



Use of Online Virtual Communities in Scientific Computing

KEVIN KOLZ^{1,2}, SHALINI VENKATARAMAN², GABRIELLE ALLEN^{1,2}
¹Department of Computer Science, ²Center for Computation & Technology
Louisiana State University

(kkolz1@lsu.edu, shalini@cct.lsu.edu, gallen@cct.lsu.edu)



1. Second Life

Researchers are always looking for new ways to interpret and interact with scientific data, which often times is very visual in nature. This has led to research in the area of a game called Second Life, where users can create their own virtual spaces in which to showcase the fruits of their projects. Researchers are beginning to utilize a brand new method of showing data and even making it interactive.

Second Life may offer even more educational and collaborative services to the research community in the future, such as providing online lectures, holding meetings, and increasing communication within and between departments as well as providing outreach to K-12 students.

2. What Is Second Life?

Second Life is a 3-D virtual world entirely built and owned by its residents and can be accessed from any computer much like the common computer game. The world of Second Life is currently inhabited by over eight million residents from around the globe [1]. Many universities have a campus in Second Life where they conduct real classes for real students [2]. Professors can teach virtual classes or conduct office hours from the privacy of their own homes, increasing convenience and minimizing campus overcrowding. Second Life can also provide a fun and exciting new way of learning. Students can view educational movies and see virtual images relating to their area of study (fig. 1). While Second Life is a valuable tool for teaching and learning, it could also be an excellent research collaboration tool. If a group is working on a project, it can be difficult to get feedback from members of the group because not everyone can be together to actually see live data. Inside Second Life, a group of individuals can be in the same space seeing the same live data and giving feedback in real time via the Second Life client. Instead of browsing through URLs and downloading many different files, information can be in one place and easily viewed by anyone. Additionally, a three dimensional virtual space is more easily explored and is also more enjoyable for the user to browse due to a sense of realism. Because of this, Second Life provides a terrific way for people to view and to share scientific data.



FIGURE 1: A visitor to the Second Life CCT Computer Center views a movie of Katrina created by the Scientific Visualization Group at CCT using data from the SURA SCOOP project.

3. Building a Virtual Computing Center

To investigate how Second Life can be used the CCT started by building a virtual center (see figure 2). This center emulates a real life building in which the proprietors are established. The building can be completely customized to meet the needs of all the individuals who use it. A virtual building is dynamic and can be remodeled at any time to better fit the requirements of its owners. Any individual with a Second Life character can visit the building, but only its owners can modify it or its contents.



FIGURE 2: User outside of the CCT research facility in Second Life.

4. Second Life Implementation

Second Life has a built in system which allows users to manipulate basic shapes. Users can also upload any image file as a texture to be mapped onto an object in the game. Each user of Second Life sees himself as an "avatar". Each avatar is totally customizable just as the world is. Objects can also be given behavior based on real world physics. The most important aspect of Second Life is the ability to program objects using Linden Labs built in scripting language called Linden Scripting Language or LSL (see figure 3). LSL is an internal, event-driven, C/Java-style language which allows you to control object and avatar behavior, up to and including mini-games and other complex programs [3]. This language is designed for users new to programming and compared to other similar programming languages is much easier to learn.

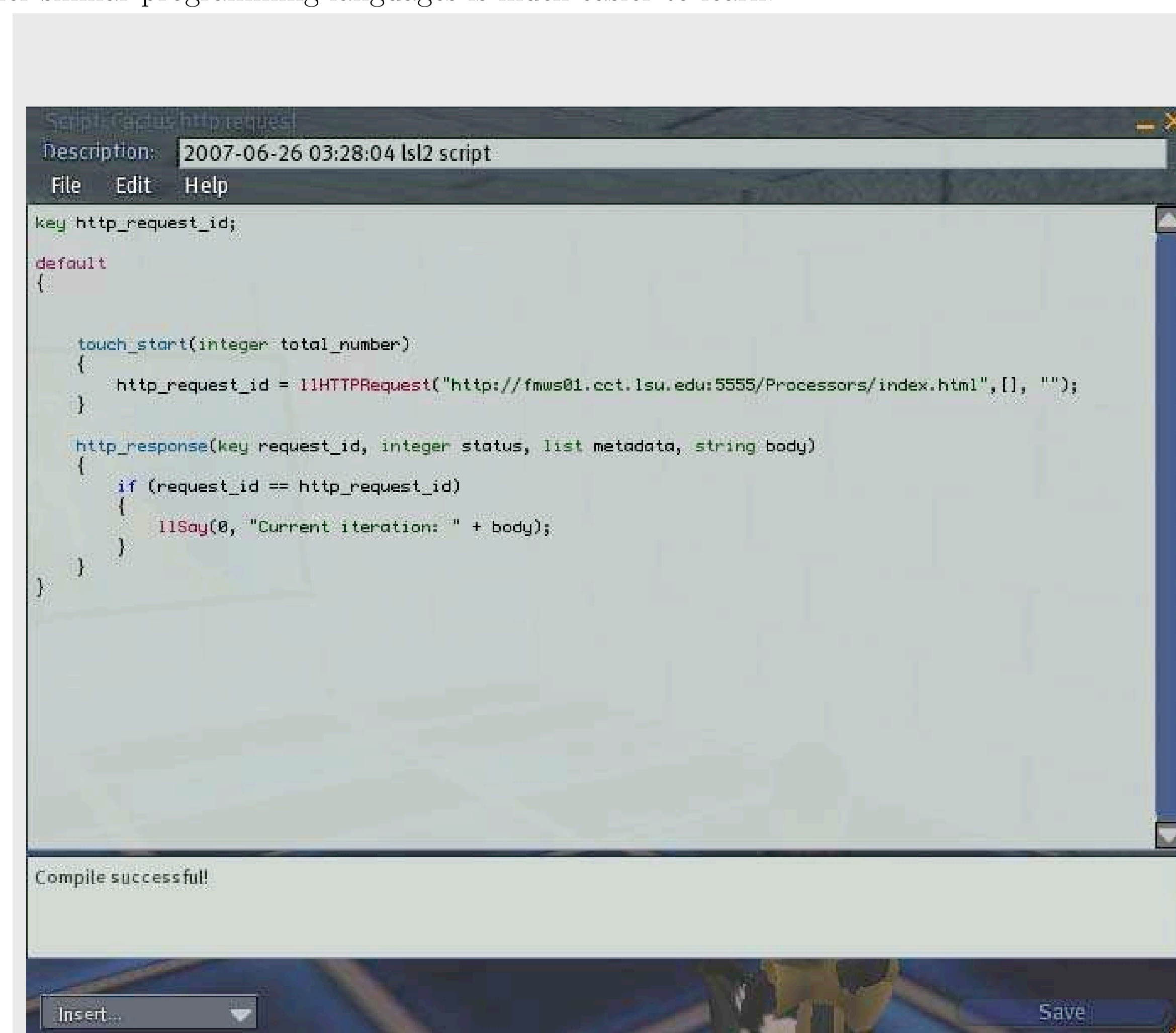


FIGURE 3: A script used to send out an HTTP request and retrieve an integer from the response.

The SL Viewer is a program that runs on the client's machine. The viewer is a window into the world of Second Life. A resident uses the viewer to execute any instruction on the grid. Actions are carried out via an intuitive heads up display or "hud". The hud allows residents to create objects, search for new places to visit, upload content, and control all aspects of a users avatar or camera perspective (see figure 4). The servers or "simulators" are the true powerhouses of the online world. Each simulator controls a 256×256 meter region of the grid. As the user moves

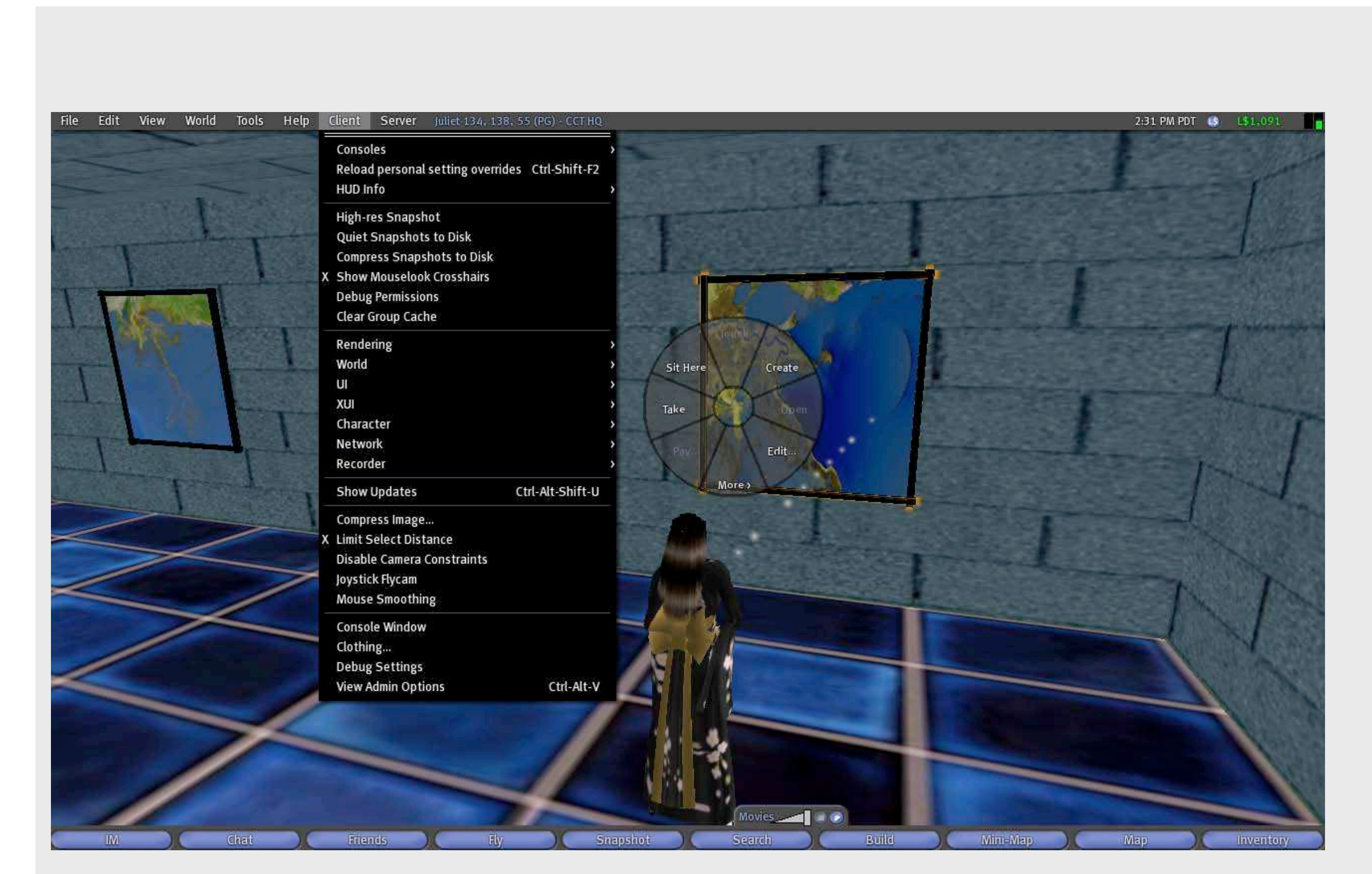


FIGURE 4: Avatar viewing an image provided by SCOOP in the CCT building. Tools used to edit the UI shown here.

5. Results

Through this project, the CCT developed a center in Second Life which taught us the possibilities of this online world. Learning how to develop content in Second Life proved to be non-trivial at first. Luckily, veterans of the game were more than willing to assist newcomers who are looking to learn the ropes. Additionally, anyone can attend daily classes held by residents who are interested in sharing their knowledge with other Second Life users. Once the basics were mastered, copious online resources were available to help us build and script our own objects.

A basic structure, serving as an online center for the CCT, was erected fairly easily by combining simple objects built through the game's interface. Once the structure was in place, we could begin to create a sense of realism by placing scripted objects into land such as doors, movie screens, walls, and even furniture. In a short amount of time, we created a structure that not only looked and felt realistic but also created an exciting way to share ideas and creations with other interested users.

6. Future Ideas

SecondLife is being used by universities and institutes as a virtual multi-player environment to explore new possibilities for education, interaction and collaboration. Following this pilot project, CCT is now planning to extend their Second Life facility to provide a showcase for its computational science projects, to provide collaborating scientists with rooms to interact with each other and their simulations, to provide real time information about supercomputing resources at LSU, and to provide a virtual supercomputing facility where the public can run simulations of complex physical systems such as black holes or hurricanes.

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