A Design Document For *Space Station: Universe*,
A Virtual World For Astronomy Education And Outreach

A Thesis submitted for Albion College Honors

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Abstract

Research has shown that games and virtual worlds are highly effective at conveying academic material while maintaining student interest. This document is a design for a virtual world that would be a companion or alternative to classroom-based learning which will contain games to teach subject matter, and will support a large and persistent community of students, teachers, and enthusiasts. One possible implementation of the concepts behind this design, titled *Space Station: Universe*, is presented as a virtual world centered around the discipline of astronomy.
Chapter 1

Opening Thoughts

1.1 Why *Space Station: Universe* Is Needed

In the fields of education, psychology, and computer science, there is a growing body of literature that suggests an alternative to the standard classroom setting of education. That alternative is a digital environment—a video game or a virtual world. In his book, *What Video Games Have to Teach Us About Learning and Literacy*, James Paul Gee points out that many behaviors exhibited by video game players—a goal-oriented mindset, a sense of accomplishment through progress, the desire for more content after the main experience has finished—are traits that make excellent students[1]. The difference, Gee claimed in a more recent talk, between games and classrooms is that “games allow us to recover ourselves as learners and agents of change”[2]. Where classrooms force students to sit quietly as passive receptacles of information with no visible application, games force players to learn as they play, immediately apply what they have learned, and see their actions change the virtual world around them. This helps the students become more motivated and more perseverant. These ideas have been applied by research teams like that headed by Sasha Barab of Indiana University. Barab’s team created an online game called *Quest Atlantis* that contains many small virtual worlds. These worlds are designed around specific units and are “designed to teach academic subject matter—such as statistics or persuasive writing.” Comparison studies performed by Barab alongside teachers in class have borne out the idea that teaching through games is more effective than teaching in a classroom[3]. Another example of successful application of games in teaching is the project headed by Jane McGonigal. McGonigal collaborated with the World Bank Institute to “create an online game to teach people social entrepreneurship.” McGonigal’s program met with valuable results, causing the creation of “about 50 new businesses started directly by the gamers to address poverty, hunger, and access to clean water and clean energy”[4].

However, according to other researchers, there is an equally important factor to be considered in education: community. According to Mimi Ito, a researcher at University of California-Irvine, the more powerful kind of learning is connected learning. Traditional education asks people to disconnect from the constant stream of social
exchange in which we live, instead of using that social exchange (peer pressure, social media infrastructure) to facilitate learning[5]. Ito points out that games in particular have their own “knowledge ecology” focused around learning the mechanics, systems, exploits, hints, and other features. This ecology is more than simple information sharing. Research performed at UW-Madison reveals that the knowledge-base community surrounding games like World of Warcraft displays a greater percentage of scientific thought and epistemological beliefs than the American populace[6]! So, clearly the community surrounding games and virtual worlds is as strong a tool as the software itself.

With such research in mind, this design has been crafted to create a virtual world that will provide both a suite of educational games and a framework upon which to build a thriving community of learners and enthusiasts. For gamers, the mini-games included in the world will be of a quality that rivals any similar creations that could be found elsewhere. For students, this world will provide an engaging and enjoyable way to learn as well as links to real-world organizations and resources. For teachers, spaces in the world are set aside for the teaching of online classes, and the associated community will be an excellent resource to draw upon. The later chapters of this design detail a specific implementation of these ideals, titled Space Station: Universe (henceforth abbreviated as SSU), which will be focused on teaching and community-building in the discipline of astronomy.

1.2 The Scope of This Work

Before delving into the discussion of the specific features that will comprise this software and how they will be implemented, it is important to note precisely what this design is intended to do. The following chapters will enumerate the general concepts that define the experience that such software should provide, as well as discuss one possible way to implement those concepts on a Windows computer system as it currently exists. This implementation will focus on giving a general picture of the software rather than providing explicit details of construction and development. Therefore, the reader should expect to find discussions and descriptions in this document, not code fragments or flow diagrams.

A final note: Though much of this virtual world cannot be considered a ‘game’, in the traditional sense of the word, the software contains many game-like qualities as far as user interaction is concerned. So, for the sake of convenience terms like ‘player’, ‘player character’ (often abbreviated to ‘PC’) and ‘in-game’ will be used as often as ‘user’ and ‘in-world’.
Chapter 2

Universally Applicable Characteristics

In this author’s mind, there are a set of qualities that should be a part of any virtual world that is created with the goals of teaching concepts in a discipline and building an online community. While the specifics of implementation may vary depending on the discipline to be taught, the platform for which the software is designed, and many other variables, these features must remain in place.

2.1 Characters and Advancement

Players in the virtual world will be able to create characters that will act as their avatars in the world. To allow players to more easily identify with their virtual selves, they will be able to customize their characters’ appearance and gender as they wish. Players will be able to advance the status and privileges of their characters, thus providing a sense of progress and reward as players complete activities and participate in the community. Each character may have qualities unique to it, such as a personal inventory, a listing of statistics, etc.

2.2 Tutorial

According to Dan White, CEO of educational game development company Filament Games, the tutorial is the most important element of any game. As the tutorial is meant to provide a foundation of knowledge about a game world and the player’s place within that world, the tutorial is naturally the first part of the game that any player sees and must be designed in order to make the best possible first impression. Moreover, such a training sequence will also serve as a framing device to place the PC in his world, and give users some context for how they are entering that world. This is even more true for games and worlds that are designed to educate rather than entertain, as players may not have ever played a game before, and may not (at first) be playing willingly[7]. Therefore, before new users set out to wander freely about the world, they will be presented with the opportunity to participate in a short tutorial
that will teach them about basic actions that are vital for becoming a functional player in the hub world and the community. However, should the player desire, they will be able to skip the tutorial and return to it later. Each mini-game must also have tutorial elements displayed—these can be given on an individual basis, though, so that the main tutorial doesn’t overwhelm the user with information that may not be used immediately.

2.3 The World’s Environment

In accordance with the ideal of a large, persistent online community, the virtual world must be hosted on the Internet and accessed individually by each user. The world will be divided into three major portions. The first portion is a set of small worlds, each of which will hold a different educational mini-game. Secondly, there must be a private space for the player to step out of the hubbub of the world and take a moment to reflect on past accomplishments, as well as to plan a strategy for achieving future goals. The third, and most important, is a central hub space that will be the entry point for the player. This hub world will be the glue that binds together the mini-game worlds, the player’s personal space, the community, and all other features and services contained in the virtual world as a whole. These spaces, as well as their associated sounds and visuals, should be designed along lines that support some theme tied to the discipline that the world is designed to advance (SSU, for instance, uses a science fiction theme to support the ideas of astronomy and space exploration).

2.4 Interaction Within The World

In addition to the simple act of walking around inside the world, players must be able to interact with objects, non-player characters (NPCs), and other players. The degree to which players may interact with every object and NPC is best left to specific implementations. However, because a large portion of the activities in the world will relate to the surrounding community, having intuitive and readily available methods of interaction between players will be important. Players must be able to talk to each other with chat, holding both public and private conversations. Moreover, players must be able to form both small and large groups. Small groups may be a temporary collection of players dedicated to a single purpose, such as a teacher leading a class of students, or a group of players dedicated to mastering a mini-game. Larger groups must exist to allow players with shared interests, similar levels of experience/advancement, nearby geographic location, or other social connections to maintain that connection within the virtual world.

2.5 Community Interaction

Outside of in-game player-to-player interaction, community interaction should be possible via some sort of forum. This forum will allow the broadest level of interface
with the community. This will be the place for players to get help, learn new things, and generally interact with their fellows for purposes both related and unrelated to the virtual world. How this forum will differ from most others, though, is that while it is accessible by any account holder via web browser, it is also completely accessible and manipulatable from within the hub space, which minimizes the segregation of game and community that seems to be very strict in most games.

2.6 User-Generated Content

In addition to content created by the developers of the world, players must have tools allowing them to create their own content and share it with the community. This user-created content could range from basic skins to change the look of the world to entirely new mini-games. Depending on how this content affects the in-game world, some of it may have to be restricted (depending on implementation, of course) to more advanced players so that the in-game goals of teaching and community-building are not undermined, but all new content should be visible to the community in some fashion. To keep track of all of this newly-generated content, the virtual world should contain some sort of in-game knowledgebase, equivalent to a Wiki, that is editable by players. This allows every player to know exactly how the virtual world’s content and community is evolving at any given time.

One content creation tool worth specific mention is the ability to build User-Created NPC (UNPC) Ambassadors that would be fully integrated into the main game world. This tool could have enormous potential if implemented in a way that makes it easy for UNPCs to become visible to everyone in the game world. These UNPCs would be special in that they could be used to advertise for various events and organizations within the game. Even more importantly, these Ambassadors have the potential to bridge the gap between game and reality by allowing teachers to provide resources to students or to allow real-world organizations with outreach or educational goals that could be advanced by the virtual world to represent themselves in-game.

2.7 Support Staff

The final feature that is absolutely necessary for any online community—particularly the one geared toward learning and positive accomplishment that will surround this virtual world—is a support staff. As a community grows, so too must the infrastructure surrounding it. There must be in-game support staff on hand to resolve minor technical issues and report major technical issues. In order to maintain a learning environment suitable for players of all ages, there must be moderators present to review (and, if necessary, remove) all forms of community content, be it a mod created with development tools or a single forum post. Most importantly, there must be developers playing as characters within the world, observing the behavior and effectiveness of
the world, and its inhabitants’ response. This observation is necessary in order to better understand how the development team can continue to improve the world.
Chapter 3

*Space Station: Universe*

The general characteristics described are useful knowledge, even when taken on their own. However, it is often instructive to see such heuristics applied in a specific case. Therefore, the case study of *Space Station: Universe* is presented as an instance where the ideals presented in past chapters are applied to create a virtual world and community framework designed to advance the discipline of astronomy.

### 3.1 Character Development

As previously stated, players of SSU will be able to create characters that act as their in-game avatars and also measure their advancement within the world of SSU.

#### 3.1.1 Character Creation

In order to have growth, of course, players must start at a base point. Whenever players decide to create a new character, they will have to undergo the character creation process. Each portion of the process will have its own screen to display the various choices available to the player. When players finish making choices for one screen, they must ‘accept’ those choices to continue onward. If at any point, players decide to change a choice that was made on a prior screen, they may click the Back button to return to the previous screen.

The first step in character creation is to enter a name and gender for the character. Any name is a viable one for the character, provided that the name is not vulgar or offensive, and that it has not already been taken by anyone else on the server to which the player is connected. Gender is a purely cosmetic choice that is available to accommodate player preferences.

The final step of creating a character is to modify the character’s appearance. The player will be presented with a closeup of the character’s face. To the side of this closeup will be a set of sliding-bar selectors corresponding to different attributes of the character’s appearance. Physical features like jaw and nose shape will be adjustable,
and so will more cosmetic changes like eye color and hairstyle. Each position on the slider will correspond to a preset value (shape, color, style, etc.) for the feature that is being modified—there will be enough variety in presets to satisfactorily choose the desired look for the character, but players will not be able to modify extremely specific features like tilt of eyes or degree of over/underbite without creating a mod in the Development Tools to do so. After finalizing a character’s appearance, character creation will be complete and the player will be transported to the tutorial level.

3.1.2 Advancement

Now that a character has been created, it must be able to advance. The player will be able to do so along three different ‘specialization trees’. These trees represent different player roles and differing forms of player activity in SSU and each offers different rewards for advancement through it. The three spec trees are:

- The Scientist spec, which focuses on learning more about the universe by examining the world around them and using instrumentation to collect data. To translate into design terms, this spec will be designed around a player who primarily wants to play the Mini-Games to learn more about astronomy theories and practices. In a classroom environment, this would be the spec that most students should pick.

- The Professor spec, which assumes that the player already has a bit of astronomy knowledge and is thus focused on dissemination of that knowledge to the SSU community and discussion of more advanced astronomy topics. This spec would be best for players who want to spend a great deal of time in the forums, as well as for teachers leading in-game or out-of-game classes.

- The Engineer spec, which is focused on building and creating new objects, items, and spaces to expand the world of SSU. Therefore, the Engineer spec is for those players who plan to make the most of SSU’s development and modification tools. These players may be artists who desire to change the look of the world or its inhabitants, writers who wish to add new characters and new storylines to the SSU universe, or budding game developers who wish to grow their skills by creating new spaces and worlds for other players to explore—anyone with the desire to create and expand the world of SSU.

To be clear, concentrating on advancement in one spec over another will never lock the player out of any particular part of SSU. Engineers and Scientists will still be able to participate in forum discussions, for example. However, a spec confers certain advantages to its area of expertise—extra privileges, more tools, etc.—that will not be available to the other specs.

Unlike many Role-Playing Games, SSU will not track the degree of player progress through some sort of ‘level’ system. Instead, each spec has an associated category of
achievements that award points in that spec for completion. For example, achievements that award points for the Scientist spec would include completing the Explorer mini-game one or five or ten times, as well as achieving an orbit with specific parameters or within a specific time limit—these, of course, are simple examples to illustrate the kind of progress that would define a milestone. In general, there must be a great deal of variety in milestones in order to ward off what is known in many games as “the grind”—performing a repetitive task some pre-specified number of times in order to accomplish some in-game goal, without feeling like an impact has been made in the game world. Additionally, achievements with more difficult requirements award more points for their completion.

After earning points in a spec by completing achievements, players may spend those points in order to unlock bonuses in that spec’s tree that affect the players’ options in-game. To continue the example of the Scientist spec, players may spend Scientist spec points to unlock new types of scenarios for the mini-Games, thereby allowing them to move on to more difficult content after they have mastered (and likely grown bored with) the current level of content. Each spec’s tree will contain rewards of varying value, and if rewards are related to one another—the ability to begin new threads versus the ability to moderate forums, for example—purchasing one or more lesser rewards may be a prerequisite for purchasing the greater reward. More valuable rewards cost more points and multiple rewards may be available at one time, so players will have to choose how they invest their points carefully. However, if a player makes a mistake in point assignment that damages his or her satisfaction with a character, that player will be able to purchase a point reassignment for moderate expense that will return all points spent on rewards to the character, thus allowing the player to reassign the points in a more satisfying manner. Finally, it is important to emphasize that points and rewards in one spec cannot be exchanged with those in other specs, which means that if players wish to earn rewards in a given spec, they must work hard in advancing themselves in that spec only. A master Engineer is not automatically qualified for Institute management—he must prove himself in the Professor spec as well.

In these ways, players can feel that their characters are truly advancing in rank and status as their accomplishments grow in magnitude, and in the process, they become experts in astronomy and leaders in the community.

3.2 The World of Space Station: Universe

For SSU, the hub-world that will tie all other elements of the world together exists in the form of the space station Magellan. Named for the famed explorer Ferdinand Magellan, the station is built around Jupiter, with an orbital radius of 3 million kilometers, just outside of the orbit of the moon Callisto. Thanks to advances in materials science, the human-occupied portions of the station are shielded from the fierce effects of Jupiter’s magnetosphere, while these same effects also power the entire station thanks to many induction coils just below the station’s outer surface. This
section will describe the layout of Magellan in detail. However, in order to properly understand the place that the Magellan inhabits in the culture of SSU, one must first outline the events that give historical context to this space station and its occupants.

### 3.2.1 Historical Timeline

- **2011-13:** A series of revolutions against African and Asian dictators catalyzes a worldwide movement toward openness and democracy, as well as a decline in first-world military involvement. Thus, the stage is set for later international cooperation and funding.

- **2011-2100:** A series of manned and unmanned ventures, including several return trips to the moon, are made by private space industries.

- **2015-20:** A probe is built by NASA and the ESA and launched to investigate the moons of Jupiter.

- **2025-30:** Probe arrives at Jupiter. In the following half-decade, several important discoveries are made regarding both Jupiter and its moons. The major planet of interest for planetary astronomers shifts from Mars to Jupiter.

- **2020-80:** Major advancements are made in propulsion systems, radiation shielding, and several other aspects vital to manned space travel.

- **2050:** The construction of a manned space station orbiting Jupiter is first proposed, but governments are not yet willing to fund such a venture.

- **2070:** Cooperation between many national space agencies has reached the point where planning can begin on the construction of a Jupiter Station.

- **2075:** The proposed Jupiter Station is scrapped because it is projected to produce too little gain to be worth its expense.

- **2090-2095:** A new Jupiter-orbiting space station, called Magellan, is proposed. While staggeringly expensive, it has the potential to serve as a permanent outpost for humanity in the outer Solar System, which could potentially decrease the cost of all further space ventures. Planning is approved and undertaken, but even with the involvement of all major national space organizations, not enough funds are available to begin construction.

- **2102:** As Magellan Station is about to go the way of its predecessor, several private space corporations volunteer to cover expenses that are beyond the scope of the national organizations.

- **2113:** The first segment of the Station is placed in orbit around Jupiter.

- **2194:** Magellan Station is pronounced completed and ready for maximized occupancy.

- **2204:** Present Day, ten years after the completion of Magellan Station.
3.2.2 General Structure of Magellan Station

The station as a whole resembles a large top, with a round middle section that contains all working and living quarters and major mechanical systems, as well as towers that stick out of the left and right sides and house communications equipment, power generators, and the shuttle docking bay. The station spins around the axis defined by the towers in order to provide gravity. On a smaller station this would cause problems for the crew, as the strength of gravity would vary between even the bottom and top of a room. However, as the radius of the central cylinder is approximately one mile, these local irregularities, are somewhat smoothed even between two to three floors, and the crew can act as though gravity is Earth normal.

Before continuing, it is necessary to make a brief note on directionality. Describing directions in a living space that is a cylinder can become very difficult, so I will define them as follows:

- Spinward and antispinward shall refer to walking along the circumference of the cylinder.
- Leftward and rightward (not to be confused with the relative directions left and right) shall refer to moving along the height of the cylinder, toward one tower or another.
- Up and down shall refer to moving closer to or farther from the axis of rotation of the station, as this is what the crew of the station would perceive from a gravitational standpoint.

The explorable portion of the station will be a small slice of the midsection of the Station, and will thus resemble a large wheel. The tramway from the docking bay leads to a large atrium, three floors high, that is placed along one edge. Leading away from the atrium to spinward and antispinward is a hallway that runs the circumference of the station and contains the labs, offices, and quarters that will be explorable by the player. A different ring hallway will be accessible from each of the three floors of the atrium, and each floor will serve a different purpose which will be discussed in more detail later in this chapter. Since walking the entire length of a mile-radius circle would become very tiresome very quickly, the ring will be broken into a couple easier-to manage segments, separated by a cutscene-like transition of the PC’s avatar running further down the hall. The leftward side of the hall will be scattered with viewports providing a view out into space and up the length of the Station’s left spire, framed by the ultra-thick plating that shields the crew of the station from radiation. The rightward side of the hall will be broken by hallways leading down the length of the cylinder. These halls lead to personal quarters for PCs. Finally, in addition to the station itself, there is a related space that must be discussed: the Orientation building. This building is located on Earth rather than the Station, and will house all of the tutorial elements necessary for learning to navigate on the Station.
Figure 3.1: Magellan Station in its orbit around Jupiter
3.2.3 Tutorial

As characters create the avatar that will be their virtual self in SSU, they will be treated to an aerial view of the launch facility from which they will leave for Magellan. Upon finishing character creation (see Section 3.1.1 for details), the PC will be placed in a simulator located in the Mission Control building, located on Earth at the launch facility from which the PC will be leaving for Jupiter. This simulator will act as the tutorial portion of SSU. Players will have a choice of several tutorial modules, covering topics like how to move their avatars, how to manipulate their inventories, and how to interact with the world. Each module will be set in a different location on the Magellan. A Training Officer will help the player through each module, all the while offering more information about the player’s role on the station. When a training module is finished, the player will be returned to the list of modules. When the player chooses to finish the tutorial, the PC will leave the simulator, and the player will be treated with a cutscene of his or her avatar boarding the ship, traveling to Jupiter and docking with the Magellan. Players will regain control in the docking bay, where they will be funneled to a tram that will run down the side of the docking tower and into the atrium.

Important Note: This tutorial will only cover the controls needed for moving about the Magellan. The controls and interactions present in the mini-games will be much different, and thus each mini-game will have its own tutorial that will be shown upon starting that game.

3.2.4 Games

The first-floor ring hallway will house the Laboratory Wing. This wing contains all mini-games, both those standard games detailed in this document as well as user creations. As the standard games tend to cover a wide variety of subjects, each will have a lab room accessible from the main hallway dedicated to that topic. Each room will contain a Lead Researcher NPC to explain the general concept and purpose of each game, and a relevant piece of equipment that, when used, will start the game. In addition to the rooms with games in them, there will also be other labs that players can explore to learn about other types of equipment and procedures that are regularly used for astronomy work.

3.2.5 Community and Knowledgebase

The second-floor ring will hold the Academy Wing. This is the home of all community-related materials. The ring hall will be studded with lounges and cafeterias. For more traditional community activity, a window will pop up upon entering the room allowing access to the community forums. However, this window can be closed or minimized at will, allowing players to wander around and socialize with other PCs in the lounge space. In other areas of the wing will be doors to classrooms and meeting rooms usable by parties of students led by a teacher (see Section 3.7.7 for details on the
Party System). There will be multiples of these doors, to provide plausible space for multiple groups, but to eliminate the question of how many rooms would actually be needed, all doors will funnel a party into an instanced room that will be occupied exclusively by that single party (if you are unfamiliar with instancing, please see Section 3.9.3).

In addition to the more social functions of the Academy, this floor will also feature an Archives room that will allow players to access the in-game knowledgebase, presented to the player as a virtual archive called the Library. The Library will be structured and will function in much the same way as a Wiki. The Library will contain historical documentation with articles on the past and present world of SSU, functional manuals to recap the lessons taught in the tutorials, textbooks containing more academic information about astronomy in general and about the astronomical principles that are applied in SSU, as well as all other relevant information that may become apparent during the implementation of SSU. Furthermore, the Library, as with much of SSU, will be malleable (though moderated) by the community to allow the game’s world and surrounding fiction to grow and take on a life of its own.

3.2.6 Outreach

The top floor ring will hold the Embassy Wing of the station. This wing will house access to all of the User-Created NPCs (UNPCs) created by the community (see Section 3.8.2 for more information on UNPCs) as well as the Institute lounges. These UNPCs will be referred to in-game as ambassadors for specific regions and organizations, and will serve to give players more information about real-world organizations in their local area, in-game guilds that players may want to join, upcoming in-game events, etc. Branching hallways will lead to rooms corresponding to specific regions of the world, where players will be able to meet with the ambassadors of their choice. Lining the hallways will be computer consoles providing directions to each region’s room. As there is no way every UNPC could plausibly fit inside the station, each room will contain a console containing a listing of all UNPCs from the room’s corresponding region, and upon selecting an ambassador, the console will project a hologram of the UNPC’s office that will allow the player to converse in real time with the UNPC.

3.2.7 Personal Quarters

Players will be able to access a private, personal space—their personal quarters—is This room is accessible via elevator from any of the branching hallways on any floor of the station. When players enters their room, a window will pop up to allow access to the following menus:

- Personal Inventory: The user’s inventory contains all items that may have been gained as rewards for earning achievements or playing the mini-games. Additionally, the inventory shows a small model of the PC. Users can drag applicable
inventory items (clothing, medals, etc.) to their character to change their appearance.

- Achievements: This is a listing of all possible achievements and rewards that any player can gain in SSU, as well as a listing of which ones have been obtained by the current player. The achievements will be separated by category (Exploration, Community, Development Tools, etc.) for easier location of specific goals. The achievement category that will act as milestones for the character’s specialization will be marked.

- Statistics: A listing of overall game statistics, such as Total Playtime, Number of Mission Completions within the mini-games, and Total Productive Forum Posts. Rewards (items and achievements) can be earned when these statistics pass certain predefined checkpoints.

### 3.3 Space Explorer Mini-Game

The purpose of this game is to instill and develop and expand the sense of wonder relating to the universe. For me, and in my experience, for many people, this wonder and amazement of all the universe has to offer is a very large part of the driving force that powers learning about and participating in astronomy. Therefore, this game will provide a close-up representation of some of the more beautiful or interesting objects in the universe, including pulsars, black holes (visible only by their accretion disks of course!), multiple star systems, and planetary anomalies.

On-station, the game will be based in the Probe Processing Lab. Upon first starting the Explorer mini-game, players will have the option of continuing from a previous save (if any exists), or starting on a new map. At any point during this game, players may save their progress or load a previously saved file. After making their selection, players will be asked to program the course that a scientific package probe will take upon arrival at its destination by manipulating a simulator—this will be the game itself. Having entered the game proper, players will find themselves able to control the probe as it approaches its destination after some centuries of sub-lightspeed travel. The probe will begin with all of the necessary forward speed to swing by the target object, but players will be able to fire the engine for course correction, using fuel from a limited reserve. When this reserve is depleted, the probe will either be captured by an object in the solar system, collide with an object, or be flung once more into interstellar space. In the latter two cases, players will be returned to their most recent saved game, while in the former, they are free to explore from their new vantage point until they desire to reload their last saved game and start again. For more minor course corrections as well as directional control during burns, players will be able to use attitude thrusters manipulated with keys on the keyboard to change the probe’s pitch, roll, and yaw.
The action will take place in a fully 3D environment. The camera will follow a short distance behind the probe by default, but may be zoomed or rotated at will. The destination objects should be the focal point of interest, but there will be other objects to visit in the traversable space, should the players find the necessary orbits, burns, and thruster bursts to get them there. The probe’s motion will follow Kepler’s Laws of Planetary Motion and Newton’s Law of Gravitation (the probe will be moving too slowly for Einstein’s Theory of Relativity to have any noticeable effects), and so developing an intuition for how objects move in space as opposed to on the Earth will be necessary for mastery of this game.

Each newly-created map will have a different set of objects, a different target, and a different configuration of orbits—all of these variables will be changed randomly, barring certain restrictions (a black hole will not have planets orbiting it). Even planets and moons will change in type and attribute from playthrough to playthrough, some may be Earth-like, some gas giants, some endlessly volcanic, some balls of ice, some with rings, some with tens of moons, or possibly one or none.

The overall stated goal will be to insert the probe into a stable orbit around the object, but there will be no penalty for not doing so, and players will be encouraged to experiment with different angles of approach, different orbital shapes and sizes, etc. If the probe should be destroyed by collision or ejected from the target area, players will be respawned from their most recent save, or with their probe once again approaching its target if no save exists.

On first playthrough, a set of on-screen instructions will help guide the players to their objective, and these instructions will turn off once a first playthrough is completed. If a player has consistent difficulty mastering specific concepts (not being ejected from the solar system, etc.), the game will direct him or her to the relevant tutorial module. However, as with the rest of the tutorial elements in SSU, these notifications may be ignored and turned off should the player so desire.

### 3.4 Planetary Analysis Mini-Game

On the Magellan, the Planetary Analysis game will be based in the Instrumentation Lab, surrounded by parts of astronomical imaging equipment. The game will be accessed by a probe simulation terminal much like that used in the Explorer Mini-Game. The purpose of this game will provide an experience of what it would be like to robotically analyze a planet both from space and on the surface—this game should focus on showcasing the kind of work that is done at space agencies like NASA, and hopefully stimulate interest in such work.

The game will open with a close view of one of the probes that was controlled in the Explorer mini-game, which is now orbiting a planet. As in the Explorer game, the salient qualities of the planet may vary widely between playthroughs. The player will now be able to control the instruments on the craft via a side panel of but-
tons. Among those instruments controllable will be a visual light camera, an infrared camera, a spectrometer, and a surface rover. Selecting an instrument will provide a zoomable view of the planet passing by beneath the craft. Various geological features—mountains, canyons, rills, dunes, polar caps, craters, etc.—will be noticeable. Choosing one of the imagers will place a filter on the view, highlighting features that would stand out with this type of camera. The player will then be able to adjust zoom and image the planet’s surface at will.

Choosing the spectroscope will bring up a reticle on the screen that will allow players to aim the spectroscope. The reticle will naturally be red, but will change to a bright green and emit a chirp once something of interest—a geyser/volcanic plume, unusual rock formation, etc.—passes into the spectroscope’s view. When players take a sample, the spectrum will appear over top of the main view, pausing the game. The player will then be able to examine the spectrum in detail and learn what features correspond to what elements.

Choosing the lander option will allow the player to pick a landing site using a red targeting reticle. Particularly interesting sites (a landing zone which is large enough to accommodate the rover and has more sights to offer than a flat expanse of terrain) will be suggested by the reticle turning green and emitting a short buzz, but players can choose any landing site they wish. Upon finalizing a landing site, the lander will be released. The player will be treated to a short animation of the rover entering the atmosphere of the planet and, if the terrain is safe enough, deploying its landing mechanisms. Then, the player will be placed in control of the rover on a patch of the planet surface. As in real life, all choices have consequences, and so if the player picks a landing site that, for instance, has very unsafe terrain, the rover may be destroyed on planetfall, and players returned to their most recent saved game. Should the rover survive, it will behave much like the space probe, with a selectable set of instruments available, including a rock drill and a microscope to analyze surface features. The explorable terrain will change based on the landing site that was selected: if a player chooses to land near a crater, then there will be a crater on the planet surface. This will likewise be true of other features—mountains, canyons, sandy desert, icy regions, rocky regions, rivers (if the planet has liquids on its surface). When the player wishes to return to the space probe, they have but to click a button.

As in the case of the Explorer mini-game, players may save and load files for this game at any time they wish, and may reload previously visited sites upon starting the game.

### 3.5 Artistic Themes and Designs

In the minds of many players and designers, it is the look of a world, more than its function, that allows players to truly immerse themselves in that world and to feel what the designers wish them to feel. As such, the spaces of SSU should create feelings
of welcome and discovery within Magellan station, and feelings of awe, majesty, and curiosity in the mini-games which take place in solar systems far from Earth’s.

3.5.1 Magellan Station

Generally, Magellan Station will have a warm, clean aesthetic vaguely reminiscent of *Star Trek*, somewhere that people would want to live and work and that players of SSU would like to inhabit. In short, I see in my mind a space that is reminiscent of a mall—clean and inviting socializing, but without some of the impersonal nature that is present in many malls. This theme will be most evident in the outer appearance of Magellan and the central atrium.

As players leave the atrium and walk further down one of the ring hallways, the visual style of that floor will take over. For instance, the Games area will be full of lab spaces— the NPCs wearing lab gear, and the walls of every room lined with machinery or computers. The NPCs will also be hard at work, as the players will be once they begin a game. To contrast, the Community area will have a more sociable feel, like that of a gigantic convention center, with meeting rooms present to allow entry to educational discussions, as well as the lounge/cafeteria space that is open for more general discussion. Of all the floors, this one has the least shift in style from the main atrium. Finally, the Outreach area, as an Embassy with the UNPCs playing the roles of ambassadors from different organizations, should be a more formal floor. Heavy carpeting will cover the halls, and the doors to the meeting room for each region will be wood paneled rather than metal or plastic, with an image of the region’s geography embossed on the center. The one feature common to all of the ring hallways will be the visibility of Jupiter and the Galilean moons outside of the windows of each ring hallway, flowing past as the station rotates. The entire Jovian system will change according to current laws of planetary motion—as time passes, Jupiter will change phase and rotate, and each visible moon will orbit its parent.
Figure 3.3: The player-controlled probe that appears in the Explorer mini-game. In the forward section (top) are instruments sliding out from protective coverings. In the middle are solar panels and movable plating that hides more instruments as well as the cargo bay holding the planetary lander. Just above the solar panels are openings for attitude jets. The aft section (bottom) holds the communications array and the main engines.

3.5.2 Tutorial and Earth

As previously mentioned, the simulator that comprises SSU’s tutorial level will be located place on Earth within the launch facility from which players will begin their journey to Jupiter. As it is likely that such a facility would have been adapted from current sites for reasons of both required infrastructure and historical respect, this space will be a building much like the current facilities at Kennedy Space Center. The simulator room will have a large window treating the player to an excellent view of the launch facility campus, including the launch pad. The ship that carries the player to Jupiter will combine the plane-like features of the Space Shuttle that allow it to re-enter Earth’s atmosphere with the majestic rocket-like appearance of the Saturn V.

3.5.3 Mini-Games

The looks of the various mini-game explorers that are controlled by the player—probes, rovers, etc.—should resemble those of the present day in that they are supremely functional. Every space on a given vehicle will be filled with sensors, communications equipment, telescopes, solar panels, and more. Not only this, but there will be compartments within the vehicles, hidden by movable protective shielding, that will yield yet more instrumentation and equipment.
Figure 3.4: Top and bottom-angled views of the probe. On the right, a plate folds open to reveal more instrumentation.

Figure 3.5: Profile views of the left-side (left) and ventral (right) portions of the probe.
3.6 Sound Design

3.6.1 Music

The music of SSU in both the hub world and the mini-games should fall into three categories: background, event-oriented, and burst music. The background music will be light and slow, with steady tempo. This music should easily fade from consciousness so that it does not intrude upon the player’s awareness, but should add to the atmosphere of the world. Different themes will present themselves in this music depending on whether the player is walking around Magellan Station, piloting a probe in space, or waiting at the game’s Title Menu. For instance: the motif for the Explorer mini-game will be as ethereal in nature as the starry void surrounding the craft, while once a rover has touched down on a planet’s surface the tone will shift slightly to something more earthy by adding more tenor and bass instruments. However, it is important that all of these works are variations on the same idea, so that they can be easily blended into and out of each other. For this type of music, I look heavily to the science-fiction action game *Freelancer* for inspiration.

Event-oriented music, as the name suggests, will be used to develop the themes of the background music as more action takes place on the screen. As such, this music will vary widely depending on the the setting. For instance, upon first entering the main atrium a grandiose theme will play—a rich, string-filled, waltz-like melody—to reflect the magnificence of the space. As another example, as a player approaches a planet in the Explorer mini-game, the music’s presence will increasingly assert itself as the planet grows ever larger. For a volcanic planet, a tone of violence and power would be appropriate, but for a greener, more Earth-like world, something pastoral would be better.

Burst music is simply a short burst of celebratory music that will accompany some player accomplishment, such as the earning of an achievement or the completion of a mini-game. This music will be brassier, with trumpet, trombone, and cymbal fanfares—almost like a short segment of Strauss from *2001: A Space Odyssey*.

3.6.2 Sound Effects

As SSU takes place in a future, science-fiction world, many of the sound effects will be akin to mechanical and computational machinery. When buttons in menus are scrolled over with the mouse, they will make a slight “tick” sound to acknowledge their impending response to a mouse click. When a button is clicked, a “boop” kind of sound will play to acknowledge the click. Similar sorts of things will be present throughout the virtual world. While all of this may sound rather clichéd, it is important to note that an audience will have certain expectations about what kinds of sounds will be present in a futuristic space station world, so in order to attract the numbers of people that will be necessary to build the community that
SSU will be created for, these baseline standards of the genre should be respected, though certainly not followed to the letter. One important departure must absolutely be made: the lack of sound in space in the Explorer mini-game. Though the lack of sounds from the probe’s engines, thrusters, and other equipment may be disconcerting at first, this level of scientific accuracy will be important for attaining the feeling of truly being alone in space, and will provide an excellent starting point for players to learn about the realities of space travel. This said, absolute silence is quite boring, so music will still play, and interface items will still make appropriate sounds when clicked—only the noises coming from objects in the world will be muted.

### 3.7 User Interface

The explorable spaces, the artwork, the sounds, the people of SSU, all are well and good, but without ways for the users to understand and interact with them, they are also devoid of the agency and interactivity that makes a virtual world what it is. As with most games and virtual worlds, the way users interact is through a main menu to allow for certain choices before entering the world, a set of keyboard and mouse controls to allow the player’s avatar to interact with the world, a Heads-Up Display (HUD) that makes pertinent information accessible while playing, and a set of in-game menus that allow players to access more information as needed.

#### 3.7.1 Access to the World

Like many virtual worlds with a large online community, the data that composes SSU’s persistent world will be stored almost entirely on server(s) owned by the developer/publisher. In fact, there will be multiple copies of SSU’s world, each stored on a different server. Multiple servers will be necessary to handle the large volume of player traffic that will eventually become a reality for SSU. Player information is stored by account rather than by server, so a player may play on any server he or she desires, with the only changes being the specific players present in that server’s world. Thus, players of SSU work almost entirely in the cloud—all they need do to access their account from any computer is download a client program that allows them to log in. One important advantage of this system is that the player’s progress is saved virtually instantly, so if the player quits or logs out, the game will be saved automatically. Even more importantly, if Internet connectivity is lost, then little or no player progress will be lost if the player is simply sent back to the title menu.

#### 3.7.2 Title Menu

As with most software in the style of virtual worlds, upon launching SSU, players will be placed at the title menu. This menu will primarily prompt users to log in to their account so that they may access their characters or create new ones, and thereby enter the world. Additionally, players may enter the development toolset directly
from the Title Menu. Players will also be able to access settings for servers, graphics, audio, network, etc. from this menu.

### 3.7.3 Basic Controls and Interactions

Generally speaking, the main form of user interaction within the hub world of SSU will be one of exploration and experimentation. The purpose of the keyboard is to move about the world and rotate/tilt the view of the world around the player’s character—by default, the latter is accomplished with the arrow keys, and the former by the keys W, A, S, and D (treated like arrow keys but manipulated with the left hand). The mouse, on the other hand, is used to determine what objects the player will interact with and then interact with them. Moving the mouse around moves a selection cursor, just as with any standard operating system. By left-clicking the mouse, the player can select whatever object the cursor is hovering over (if that object is selectable and not just a generic piece of environment), and view information about that object (name, portrait, type of object, etc.) via the Selection Bar. A right-click of the mouse on some object will perform some standard action on whatever object the cursor is over, regardless of whether or not the object is selected. This standard action varies depending on the object that is clicked—a door will be opened, a computer console will be used, an NPC will be talked to, etc. If an action other than the standard one is desired, the player has but to select the object in the manner that is described above and right-click on the Selection Bar. This will bring up the Drop-Down Menu, a list of all possible actions that may be employed for a given selection. Finally, scrolling with the mouse wheel will zoom the camera in and out for a closer or farther view of the PC and the immediate surroundings.

### 3.7.4 In-Game HUD

While I would like any in-world interface to remain as small as possible for the sake of allowing players to immerse themselves in the world without distraction, there are certain necessary items of information that the player will need to know.

- **Mini-map:** This will be placed in the upper-right corner of the screen, and will display the user avatar’s current position within Magellan Station as well as an overhead view of the surrounding area.

- **Clock:** Centered over the top of the display. Keeps local time, and includes an alarm so that the users of SSU do not miss any engagements, be they in the virtual or the real world.

- **Selection Notification:** A small, semi-transparent outline will appear around any object that has been selected by the player.

- **Selection Cursor:** Controlled by the mouse, the cursor provides a tool with which to select objects in the world.
• Selection Bar: Above the menu buttons, text will appear naming whatever object is currently selected.

• Chat Window: A window displaying a history of all chat messages and system announcements that the player has received since logging in (See Section 3.7.6 for details)

• Menu Buttons: Three buttons centered on the bottom of the screen. From left to right, there is a Main Menu button to bring up a smaller, less elaborate version of the title menu that provides the choices—to return to the game, to go to the options menu, to go to the game development tools, to quit the game, or to logout and return to the title menu. In the middle, a button to teleport the player to their personal quarters to access the features described in Section 3.2.7. Finally, on the right is a button to access the Library.

3.7.5 Library

SSU’s in-game knowledgebase, called the Library, is accessible through the archives on the Academy floor and through the menu buttons on the HUD. The Library will have information available on every subject connected to SSU. Subjects for Library entries would include everything from basic control and interaction information, to descriptions, explanations and backstories for every room, person, and technology present on Magellan Station, to articles on astronomical history, concepts, and technologies both fictional and nonfictional. Though the Library will begin fully stocked with information about the qualities of the original SSU world, community members who have proven themselves to be responsible and constructive will be able to edit the Library to reflect everything from updates issued by the game developers to the changing social atmosphere and community that surrounds SSU to the mods that will eventually be released by community members. Who better to update the Library, the documentation to go with the world of SSU, than the community itself?

3.7.6 The Chat Window

The chat window is the most immediately available portal to community interaction. It will display every message the player receives and allow the player to respond in kind. To begin chatting, the player need only press the Enter button on the keyboard. After typing in the desired message, pressing Enter again will send the message. Additionally, conversation can take place on multiple levels, called chat channels. There will be a general channel on which every player on a given portion of the station will be present, an institute channel for discussion among members of a given institute, a classroom channel that will be only available among members of the same class, and a whisper channel for private communication between two players. By default, conversation will take place on the general channel, but each channel will be assigned a number, and thus to swap chat on a given channel, all that is necessary is to prefix the chat message with a slash, followed by the number in
question. Thereafter, the new channel will be the default for conversation until the
channel is changed again. To be clear, though, even if a player is conversing on one
channel, they will be able to see chat from every channel in the chat window.

3.7.7 Classrooms

In many cases, players may desire to group together for common gain, and so SSU
allows them to do so by joining into ‘classes’. A class is a collection of ten or fewer
players led by a player designated as the ‘teacher’—a player who is an experienced
Professor. Classes, as groups, are accumulated by the teacher via invites that are sent
to each class member via an option on each player’s Drop-Down Menu. Each player
can then accept or refuse that invite. Upon becoming part of a class, a player will
now have access to the class chat channel and be able to enter classroom instances.
More importantly, class members will be able to easily see each other’s locations via
highlighted dots on the mini-map.

3.7.8 Institutes

Institutes, similar to guilds in many online games, are organizations that exist to
accommodate large groups of people who have become connected in the community.
While Institutes may be joined by any player who is invited by the Institute’s ad-
ministration, these organizations may only be created and maintained by the most
experienced Professors—community members who have had a great deal of practice
in participating in forum discussion and leading in-game classes, thus making admin-
istration positions a great mark of status and experience. The major perks of creating
or joining an Institute include: access to a private Institute lounge on the Embassy
floor of the Station that may be reconstructed as members desire, the ability to create
a UNPC ambassador to advertise to potential members, and the ability to create a
Institute uniform that will be optionally wearable by all Institute members.

3.7.9 Forum

The forum, accessible upon entering the main lounge on the Academy floor, is struc-
tured in much the same way as other community forums that can be found on the
Internet. As with these other forums, players can interact by making text-based posts
on already-running discussions, or create a new discussion by providing an initial post.
Threads are usually grouped by topic, with restrictions enforced by moderators as to
what kinds of content can be posted in which topic group.

3.8 Development and Modification Tools

Bundled with the software itself, SSU will include a set of development tools. This kit
will consist of two parts. Firstly, a collection of game modification (‘mod’) creation
tools called the Modification Creator (or Mod Creator). Secondly, there will be a tool
for the creation of lifelike User-Created NPCs (UNPCs) that can be integrated into the main world of SSU for all players to see.

### 3.8.1 Modification Creator

The ultimate design of the Mod Creator will be a suite of tools that combines the comprehensiveness of toolsets like the *Source Software Development Kit (SDK)* and the ease of use of systems like the *Starcraft II Galaxy Editor* in order to allow players to build their own mods for SSU. These mods could include everything from skins or texture packs that alter the appearance of SSU to new music tracks or sound effects to world-changing mods that contain new locations, new characters, and even new mini-games for the other players to enjoy. To help bolster the atmosphere of creativity that will surround the Development Tools, advancement in the Engineer spec will have access to extra tools and materials.

Rather than outlaw mods to in-game content, as many virtual worlds and games have done in the past, SSU will embrace the modding community by including a mod submission and integration system that will help combine mods into the main SSU software in much the same way as fan-created mod managers. All mod submissions will be accessed through the Forums, and will be classified by the purpose of the mod. This organizational structure will allow for easier searching by the users who desire to find mods for a specific purpose.

### 3.8.2 User-Created NPC (UNPC) Editor

While many games allow user-created locations and characters to be used in mods, this author has never encountered nor heard of any virtual world or game that allows players to create their own characters and have them be inserted into the original world/game itself. This is the function of the UNPC Editor.

### 3.8.3 Functionality

This feature will allow any player or group of players to create their own NPC representative, complete with surrounding office, to be placed on-call via the Embassy wing of Magellan Station. The UNPC Editor will allow creators to control every aspect of their NPCs. Options will be available to modify body structure, facial features, uniforms and more from either an empty model or one of a set of predesigned templates. More importantly, creators will also be able to write a small speech, complete with accompanying gestures and actions of their choice, so that their NPC can provide sufficient introduction of their creating person and/or organization. Finally, creators using the UNPC Editor will be able to provide links to outside websites or other resources that will be accessible to the user through the same pop-up window that is used for other NPCs.
3.8.4 Interface

The interface for the UNPC Editor will be relatively simple. The main window will show the basic form of the UNPC, which can be created as a new file, loaded from a provided template, or loaded from a previously saved session. At the top of the screen will be a toolbar which will have buttons to perform various functions. There will be three modes to the editor: Form, Function, and Room selectable by buttons on the right side of the window. In the first two modes, the body will be separated into head, torso, arms, hands, legs, and feet. These parts can be positioned and proportioned with left- and right-clicks of the mouse, respectively, and a middle-click will move the camera’s view of the UNPC to whatever angle is desired. Each mode will function in the following manner:

- In Form Mode, the user will be able to provide clothing and surface features, by either selecting from pre-defined templates provided with the Development Tools, manually adjusting sliders and color selectors, or importing texture files created in the Mod Creator or in another program. Buttons will be included on the toolbar to open pop-up menus for each of these options.

- In Function mode, additional features will appear to generate a response that will occur in-game when a player decides to talk to the UNPCs. The UNPC’s positioning can now be saved as a specific pose. By selecting a start and end pose and specifying a start time (relative to the beginning of the response), a full movement will be generated to move the UNPC from start to end pose. Additionally, a text box will appear beside the main view of the UNPC that can be used to fill a speech bubble that will be displayed at a given start time and for a given duration. If the speech is too long to fit in a single text box, multiple saved speech bubbles can be used to form a longer speech. A timeline bar at the bottom of the screen will allow for combination and placement of all movements and speeches, as well as playback of the entire response.

- In Room mode, the view of the UNPC will change to place it inside the conference room it will inhabit when it meets with SSU’s players. The room’s appearance can now be edited, either using one of several preconstructed themes, or using a completely user-designed theme. Users can pick from a library of object models, textures, lighting themes, etc. to create the perfect room for their UNPCs. As with the Modification Creator, there are certain items in these libraries that are only made available by the accomplishment of milestones by Engineer-spec players.
3.9 Miscellaneous

3.9.1 Achievements and Rewards

Put simply, an achievement is an optional milestone—a specified objective that players may complete as they choose in order to show progress in a given portion of SSU’s world. The achievements in SSU will be separated into three categories: Knowledge, Communication, and Creation. These categories correspond to the three specializations available to PCs. Completing achievements in one category earns points for players to spend on rewards in the corresponding specialization. Very difficult achievements may also award items as well as a great number of points, thus giving players a badge of honor for completing a notable task that will be visible to the rest of the community.

3.9.2 Cast of Characters

1. Orientation Chief Jensen: The first person players meet after creating a new character, Jensen will deliver all tutorial information to help new players get started. She is in her early thirties, with extremely vibrant red hair that falls to her shoulders. Her demeanor should be pleasant, happy, and welcoming, to further encourage players to immerse themselves in the world of SSU.

2. Lab Tech Donelly: The lead technician in the Probe Processing Lab, Donelly is a bright-eyed graduate student who is thrilled to be able to work on the station. Donelly will explain how to play the Explorer mini-game with the utmost enthusiasm.

3. Dr. Ruan: A professor on sabbatical from Peking University, Dr. Ruan is a planetary astronomer using the instruments aboard Magellan Station to study Jupiter. She can be found in the Instrumentation Lab, and will teach players how to play the Planetary Analysis mini-game if asked.

4. Dean Vurmeer: Stodgy and bureaucratic, the Dean of Magellan Academy will initially treat those who interrupt him in his office with disdain, but if his ego is stroked sufficiently, he will reveal a great deal about the history of Magellan Station.

5. Director Warren: The Director of Magellan Station, Warren is a stern and rigid administrator hailing from the private space industry. The Director is a hard-working man who, due to his obsessive desire to handle every task personally, has found himself directing multitudes of projects across the station, as well as further initiatives on Earth. Therefore, the Director is often unavailable to the average station worker. Only the most elite of the station’s complement of scientists, engineers, and professors are able to meet him.

6. Jan Flescher: Jan is the secretary assigned to Director Warren. Because the Director micromanages his own schedule to the point that Jan has nothing to
do. As she craves company, Jan will talk at length about the social practices and office politics that traveled to Magellan Station along with the crew members.

7. Various minor NPCs: Talking to the various technicians, researchers, ambassadors, engineers, and other NPCs on the station will produce short but unique responses that may be simple small talk, or may be an illuminating fact about astronomy or Magellan Station.

3.9.3 Instancing

Instancing is a technique used in some Massively Multiplayer Role-Playing Games (MMORPGs) to ensure that only a single group of people, all of whom satisfy certain entry conditions can enter an area at any given time by creating separate instances of the area for each group. As applied in games, this means that a group that has formed to run through a difficult dungeon is guaranteed to have the dungeon, and thus all of the loot and experience, to themselves. Additionally, by adding entry conditions, game developers can ensure that a player who is not strong enough to survive in a dungeon will not be able to wander inside accidentally. In SSU, instancing will be applied to classrooms and Institute lounges to ensure that, respectively, a class of players will not be interrupted by interlopers and only members of a specific Institute will be able to enter that Institute’s lounge.
Chapter 4

Closing Comments

4.1 Future Directions For Development

As can be seen, there is much left to do if any virtual world of the kind described here is to come into existence. An enormous amount of further work is required to design an effective implementation of the major concepts outlined in this design document. It also remains to be seen if, given the proper polishing, SSU can become the first such world to come into existence. It may be that much of the surrounding norms that are tacitly assumed to underly the design of SSU (Windows operating systems, mouse/keyboard-operated PCs) may shift to something entirely different by the time any such virtual world is created.

It is certain, though, that the scale of this project is such that it simply cannot be built by any one man. Most likely, the software will be constructed by a small, dedicated team of developers. While the resources of a well-known development company would be a major asset, it is more likely that SSU would be absorbed by such a company after it is established and proven to be a promising venture. Whether or not a large company becomes involved, the developers of SSU will likely remain on the project as the initial group of administrators, moderators, and participants of SSU’s community. Over time, the community will grow larger. More content will be added by developers and by community, causing the world to grow and change even more. It is my conviction that such a world has the potential to see use by teachers and enthusiasts across the globe, and to become an invaluable resource for anyone who wishes to acquire the knowledge that this virtual world has to offer. It is my goal to see that such a world becomes a reality.

4.2 Acknowledgements

4.2.1 Design Influences

Over the course of creating this document, I have allowed my design to be influenced by much of my prior experiences with virtual worlds and gaming. If it could possibly
said that some of my creations resemble those of other products a little too closely, I would say that I merely have recognized a good idea that doesn’t need changing.

- 2001: A Space Odyssey by Arthur C. Clarke
- Contact by Carl Sagan
- Call of Duty 4: Modern Warfare
- Dragon Age: Origins
- Freelancer
- Mass Effect 1 and 2
- RuneScape
- SecondLife
- Source SDK
- Starcraft World Editor (StarEdit)
- Starcraft II
- Star Trek
- World of Warcraft
- Many other MMORPGs and RPGs

4.2.2 Image Credits

All 3-Dimensional renders of the Explorer mini-game probe were created by Joel Scott.
All other images used in this document were created by Sydney Groth.

4.2.3 Personal Thanks

I would like to thank the following people, as they have greatly contributed to the success of this thesis:

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Bibliography


