:

Jeff Holloman is making a store on Second Life to distribute animations made by the CMU team to end users.

        Years of schooling completed: Junior

        Home Institution: Same as Research Site

        Home Institution if Other:

        Home Institution Highest Degree Granted(in fields supported by NSF):   Doctoral Degree

        Fiscal year(s) REU Participant supported: 2007

        REU Funding: REU supplement

Organizational Partners

Carnegie Mellon University

We are working closely with our collaborative partner on this grant, CMU. Our work with
kids uses their technology, and our research agendas are designed to be mutually
supportive.

The Galloway School

We are conducting our research at the Galloway School, and they have been very helpful
and supportive.

Other Collaborators or Contacts

We have been working with the founder of the site newgrounds.com where people share animations to study how end users create and share
animations.

Activities and Findings

Research and Education Activities:

Activities and findings are summarized together in the attached findings file (see below).

Findings: (See PDF version submitted by PI at the end of the report)

Training and Development:

Jose Zagal led the effort to deploy the animation system to inner city kids
in Atlanta as well as the suburban school.

Lee Inman, a Masters student, has worked on the graphic design of the
web-based online community as well as the design and refinement of the
workshop curriculum.

This project was also part of the undergraduate senior research project of
Zeina Atrash and Anne-Marie Piper, who assisted Jose in the planning and
execution of the first and second workshops respectively. Anne Marie went on to win an
NSF Fellowship for graduate study. She has finished a master's at Stanford University, and
as of fall 2006 is currently applying to PhD programs.

Peter Kinnaird, an undergraduate student, has worked in the development of
the web-based online community. He has done programming related tasks using
PHP and mySQL.

PhD student Kurt Luther has recently taken over the project, and this will form the basis
for his PhD dissertation. It is also the basis for the master's thesis of Pamela Griffith.

This was the first research project of undergraduate Kevin Ziegler, who is emerging as a strong researcher. Kevin has worked with
programming for data gathering and analysis to understand creators of animations on newgrounds.com.

Outreach Activities:
As part of this project, we conducted a workshop on how to create
3D animation at an after-school computer drop-in center that caters
to less-advantaged minority youth. Second, we conducted a second workshop
at a suburban elementary school. In both trials, students had
new opportunities to use cutting-edge technology and to interact
with mentors from Georgia Tech. Through this, they had opportunities
for both creative expression and the development of programming
skills.

We have completed a detailed study of how amateur animators who post their work
on line accomplish both technical, artistic, and collaborative aspects of this work (published in CSCW 2008). We will
use our findings to help create a suite of tools to assist them in this endeavor, and plan to
release those tools publicly as free, open-source software.

Journal Publications

Jose Zagal and Amy Bruckman, "From Samba Schools to Computer Clubhouses: Cultural Institutions as Learning
Environments. (Feature Report)", Convergence, p. 88, vol. 11, (2005). Published,

Books or Other One-time Publications

Zagal, J.P., Piper, A.M. and Bruckman, A., "Social and Technical Factors Contributing
to Successful 3D Animation Authoring by Kids", (2006). Technical Report, Published
Collection: GVU Tech Report
Bibliography: GVU Tech Report: GIT-GVU-06-14

Kurt Luther, Pamela Griffith, and Amy Bruckman, "Collaboration in Online Animation Communities", (2008). poster, Published
Bibliography: Poster presented at the First Annual American Society for Information Science and Technology Social Computing Summit. Miami, Florida, November 2008.

Luther, Kurt and Amy Bruckman, "Leadership in Online Creative Collaboration", (2008). refereed conference article, Published
Collection: Proceedings of CSCW 2008
Bibliography: Luther, Kurt and Amy Bruckman (2008). ?Leadership in Online Creative Collaboration.? Proceedings of CSCW 2008, San Diego, CA, November 2008. (23% acceptance rate.)

Web/Internet Site

Other Specific Products

Contributions

Contributions within Discipline:

In phase one of this project, we conducted iterative trials of the Alice animation software with inner-city kids, and uncovered some of the challenges and benefits of using this as a learning environment for this population.

In phase two, we have explored the practices of amateur animators who share animations online, with the goal of helping our colleagues at CMU to develop more effective tools to support them. We also have begun design requirements for our revised website for sharing of animations and helping foster collaborative innovation.

As part of this work, we developed the first formal description of how collaborative creative projects on the Internet are organized, with a focus on the challenges to leaders of such projects.

Contributions to Other Disciplines:

See above.

Contributions to Human Resource Development:

Improving the performance, skills, or attitudes of members of underrepresented groups that will improve their access to or retention in research and teaching careers: four women and one hispanic male have participated in this research project, and all have gone on to successful careers in science, technology, and research.

Providing exposure to science and technology for pre-college teachers, young people, and other non-scientist members of the public: In phase one of our project, we worked with inner-city minority children to help them learn to create their own computer animations. Through this work, we hope to encourage them to chose careers in science and technology. In phase two, we worked to understand the technical accomplishments of members of the general public (amateur animators) with no formal training, with the goal of designing ways to further that competence.

Contributions to Resources for Research and Education:

This research forms the basis for the ongoing development of an Internet site designed to support people in working on collaborative creative projects on line. This site will be released as free, open-source software.

Contributions Beyond Science and Engineering:

Our research goal includes understanding the fundamental problem of collaborative innovation. This has broad implications.

Categories for which nothing is reported:

Any Web/Internet Site
Any Product

Activities & Findings

Technology being developed at CMU is intended to make animation more usable by amateurs. But who are amateur animators and what are their real needs? The team at Georgia Tech has been working to answer this question by interviewing amateur animators to develop a detailed portrait of their practices. We are exploring amateur animators working in both 2D and 3D, and contrasting the challenges they face. This in turn is informing the design of tools at CMU. Conversations between GT and CMU shaped our research questions at GT, and our results at GT in turn continue to shape the direction the tools are taking at CMU and ensure that they will effectively serve their target population. This transfer of ideas has richly connected the two projects and both are stronger from the collaboration.

The Georgia Tech team's fieldwork has found that most animations by amateur animators are about people. They are frustrated by the limited expressive vocabulary for human motion provided by the commonly available commercial tools. They would definitely like to create richer animations of human motion, but need easy-to-use tools to make this possible. The human body is particularly challenging for animation because many degrees of freedom are required for realistic and appealing motion. Further, people are extremely sensitive to errors in human motion and are therefore more critical of human characters than of cartoon characters (as shown by results in the literature and some of the recent perceptual studies at CMU conducted under the auspices of this grant).
The Georgia Tech team has also found that many amateur animators begin doing work in two dimensions, and would like to move to three dimensions, but find this transition extremely challenging because of the two-dimensional nature of the screen and the input devices. This has helped inform design requirements for the CMU components of the project, for example the requirement that human motion be specified in an extremely simple fashion from a few constraints such as poses or the path to be followed. The need for an intuitive interface has also motivated their several projects on performance animation where the animator acts out the motion with his or her body and a motion capture database is used to provide domain knowledge to allow accurate reconstruction of the motion from a limited input signal.

In our studies at Georgia Tech, we have approached amateur animators sharing their work on popular websites like newgrounds.com. We were surprised to find that a large number turned out to be teenagers. The teenagers come from a wide variety of socio-economic and geographic backgrounds. Many work collaboratively, including collaborations with other teens who in some cases are not only not colocated but actually from a different continent. They have no formal training in animation, and a limited understanding of the physics and natural properties of human motion. Understanding this target population has helped CMU members of the team to set targets for both desired functionality and ease of use of tools to support these budding artists in their practice. With the tool set we are developing as part of this project, these teenagers should be able to develop much more impressive animations. By giving them greater expressive possibilities, we can facilitate the quality of their products, enhance what they learn through the process of creation, and help them come closer to their goals of careers in the

entertainment industry.   This research was published in the selective CSCW 2008 conference, and also formed the basis for Pam Griffith's master's project.

Luther, Kurt and Amy Bruckman (2008). "Leadership in Online Creative Collaboration." Proceedings of CSCW 2008, San Diego, CA, November 2008. (23% acceptance rate.)

Luther, Kurt, Pamela Griffith and Amy Bruckman. (2008). "Collaboration in Online Animation Communities." Poster presented at the First Annual American Society for Information Science and Technology Social Computing Summit. Miami, Florida, November 2008.

In our studies of existing end-user animation practices, we found that leaders play a central role in the success or failure of such projects. However, little is known about the challenges leaders must manage. Our results indicate that most collabs fail. Collab leaders face two major challenges. First, leaders must design collaborative projects. Second, leaders must manage artists during the collab production process. We contrast these challenges with the available empirical research on leadership in open-source software and Wikipedia, identifying four themes: originality, completion, subjectivity, and ownership. Building on this analysis, we were able to draw with broader implications for online creative collaboration in its many forms.

In the next phase of this research, we will develop a new set of tools ("Sandbox") to both support existing leadership practices, and also try to make more decentralized forms of leadership possible. This forms the basis of Kurt Luther's PhD research. Luther's work has been called ground-breaking in opening the new research area of leadership in online creative collaboration, and collaboration with CMU and this grant made it possible.

Second Life
Second Life is a massively multiplayer, end-user programmable 3D environment. Within Second Life, users can create objects that have behaviors. People can talk and interact in unprecedented ways. Second Life is not just an entertainment platform, but also has applications for education (colleges are setting up "virtual campuses") and business. Virtual store fronts have been set up by companies like BMW and Adidas Reebok. IBM has bought 24 islands on Second Life, a significant investment in real dollars. Disney holds meetings there.

As people interact with one another, human motion of 3D avatars is everywhere. In this highly social environment, human motion is how individuals communicate, interact, and express who they are. Individuals can create new animations for their avatars, and upload them into Second Life. Animations are also sold for virtual dollars ("Lindens"). For example, before an online job interview for a summer job at Linden Labs, one student purchased a handshake animation in order to make a good impression on his prospective employers.

As part of this project, we engaged in a collaborative, critical analysis of Second Life and explored whether this will remain a fringe entertainment environment or more of a mass medium. This culminated in a panel discussion at SIGGRAPH 2007:

Bruckman, Amy, Jessica Hodgins (CMU), Paul Hemp (Harvard Business Review), Asi Lang (Linden Labs) and Vernor Vinge (science fiction author). "The Potential of End-User-Programmable Worlds: Present and Future." Panel, SIGGRAPH 2007, San Diego, CA, August 2007.