HOLODECK – STAR TREK (STAR TREK VOYAGER)

Introduction

Star Trek is a TV series set in the future which explores many futuristic Interaction paradigms throughout the different Star Trek shows. One of these, Star Trek Voyager which started airing in January 1995 is a notable show which explores technology created many years before it is (or could be) technically feasible to develop and use. Star Trek Voyager is set in 2371, in a more technological advance time period where technology exists that allows starships (spaceships) to travel to and from different planets, allowing humans to interact with a mix of different alien cultures.

For this assignment, I will be discussing the Holodeck, a room where the computer generates the environment and landscape allowing the user to be in a simulation of a chosen location or time. While this room is enclosed by 4 walls, the holodeck is designed so that the user can interact, and the simulation changes based on what the user is doing, and in effect never restricts the user's movement. Often in Star Trek Voyager, the Holodeck would be used by crew members to relax from working on the starship in their downtime, such as by visiting the simulated township of Fairhaven (a small country town) and allowing them to interact with people created by the author of that Holodeck Program.

The holodeck was also able to be used for training simulations, to ensure that the crew were prepared for missions on other ships or planets. For this assignment I will be focusing only on the use of Holodecks in Star Trek Voyager, as while Holodecks also featured on Star Trek the Next Generation and Star Trek Deep Space Nine, the holodecks were not featured and explored in as much detail in these other shows compared with Voyager.

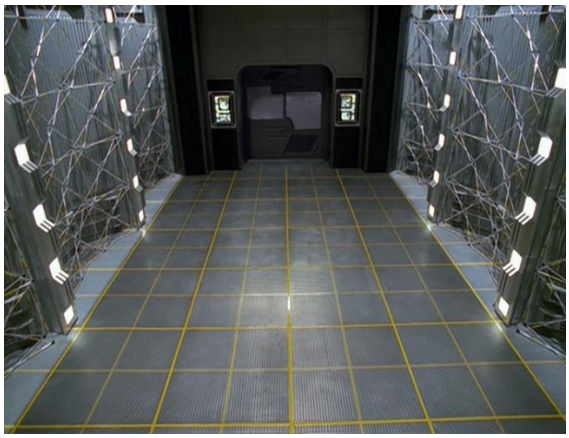

FIGURE 1. AN EMPTY HOLODECK WITHOUT A PROGRAM RUNNING

FIGURE 2. FAIR HAVEN (A PROGRAM AND TOWN) RUNNING IN THE HOLODECK

Discuss possible benefits of the futuristic HCI over current interaction paradigms, or if the source material is old, discuss the differences between interaction paradigms of the time and that presented in your source (minimum 150 words).

The clear and key feature of the holodeck is that they allowed the user to feel like they weren't on a Star Ship but anywhere they choose to be, whether that is a country town from earth or a rocky cavern location from a different planet. This results in the benefit that the holodeck helped to reduce stress and allowing the user to experience different worlds and time periods (such as working

with Da Vinci), depending on the creator of Holodeck Programs. People were able to explore new worlds or learn and witness history while being in the holodeck. Currently, the only main way we can explore history is to read about it in a book or online or to watch a film or tv show. Holodecks would allow us to explore history and see what happened in the past in greater detail then reading online. Stress levels could also be reduced by going to a holodeck and being able to have a simulation that someone has made, meaning the user does not need to create it, but only enjoy and experience it.

FIGURE 3. A SIMULATION OF DA VINCI'S WORKSHOP ON THE HOLODECK

Another key feature of the holodeck is that they could be used for training purposes, such as running simulations of fighting against an enemy or running simulations of doing operations. This provides another key benefit of allowing easy training, allowing the crew to be easily trained on things without having to leave the ship and be simulated within the room. This would provide the ability for those that work in dangerous/life-threatening conditions (such as bomb disposal units) to have additional training within a simulation, allowing them to understand and try to mitigate the risks they encounter without risking death or serious injuries.

By also performing tasks as a simulation this also meant that training and simulations where there is a risk of death could also be performed with a lower level of risk (with how it is a simulation), with the option for the user (if they wished) to turn safety protocols off, resulting in the possibility of severe danger and risk of death if chosen. This provides the benefit of providing training (such as brain surgery) without a real patient, with everything simulated and no risk of harm for people. Instead of watching videos and reading books, simulations could provide greater detail of training for Trainees, allowing them real-life experience but all within a simulation. For those that want to play high-risk activities such as jumping off a plane, they could do this within a simulation and depending on their choice risk no danger or severe danger.

Note: Already we are seeing Simulations through Augmented and Virtual Reality allowing training of surgeries and operations through the user of Headsets. By having a Holodeck these simulations generated by a Holodeck would provide greater detail of training, without the added weight of a headset. Holodecks would also allow the user to interact with the story in mode depth and understanding while not being restricted.

FIGURE 4. A CURRENT VIRTUAL REALITY SIMULATION OF AN OPERATION

Holodecks also introduced a new way to interact with the System when Star Trek first aired, through voice control. While voice control is relatively common in 2020, back when Voyager was release in 1995 Voice Recognition and Voice Control did not exist. Commands could be issued on a Star Ship, or commonly within a Holodeck, allowing actions and processes to occur such as starting and stopping a Holodeck Program. Star Trek Voyager through the use of the Holodeck introduced two new ways of Interacting with Technology – through voice (voice commands), or via performing actions within a simulation. While voice currently exists as an interaction style, performing tasks in simulations is still not a mainstream interaction style.

Barriers

The key barrier to achieving the ability to have real-life holodecks is that we are not technologically advanced enough at this create, develop and design Simulations with holograms inside of a Holodeck. Holodecks require a lot of complicated technology, such as Holograms and the ability to transform these Holograms into Matter (physical objects) due to how Holodecks allows the user to pick up and use objects.

Currently, Holograms do not exist, with how at the moment we haven't developed the technology to make items project in 3D, as currently we are limited to 2D technology and projecting 2D images onto surfaces. While there are some small forms of holograms, there are none that currently exist or are made which would provide the level of depth or reality needed for a holodeck.

We are also currently not technologically advanced enough to be able to have technology which can adapt and change the behaviour of a simulation depending on what the user does or performs. While Artificial Intelligence is advancing, we still are not completely at the stage where AI can accurately adapt and respond to the actions of an individual, which is a major barrier to the possibility of a Holodeck. Holodecks will need to cope and be able to adapt to what a player does, whether that is to perform a certain task or not or to do something completely different. An author of a Holodeck Program will never be able to fully predict every result to every user's action, meaning that the computer will still need to adapt to the user's interaction.

However, holograms and holodecks are becoming more and more of a possibility in the future through Virtual Reality and Augmented Reality. With the current technology available such as the Microsoft HoloLens Virtual and Augmented Reality, this allows us to play and interact with different environments and tasks. While this technology is still an emerging technology and Interaction Paradigm, in the future there is the possibility that simulations through an interface like the Holodeck could happen.

Analysis

For this part I will be analysing the Computing Environments within Holodecks:

Physical Computing Environment:

Due to how a Holodeck operates, the system works together with Projectors and a saved simulation program to create an environment based on what the author has designed, immersing the user in it. The Program tries to create an environment that is like the real-life environment that the program is based on. However, key elements from outside the simulation can still be summoned, such as the doorway which allows the user to exit the holodeck and controls which allow the user to modify, alter or change the program. These can appear through voice commands, and try to appear non-intrusive within a program as seen below

FIGURE 5. THE HOLODECK DOOR'S APPEARANCE AS SEEN FROM A SIMULATION IN STAR TREK THE NEXT GENERATION

Other Physical Computing Environment values that are also considered within the Holodeck is that the simulation creation must consider the noise, lighting and cleanliness of what will be in the environment. If the setting is a dark, damp, stink jungle then the Holodeck will create and set this environment within the simulation as such. This can be seen in Figure 6 which is a creation of a jungle environment based on Earth.

FIGURE 6. A HOLODECK SIMULATION SET ON EARTH

Safety is a major factor of the simulation with how there is the ability to turn on the safety features (which appears to be the default in the Holodecks) allowing the user to interact with the simulation without any risk of death or severe injuries. This keeps the user safe and severally injured free, however, there is also the feature of allowing the user to turn the safety protocols off, allowing them

to be in danger and feel the effects if they were to do it in real life. There is plenty of warnings and cautions to the user to ensure that they are aware and informed of the risks when turning the safety protocols off.

Social Computing Environment

Within the Social Computing Environment of the Holodeck in Star Trek Voyager, there are only 2 holodecks available on Voyager. This means that there is the limitation that only 2 people (or 2 groups of people) can use then at one time, resulting in there needing to be a roster or booking system in place. Holodecks are not easily able to be created, resulting in their being the social limitation of there not being a large availability of Holodecks.

Holodecks require a large area of space to allow movement of the user, while also requiring a large amount of energy and power to run and project these simulations. Due to this from what I have seen in the Star Trek shows, Holodecks are considered a luxury for starships, with other large vessels may not be equipped with them due to costs or energy factors. If Holodecks were to be able to become a reality in the future this would impact on their practicality and availability. Due to the materials and hardware required for Holodecks, they would be expensive and time-consuming to install in a readily available location. This might mean that if they were to become reality, Holodecks could be restricted to the ultra-rich people, or limited to only select locations.

Cognitive Computing Environment

Due to the flexibility of Holodecks, the Holodeck could be targeted to a large variety of people based on the holodeck novels (or programs that authors create).

For people that like old western types of environments, there would be programs available that have stories for them. For those that wanted to partake in high-risk sports (such as jumping out of planes), there were holodeck novels for them. Due to how Voyager was trapped lightyears away from Earth, often the Voyager crew formed a social group and met in the Holodeck weekly to visit earth and have a drink or party at a simulated bar. With the large selection of programs available, there were options for many different people.

Degree of Technical Ability did not seem to affect how a person interacted with the holodeck due to how all of the crew that were using the holodeck were trained in how to use it, and for visitors that visited Voyager and used the holodeck, the controls were mostly voice-controlled allowing them to easily pick up how to use the controls of the holodeck.

However, the one area that Holodecks may not completely cater to is those that have disabilities, such as those that might be wheelchair-bound or have limited mobility. Due to how Holodecks required the user to interact with them through moving around and performing tasks and progressing through stories this could result in them disadvantaging users who have disabilities. For those that are also blind or deaf, holodecks are not suitable for them due to the range of the sounds and visuals that are provided.

The degree of focus in Holodecks can also be overwhelming due to how being in a Holodeck appears to be in a completely separate space, outside of the starship and in a completely different environment. While users may not completely be able to focus on their surroundings, with all the noise, imagery and smell effects a Holodeck Program allows them to transport away from their worries on the ship.

However because the holodeck is on the starship this does result in the issue that they can't completely escape their reality of life, as if the ship was to be attacked the holodeck could shake, or

if power was to temporary go out while in a Holodeck Simulation the simulation would end. Users can escape their reality, but only to a point where external factors still influence the holodeck. This is clearly shown in the Star Trek Voyager Episodes **Heroes and Demons** and **Bride of Chaotical** where in **Heroes and Demons** a gas alien is trapped in the holodeck, resulting in holodeck malfunctions and has only happened because Voyager had accidentally transported it across while in **Bride of Chaotical** Voyager is stuck in a region of space where the aliens can only sense life within the holodecks (photonic life), while real-life objects are unable to be sensed by the aliens. Despite this, the aliens have an influence on the program by changing the course of its program, while also affecting the actual ship by stranding them in space. If holodecks were able to be manufactured and become a real thing, external factors such as earthquakes or power outages would continue to be able to affect the holodecks performance and experience.

Holograms would allow people to easily escape from life, easily allowing them to go on trips overseas when travel bans could be imposed (such as currently with Covid19), instead of reading or watching content online about these countries. Holodecks could also help reduce mental health issues with how people could be able to relax and escape from their worries in holodecks. However mental health issues could also increase, due to how people may decide that life in the holodeck is better than real life and start to live more in a simulated life the real life.

The Threshold of Stress is also adjustable in the Holodecks, allowing the programs to be designed and run depending on the person's preference of stress, whether they want it to be easy or hard. However other elements such as other crew members who might be joining in the simulation can still adjust the threshold of stress by adapting how they play. This provides more advanced levels of the range of stress then books, films or games with how in games you are restricted to the levels that the game creator has chosen (usually easy, hard, extra hard, extreme) as seen in the below figure.

Figure 7. A Level Difficulty Selector Screen in an Xbox Game

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Figure 1

https://vignette.wikia.nocookie.net/memoryalpha/images/4/43/Voyager_holodeck.jpg/revision/latest?cb=20120425004714&path-prefix=en

Figure 2

https://vignette.wikia.nocookie.net/memoryalpha/images/0/0a/Fair_Haven.jpg/revision/latest/scale-to-width-down/340?cb=20100806195336&path-prefix=en

Figure 3

https://vignette.wikia.nocookie.net/memoryalpha/images/0/0a/Leonardo_da_vinci%27s_workshop.jpg/revision/latest/top-crop/width/220/height/220?cb=20161016182455&path-prefix=en

Figure 4

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.dailymail.co.uk%2Fhealth%2Farticle-6086893%2FA-real-life-surgeon-tries-VR-operation-horrific-consequences.html&psig=AOvVaw3sdpfw7m-Oq579X3OatxIj&ust=1588727891761000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCOiOx9_Gm-kCFQAAAAAdAAAAABAD

https://images.theconversation.com/files/162837/original/image-20170328-21254-1cddjy3.jpg?ixlib=rb-1.1.0&q=45&auto=format&w=496&fit=clip

Figure 5 & 6