MDo Safety

Research Report

What are the best practices to create an effective training environment in VR for MDO Safety?

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1. Summary

The goal of the research is to find out the best practices that should be used when designing a VR training application. The findings of the research will be used for the design and development of the VR training app for MDo Safety, which will be used for training their customers for handling emergency situations.
The study gathered qualitative data from an expert in the field of serious gaming, and from interviewing volunteers which were given an opportunity to play a selection of VR games and asked questions regarding their experiences in the VR environment.

Information received from the expert was used to generate questions and choose viable games for the user experience interviews. The interviews with the volunteers were used to verify the information provided, and to get into the details of different experiences in a VR environment.

The findings of this research showed the following:

- Graphics are only slightly important to the immersion of the player
- Simple and intuitive controls affect the immersion greatly
- Engagement was the main driver of immersion and, thus, creating an effective training environment
- Engagement caused players to continue playing and get better at reaching the objective in provided games
- “Trial-and-error” is effective for the purposes of training and engagement
- To increase engagement, it is viable to utilize scores and competition, but it is also viable to focus on creating entertaining gameplay that makes the player continue playing

2. Introduction

The main question of this research is:

What are the best practices to create an effective training environment in VR for MDO Safety?

The following sub-questions were created to answer the main question in greater detail:

- How to effectively utilize visual and audio aids?
- What are the minimal graphical requirements for creating an immersive experience?
- How should the user interact with the environment? How should the controls be handled?
- What additional features should the application have to create an immersive experience for the users?
- Is video with interactive choices sufficient for an immersive experience?

The research was proposed and carried out for MDo Safety by the development team of the training VR application that MDo Safety requested. The findings of this research will be used for the creation of a training VR application for MDo Safety, as it will provide insight into design, features and priorities of the application. The best practices, that will be discovered via this research, will be used in the creation of the application, which will ensure that it's an effective training environment for customers of MDo Safety.

The research was done in two parts: An interview with a professor of Serious Gaming of NHL Stenden from Leeuwarden, asking them relevant questions about creation of a serious game, and interview with 10 selected volunteers, in the same age range as expected customers of MDo Safety. Details about the research method can be found in the "Methodology" chapter of this report.

The interview with volunteers is necessary, as it allows us to prove in practice whether the professor's information is valid and gives us an opportunity to get a better understanding of users' experience with VR environments. These experiences will be accounted for when creating features for the VR training app for MDO Safety.

Theory

The concepts that are the basis of this research are listed below:

Virtual reality

A simulated experience that is projected to a user in such a manner that immerses them into the virtual world, making it appear as if the user is physically present.

Immersive

An experience that makes the user partially forget that it is artificial and simulated. It feels real to a certain degree.

Aid

A visual or audio signal which subtly informs the user in addition to the main information source. An example of a visual aid would be a white outline of a correct door after a user has been told “to open the door to the left”.

Best practices

A best practice is a method or technique that has been generally accepted as superior to any alternatives. In the scope of a serious VR game, best practices are those that ensure immersion for the user and utilize the capabilities of VR to maximize the effectiveness of the training.

3. Methodology

Interview with professor of Serious Gaming

The first part of the research was an interview with a professor of Serious Gaming from NHL Stenden Ivo Wenzler. As the professor was situated in Leeuwarden and we are situated in Emmen, the interview was held online via Teams.

This interview gathered qualitative data, information about the best practices and approaches when it comes to developing a serious game.

The professor was asked for permission to record the interview, then he was asked several questions related to VR Games, concerning topics of immersion, graphics, audio- and visual clues etc. With the recording, we made the transcription and built the questions for the second part of the research. The interview transcription can be found as a pdf titled “Serious Gaming Interview Transcription.”

Interviews of user experiences

User experience interviews gathered qualitative data about the experiences the participants had whilst playing one or more VR games from a provided selection. This allowed us to prove information gotten from Professor Ivo Wenzler and get into details about how users experience unique features in VR games, and the VR environment. This data is necessary for creating an immersive and effective training serious game for MDO Safety.

Participants

The participants are 10 selected volunteers in the age of potential MDO Safety customers, selected primarily on availability of volunteers near us.

Materials

- 5 VR games (“Rec Room”, “Spider-Man VR”, “Blade and Sorcery”, “Hotdogs, Horseshoes and Handgrenades”, “Half-Life: Alyx”)
- HTC Vive VR headset connected to a computer that can support it

Procedure

The participants were asked for consent, let to play at least one of 5 selected VR games for about 30 minutes, and then asked a series of questions about their experiences. The list of questions is as follows:

1. Did you feel immersed into the game?
2. Can you pinpoint what made you feel immersed into the game?
3. What did you think of the graphics? Were they important to your immersion?
4. How were the controls? How did they impact your experience?
5. Was the objective clear? Were you given enough information to know what you need to do?
6. How do you feel about the action cues provided? Was there too little, too many? How did that impact your experience? (If the game provides customization options for such, the participant will be asked to customize them and see how the game feels after)
7. Was the “trial-and-error” approach effective for your practice? Did it keep you engaged?

The transcriptions of all the individual interviews are available in a folder called “User experience interviews”.

Measuring instrument

Information gotten from the professor was put against information received from interviewing people about their experiences with different VR games. This eliminates possible biases or outdated information that the professor might have had.

Information gotten from both sources together allows us to draw conclusions about how to implement different features, and what kind of features to implement, into VR games and applications. We will know about how people experience VR and the different features of the games that were researched and will find out the best practices related to creating an effective training environment in VR.

4. Results

Interview with professor of Serious Gaming

From the interview the following information can be derived:

- Graphics are not important to the immersion
- Immersion is driven by engagement of the user
- For training purposes, simulating the real-life world as closely as possible is the best way to teach effectively, because that lets the user to relate their information to the real-world immediately
- “Trial-and-error” is an effective strategy for a training application
- Creating a sense of urgency and making it known that a good outcome is possible is the best way to induce engagement

Professor Ivo Wenzler also provided us with information on qualities of a good serious game, which is the following:

There are 4 key factors that make a serious game a seriously good game:

- Foundation
- Structure
- Action
- Outcome

Foundation

The game must have an idea or a principle that acts like an underlying base or support upon the entirety of the game. The foundation consists of 9 essential elements:

- Purposeful: complete clarity on the what and the why
- Relevant: solving real problems for real people
- Ethical: no manipulation and exploitation of players
- Mindful: considering broader consequences
- Honest: making promises it can always keep
- Thorough: designed and crafted down to the last detail
- Cohesive: clarity on how pieces relate to each other
- Aesthetical: quickly fascinates and appeals to senses
- Unique: offering experience nowhere else

Structure

When designing the rules and mechanics of gameplay everything needs to be considered and information needs to be passed on to programmers on how various parts interact and how the overall flow of the game happens. There are 9 key criteria when making the structure of the game:

- Understandable: easy to comprehend how the game works
- Believable: ensuring suspension of disbelief
- Playable: easy to use and it works as intended
- Intuitive: explaining itself on how to be played
- Focused: ensuring simplicity and attention density
- Constrained: restrictions that will bread creativity
- Flexible: diverse ways to accomplish each goal

- Interactive: stimulating players to react to one another
- Reactive: providing immediate, useful rewards

Action

Action is how the game is doing, the process of the game which produces the desired outcome.

- Motivating: making players want to engage in a game
- Compelling: immersion through intriguing narratives
- Surprising: dynamics that cannot be predicted
- Challenging: challenges leading to new challenges
- Captivating: catching attention, keeping suspension
- Engaging: steady pace of interesting events
- Hopeful: keeping tension to the last move
- Enjoyable: personal gratification and fun to play
- Memorable: unforgettable story and experiences

Outcome

An outcome is a result that happens because of playing the game. How the outcome of the game will be is completely depends on how the developers want it to be.

- Runnable: easy to set up and facilitate
- Multifaceted: allowing various outcomes
- Unobtrusive: leaving room for user self-expression
- Insightful: sufficient input for decisions to be made
- Valuable: effective in meeting all the objectives
- Credible: proven success with reliable testimonials
- Actionable: results are translatable to reality
- Scalable: replicability in multiple contexts
- Sustainable: long-term usability and impact

User experience interviews

Due to time constraints and difficulties with getting the VR headset to conduct the interviews on time, we were only able to get user experiences of 7 volunteers. This impacts the results since the sample size is smaller and, thus, less reliable, but the results show that most opinions were similar. However, this does mean that outliers are less likely to appear, which may be important to consider when creating the training app for MDo Safety.

Most of the 7 participants were students from the second year of the IT course in Emmen.

Results of the user experience interviews show the following:

- Despite the differences in the sampled games, all participants were immersed into the VR games
- Graphics did contribute to the immersion for some of the participants, although the effect of the immersion is minimal. If the necessary information is conveyed, and the graphics do not look unpleasant, the graphical aspect is completed for immersion's sake
- Simple and intuitive controls made for a seamless experience which allowed the user to keep being immersed into the game, without it being broken by "misbehaving" controls
- Simple visual indicators which told the bare minimum required information, without clutter, also contributed to a seamless, immersive experience

- The “trial-and-error” approach was effective in teaching the participants in how to play the game, after being given a brief explanation of the controls, and made for a more fun and engaging experience, which made the player want to keep get better. Scores and competition are not the only options for gamifying training.

5. Conclusion and discussion

Conclusion

With the results gotten from contacting an expert in the field and interviewing participants for their experiences when play VR games, we can answer the central research question: “What are the best practices to create an effective training environment in VR for MDO Safety?”

The information from the expert correlate directly to the central question, as the answers directly correlate to the best practices that are required to create an effective training application for MDO Safety. User experiences from the participants allowed us to check whether the information was valid in practice and get more detailed information about the individual aspects of creating an immersive and effective training application.

Using the results, we can give these answers to the central question:

- To not take away from the immersion, the graphics should not be low quality. Stylized and not realistic graphics are fine if they are aesthetically pleasing to a degree
- The controls should be simple, to keep them intuitive and seamless with the VR environment
- Audio- and visual clues should be kept to the necessary minimum, not cluttering the user with information and visuals and mimicking reality as much as possible
- “Trial-and-error” is an effective approach which keeps the user engaged and, thus, immersed
- Engagement is the driver of immersion, so the game should be made with entertainment in mind
- Engagement can be both achieved with scores, to drive the player to get better, and with simply fun gameplay, that keeps the player wanting more.

Discussion

Contacting an expert in the field and verifying this information via user experience interviews is an effective strategy for researching this topic. The contact with the expert set the research in motion and led it towards certain points, which later were explored and verified in practice, by allowing people to try out various aspects of VR and explain their experience.

The method of getting detailed user experiences is also effective in eliminating potential biases or incorrect facts that may have been provided by the expert. If the opinion of the majority differed from the experts, it would be clear that it was not correct, as serious games are focused on the players that play them, not those who create them. Thus, this study has good validity.

Due to little number of participants, the study loses reliability, as it is possible that a lot of potential, differentiating results were not considered, and it is also possible that the small sample size with primary IT oriented people produced data which differs from most of the population.

In a follow up study, a bigger sample size with people of more ages from diverse backgrounds is recommended to increase reliability, as it would more realistically reflect most of the population and would produce information that may have not been discovered by the small sample size of this study.

6. Bibliography

No external information sources were used for this research

7. Appendix

The folder with all the transcriptions can be found via the following link: https://newuniversity.sharepoint.com/sites/Group-2021-2022Project5.1-5.2INT-IT2A-VR_ARApp/Shared%20Documents/IT2A%20-%20VR_AR%20App/Research%20reports/Chris%20and%20Sasha%20report%20pdfs