Is Seeing Believing?
A Study in Virtual Realities,
Immersion and Game Design

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Abstrakt


Nyckelord: Virtuell Verklighet (VR*), Game Design, Immersion, Flow, Mindfulness
Abstract

Virtual reality has as a new mediaform dramatically changed how we look at interactive digital experiences. With this there is also a subsequent change in how we look at designing these experiences. Can we use our already established methods and design principles to create content for this new mediaform? This paper aims to explore if our more classical design principles and methods of designing digital experiences is applicable to the virtual reality. Along with this i will also create a better understanding of what defines immersion in digital mediums and virtual realities as well as how we can deconstruct the term “immersion”. All of this is then used in conjunction with the creation of a VR* game and the design method “Zen Game Design (2007)” to give a better picture of how a complete design method and process could look like for VR* games.

Keywords: Virtual Reality (VR*), Game Design, Immersion, Flow, Mindfulness

Words and terminology marked with * will have definitions in the Dictionary Chapter
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Background

Due to VR* technology just recently reaching the consumer and developer level, the platform is still in a state of largely undiscovered domains. This is both regarding the technology itself as well as the body of knowledge encompassing VR* design methods, philosophies and principles. Being able to contribute even in some small part to this growing body of knowledge is one of the driving goals behind this paper. But what exactly does designing for VR* experiences entail for us as developers and designers and should we apply our more classical design methods to this new medium and if so, how? The VR* space enables such different modes of play and experiences compared to previous ways of virtual interaction. The general theme for this paper will revolve around seeing if our more common and generally accepted design practices and methods are applicable unto this new platform. It is entirely possible that many core concepts such as usability, immersion and game feel may take on entirely new meanings when applied to the virtual reality experience. An early example of this which built the basis for this paper was the concept of immersion, more specifically how important is the immersion factor for virtual experience and how does one maintain those levels of immersion. This in a media form where direct sensory disruptions and links to reality can mean a total disconnect in gameplay, unless this is specifically focused on as a core design principle early in development.

Research Questions

*How do our current design methods and practices apply when designing for a new form of interactive media.*

*How do we design around higher immersion possibilities?*

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Aim

The purpose of this paper is to contribute to the growing discipline of design within VR* games and experiences through investigating immersion, game feel and flow states for VR* and how these things can either contribute or detract from the player experience.

Alternatively, this could prove designs around more mindful play to be a better approach thus proposing designing for limited immersion and more detached experiences. Due to VR* still being a medium in the progress of development, it still has several problems related to human biological perception and our senses that need to be solved until it can reach its full potential.

This could as previously stated lead to a more mindfulness focused design philosophy built around the player knowing they are in a virtual reality and building around this fact, at least until such a time as the medium supports closer levels of or nearing full immersion.

To assist in the research and to ascertain the validity of proposed methods and ideas, the development of this paper will run parallel to the development of a virtual reality project. The project at hand is a narrative driven virtual reality experience named Norn which will be detailed further at a later stage of this paper.

Previous and Current Research

In this chapter I will attempt to explain some of the concepts, ideas and sources used during the development of this paper as well as the production of the VR experience Norn.

To get a better understanding of how immersion, flow states and virtual reality affect each other as well as possible design practices surrounding them, a larger and more generally applicable body of knowledge is needed. To build this body a, deep dive into earlier works surrounding these subjects is required. This both in regards to general game design as well as definitions made in broader terms. This includes Immersion and its different components, user friendly mechanics and game design, narrative structures and flow states.

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Adding on to this is also the technical aspect and limitations of the medium and what is considered user friendly designs, as to not cause discomfort for the user.

**Immersion**

Immersion is a tricky subject to discuss as it encompasses so much and is defined in such broad terms. Therefore, a definition is needed that is built on design methods for earlier forms of media such as films/books/experiences and of course games, as well as considering the new ways of interacting and reacting to the VR* experience. As a starting point, we will break down the several different components/types of immersion as proposed by Staffan Björk & Jussi Holopainen (Patterns In Game Design, 2004) into the following.

- Spatial Immersion
- Emotional Immersion
- Cognitive Immersion
- Sensory-Motoric Immersion

**Spatial Immersion**

“*Spatial Immersion occurs when the simulated world is perpetually convincing. The player feels as if he or she is really “there” and that the simulated world looks and/or feels “real”*”.  
(Björk & Holopainen, 2004)

“*Spatial Immersion as such is the result of extensive maneuvering in the game world in real-time games and can even be occasionally felt in movies as well.*”  
(Björk & Holopainen, 2004)

As far as i can tell, this tends to be the focus of design attention for many VR* experiences and for good reason. The VR* experience offers a new way to exist in the virtual world as a spatial presence, hopefully being afforded by the designer the means to enact agency unto the virtual world. This new way of interacting and reacting combined with the visual encapsulation of the HMD* helps to remedy one of the largest factors of immersion disconnects, namely the visual connection to the real-world space. Adding on to this there is

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the room scale tracking offered by devices such as the HTC Vive Stations* which enable the
player to walk around the virtual world to a certain extent.

There does however exist several common factors of disconnects following spatial
immersion. Most of these are technical factors of either the performance or the game world
such as reconfigurable game worlds, invisible walls and breaks to the game worlds consistent
reality logic. One of the major technical design aspects of VR* is maintaining a constant
frame rate with a minimum of 60 fps (preferences tend to be higher around the 90 frames per
second area), any lower then this will cause the player to feel discomfort and/or sickness.
The mode of transportation/locomotion is another key point as the player may have to
navigate the game world, and if so preferably in a way that feels natural and fitting to the
world’s reality logic. Teleportation tends to be a main mode of locomotion for many VR*
experiences but these seldom focus on the immersion factor and more on the experience of
playing with a toy. Other means of locomotion in VR* are being designed and tested as of
this date but there has yet to be a conclusion of the use all / end all of method designed for
every and all VR* experiences. More than likely, this should be designed specifically for the
project at hand and in such a way that it feels natural and logical in the world the player will
inhabit.

Emotional Immersion

“Emotional Immersion is obtained by responding to the events that Characters are part of
during the unfolding of a narrative structure and is like the immersion that books, theater or
movies provide”(Björk & Holopainen, 2004)

As of yet there has been a lack of VR* experiences which focus on a narrative experience
while still offering the player any form of agency in the game world. Previous narrative
experiences have largely been experiences more heavily likened to that of a 360 degree point

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of view Movie more than interactive experiences. Since there is a plethora of information already existing in the field of narrative experiences the next goal will be to find a way to utilise the factors that make the VR* experience unique and how it can be used to enhance a narrative structure.

Common pitfalls for narrative game design can be such things as the player's avatar not portraying the emotions the player expects them to.

Cognitive Immersion

“Cognitive Immersion is based upon the focus on abstract reasoning and is usually achieved by complex problem solving.” (Björk & Holopainen, 2004)

As stated by “Björk & Holopainen” cognitive immersion is based on challenging the players mind and reasoning and presenting a challenge.

Sensory-Motoric Immersion

“Sensory-Motoric Immersion is the result of feedback loops between repetitious movements players make to perform the actions in the game and the sensory output of the game.” (Björk & Holopainen, 2004)

Sensory-Motoric immersion is such defined as a feedback loop* of the player performing inputs which produce sensory output from the game which the player then once again reacts to via inputs. This also means that when the player performs an action in game, the visual and auditory response that ensues has to fall in line with what the player would expect from that action. If the sensory response deviates to far from expectations it could cause a disconnect in immersion. This state is also best maintained if the gameplay is adequately challenging for the player.

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Returning once again to “Björk & Holopainen” they offer up a valuable point about the connection between the sensory-motoric feedback loop* and immersion in the following definition.

“Immersion is not the cause of game mastery but can often be found in those that possess game mastery and is often sought by players. However, once the immersion gained in gameplay has been achieved, it can be easily lost.”(Björk & Holopainen, 2004)

One of the key points for ensuring and maintaining sensory-motoric immersion is allowing the player to feel challenged as play continues, if the experience ends up to lenient or monotonous then the player will quickly grow bored and will lose interest. If the scale of difficulty turns the other way however, then the player will feel frustrated and thus will shift their focus away from gameplay.

**General Technical / Gameplay disconnects**

The most common causes for immersion disconnects are so called “disruption of focused attention” events, these events may take the form of meta game activities such as “Book-keeping tokens” and performing “Save-Load Cycles”, presentation of extra-game information (Health bars, status indicators ie. the UI/Hud implementation), failure to consistently follow the games reality logic and forcing downtime upon the player.

**Flow States**

Once the player is immersed in the game and the difficulty is suitably challenging, players may experience the next step of game immersion, namely flow. For a definition of flow and flow states we look to Wendy Despain (100 principles of game design, 2012) which describes it as the following:

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“Flow is the idea that at the apex of intrinsic motivation, the mind transcends its physical
perception and enters a state of performance ecstasy. It is achieved when the individual’s
skills are perfectly in tune with the task or challenge at hand”
(100 principles of game design 2012)

“Flow is characterized by enjoying the process of the activity, being fully involved, and being
immersed in a feeling of energized focus.”(100 principles of game design 2012)

From this we gain the understanding that as previously stated the difficulty of the experience
needs to be finely tuned as well as the player having the motivation to want to perform the
activity itself. These are necessities for achieving and maintaining a flow state, but what
characterises the actual flow state and what does it entail for the person experiencing it? For
this we once again return to 100 principles of game design as well as (Csikszentmihalyi,
1990; Nakamura & Csikszentmihalyi, 2009). Using these previous works we can define flow
as to contain and require the following components.

● Immersion (requirement)
  Immersion helps motivate the player to perform and improve at the activity.

● Interest Curve (Method of design, tied to immersion)
  Designing the experience along an interest curve ensure that the player is constantly
  being fed new events, information and experiences often enough to stay invested but
  also leaving time in between for the player to digest what has happened as well as
  having time to act by themselves and feel like they are the ones in control.

● Challenge (requirement)
  Ensures that the activity does not become monotonous.

● Learning Curve (Method of design, tied to challenge)
  A well designed learning curve of introductory levels and tutorials keeps the player
  invested enough to progress and learn while preparing the player to achieve flow at a
  later stage of the game where the difficulty ramps up.

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- **Aesthetics & Narrative**
  The graphical and narrative portions of an experience help cover up for mechanical leniency or boredom at introductory parts of the game and keep the player invested for longer periods of time.

- **Time Dilation (byproduct)**
  Due to the level of focus needed to enter a flow state time will seemingly dilate and become irrelevant, as the activity consumes all of the player’s attention.

Now that we have a general idea of the concept of immersion as well as which aspects we can focus on during the design process to enhance immersion in its different forms, we can move on how we apply this during the design and production process.

**Methods**

Now that we have a fundamental understanding of the core principles of VR* based immersion we can begin implementing these ideas and design methods into an actual project. In parallel with researching immersion and design principles for VR*, a project has been in development to both make use of and determine the validity of mentioned design methods and ideas. This project has taken the shape of a narrative driven VR* experience under the project name of “Norn”, with the intent to identify if we could create a narrative environment in which the player feels comfortable appearing as another character in a role playing scenario. This was also a good fit for my own research for this paper, as i expected a huge part of making a player feel comfortable in both VR* in general as well as role playing would come down to immersion.

This was done in conjunction with 6 other design students of different disciplines to research (among other things) general VR* design methods, the possibility of empathic relationships in Virtual Experiences, how to design around the ideas of constant immersion and general practices off working with this new technology/medium.

When development started for Norn there was no one set design method to be used, instead the design process took a turn towards a way of thinking based on Zen Game Design (2007).

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
Zen Game Design (2007) proposes that there is no end all method to be used for any specific project. Instead the needs and obstacles dictate the course of development and the method itself is iterated upon until a custom amalgamation of methods is created specifically for that project. This can be seen in the two principal tenets of Zen Game Design (2007) which state the following.

1. There is no single method to design
2. Game design reflects needs

Besides this there is also an implied “zeroth” tenet.

○ There are methods to game design

This may seem redundant to some but it refers to the design process being an intrinsic part of game development and the fact that some may not be able to see the distinction between a person programming a game and someone designing it.

Zen Game Design (2007)

Among the different design examples brought up by Zen Game Design (2007) the choice was made to adopt and combine 4 common methods that we felt had an immediate connection to the project.

- First principles
- Expressing Technology
- Story-Driven Design
- The Frankenstein approach

Following this section i will briefly describe the different methods as well as their how and why of application, following that will be a section explaining how they were related to the development of Norn.

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First Principles

First principles is a method of design in which the first step is determining the objective of the game and then abstracting the game world. Once the objective and abstraction is set you proceed to design and then implementation.

Expressing Technology

Expressing Technology is more based on the technology you want to showcase or build your project on and simply dictates that the game is designed around the software/hardware you want to express.

Story-Driven Design

Story-driven design as it sounds focuses more on the narrative part of the game and as such proposes that you identify both the game goal and narrative goal first. Only once both have been identified do you move on to abstract the gameworld and finally develop both the narrative and the game design in tandem.

The Frankenstein Approach

The frankenstein Approach describes the situation where a first draft of design is scrapped partway into production and a new project takes its place that is built upon the first one. Mostly this is used to rescue a project which is having problems but can also be applied to projects which switch focus partway through and/or brings in new designers to form a new design plan.
Methods in Practice

In this chapter I will go into further detail about the project in which the methods and design practices were used as well as how they were applied to our design and production process.

Introduction to Norn

The idea behind the current design iteration of Norn was to create a narrative driven experience in which the player takes on the role of a predefined main character in a fantasy setting based on nordic mythology. The player assumes the role of main character Thora, one of two young sisters and will play through a day in their lives of living in their forest camp. The game is based around interacting with the other sister Eira as well as experiencing what a day in their lives would be like, in the hopes that the player will feel comfortable assuming Thora’s role and creating an emotional interest in Eira. The actual gameplay factor of the experience is based around different “event nodes” around the map in which the player can perform activities based on the context of the environment. One example could be heading to the smithy/forge area and crafting a piece of jewelry for Eira. Some of the events are built around interaction between the player and the sister, others let the player take their time and explore activities in their own pace.

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First Principles in practice

One of the core pillars of Norn’s design was the attempt at bringing forth emotions and empathy from the player towards an NPC, thus this was early on set as the goal of the game and brought on abstractions and design focuses aimed at enabling this sense of role playing. With the focus of evoking empathy in the player it was decided that the player character and the NPC would be related to each other. The brunt of the gameplay was decided to be focused on the player spending a day with the npc as to allow time for exposition regarding the characters and their situation as well as allowing for the player to get invested in the world. The whole experience would culminate in the sister being threatened / taken away in some form, hopefully bringing forth a sense of worry in the player.

Expressing Technology in practice

“The best VR* experiences that we’re going to see aren’t going to be adaptations of existing media forms. They’re going to be experiences that really understand the strengths and weaknesses of VR*, and are going to be built from the ground up.” (Rob Jagnow - Google - Lessons learned from VR* prototyping)

This felt like a perfect fit for a virtual reality experience as the technology is constantly the center focus of the experience. Not only are we designing around VR* as a platform and are thus faced with new obstacles to overcome because of it, we are also deriving something from the technology. We do this in the hopes that it will enhance the experience in such a way that would not have been possible on earlier platforms. Designing for, and expressing the technology of VR* is part building the gameplay around the players new perspective, but also making sure that the interactions and mechanics feel natural with the limited button layout of the selected motion controllers. This resulted in most of the mechanical interactions being

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based on the player picking up different objects and letting the context between the held object and the object it’s used on define the results. A perfect example of this would be archery range in Norn which allows players to practice firing a bow in VR*. To make this experience as interactive as possible we attached a quiver to the players back which they can reach over their shoulder and retrieve arrows from. This motion feels natural for the player and grants a deeper level of both spatial and sensory-motoric immersion.

Locomotion is as previously stated another big part of virtual experiences that needs to be tailored to the project at hand. Some games tend to focus on the player being either partially or fully stationary (standing/sitting or just enabling room space* tracking) but if your game offers a large area to explore then the player probably needs to be able to traverse it. Locomotion is tricky as it often leaves the player feeling ill if handled carelessly, and can in certain ways also be tiring for the player if intended for longer sessions of play. At this point we had already decided that the gameplay would be based on several area “nodes” which would be self contained play spaces*, so teleportation seemed like a good fit. Teleportation itself is one of the more well used modes of traversal in VR* experiences and works well for most users as they themselves can control when they teleport and anticipate the change of location. In the case of Norn the player can point towards different areas to see if they are accessible or not. If an area is accessible then an translucent glowing orb will form around the area as well as a glowing sign or runestone in the vicinity will confirm that they can travel to it. Once the player confirms a teleportation the screen will fade to black to hide the instantaneous shift in location and also play sounds of walking based on the ground they teleport to before fading back in.

The expressing of technology is however not just bound to mechanical design decisions, as the technology played a large part in the narrative design as well. Since the experience was being designed around the player assuming the role of one of the two sisters, we wanted to help the player feel more comfortable assuming her role. To do this we decided to experiment with giving the player a full virtual body which would move in accordance with the player in real time. This was done via the Ikinema run-time plugin for Unreal engine 4 and gave us the ability to have a virtual body which moves in accordance to the HMD and motion controllers.

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
Story-Driven Design in practice:

Due to the narrative focus of the experience, the narrative needs to be a constant part of the design process. Anything added or removed from the experience needs to be done with the narrative structure in mind so as to enhance the gameplay as much as possible, as opposed to causing narrative hindrances or immersion breaks. As in the example of the ikinema plugin above, these things were added with the narrative in mind and to enhance the gameplay by aiding the player in assuming the role of Thora. In doing so we were hoping that when the player did assume Thora’s role they would feel a greater connection to the world and that they belong in it (thus a greater spatial immersion) as well as finding it easier to connect to both Eira as a character and the narrative (a deeper emotional immersion).

The Frankenstein Approach in practice

This is partway applicable to this project as the team had been experimenting with gameplay in virtual reality before I was brought along for the current project. Parts of these previous games were then adopted into Norn. Examples of this would be the archery event where the player can practice archery along with the main character’s sister. This helped with fleshing out the game (and aesthetics) while not being to costly in terms of development time.

Hopefully this chapter will have presented a clear idea of how our design and production process was handled, as well as giving some insight into how a dynamic multifaceted design method can be created and utilized.

Conclusions and Discussion

The following chapter will be focused on discussions around the project, about design for and around immersion and our experiences and results exorcised from playtesting and public reaction from Norn.

Words and terminology marked with * will have definitions in the Dictionary Chapter
Immersion Revisited

Going into this we knew what different types of immersion the project was to focus on and which of them we thought to be most important to the experience, namely spatial / sensory-motoric and emotional.

Spatial Immersion Revisited

Designing for spatial immersion proved to be straightforward in certain ways, as most reasons for immersion disconnects become apparent while developing the prototype of the project. These reasons usually boiled down to such things as unexpected physics behavior in the world, general technical bugs and framerate optimizations. The latter proved to be one of the more challenging aspects due to the fact that rendering large spaces in VR* is expensive performance wise. This becomes even more of an issue when considering Norm was developed on a high-end computer and the minimum consumer specifications to be able to run VR* are much lower than what was used during development. Most virtual experiences tend to either keep their areas small or use large scale props to enable large uses of occlusion culling* for this, but in our case the play area is very large and open which made optimisation challenging.

If these things were ironed out to behave correctly then the remaining design decisions revolved around making sure that the player had a consistent understanding of how the game world’s logic works (physics, objects, actors, mechanics) and adhering to this understanding. This included the visual design of the world as well, as we tried to design it and the objects and inhabitants to resemble something the player could relate to as well as seem like they fit the world they existed in. An example of this would be the design of a tool that creates fire. By our standard this would resemble something like a torch or a lighter, but seeing as the game world is abstracted to resemble ours but with a nordic/fantasy setting where magic exists, we decided to model it in a way that would fit. The end result was an object resembling a torch but with a triggering mechanism and magical runes attached. Most test

Words and terminology marked with * will have definitions in the Dictionary Chapter
players could immediately identify it as something that would create either light or fire while it still made sense in the context of the world.

Sensory-Motoric Immersion Revisited

Sensory-Motoric Immersion turned out to be one of the harder immersion types to design for in the case Norn. The game has a narrative and free roaming focus with gameplay that leans more towards exploration and discovery then challenging the player. As earlier stated by Björk & Holopainen(2004), sensory-motoric immersion is based on two major factors

- What the player does as well as the auditory and visual feedback they receive when performing an action.
- Making sure the player is engaged / challenged enough to want to continue.

The first point once again enters the territory of making sure physics and similar effects are working correctly for player interactions, but also adds the auditory aspects. Making sure that interactions responded with fitting sound effects was crucial for the not only the immersion, but the experience as a whole.

Besides these two points there is also an additional method of presenting the player with feedback, this presents itself in the form of haptics. Haptics (alternatively known as kinesthetic communication) recreates a sense of touch by applying forces or vibrations to an object. Most modern gaming controllers have built in haptic functionality and has in the past been used in a variety of ways to enhance gameplay. However haptic technology and usage took a massive leap when motion controllers started being introduced in the industry as it gave a clear cut way to present some form of force feedback to the player when performing activities. As it currently stands the most readily available form of haptic feedback is basic vibrations, which can be used to signal resistance or simulate weight or touch, but more advanced haptic technologies are constantly being developed to more accurately depict these sensations.

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As for the second point, we did consider this at length in the form of how much we needed to guide the player in the form of context for wieldable objects in each “Event node”. The forge area is a prime example of this, as we wanted to give the player as much leeway and means to express themselves as possible when forging a piece of jewelry for Eira to wear. To do this we kept the visual cues and hints to a minimum and tried to reach a threshold where the player could puzzle together the forging process by themselves.

Emotional Immersion Revisited

Designing for emotional immersion was one of the main focus areas during the production of Norn, as the game places a heavy emphasis on the characters, setting and narrative. We did not however find any notable differences in designing for VR* in this specific area that would differentiate it from other interactive media forms. There was however a very strong connection between the spatial and emotional immersion, as it was hard to build an interest in a character or world if the player isn’t immersed in the experience. This essentially boiled down to the same points previously discussed in regards to spatial immersion (game world logic, spatial cohesiveness) as well as more classical narrative goals such as making the characters and dialogue feel believable and relatable.

Cognitive Immersion Revisited

Cognitive immersion was a more tricky subject to tackle as the game didn’t have any inherent puzzles or riddles to solve. We did however notice that for many users this took the form of merely learning to act in the virtual world as well as interacting with objects (both by themselves and in context with other objects), this brought forth a form of cognitive stimulation we hadn’t considered. This was especially noticeable with people new to virtual experiences.

Words and terminology marked with * will have definitions in the Dictionary Chapter
Accessible Gameplay Design

One point of ongoing design discussion during the project was how to design mechanics and interaction that felt natural to perform. This meant designing all the motions we wanted the player to perform to not be taxing for the player as well as not being a problem during extended play sessions. General noteworthy points for designing virtual reality mechanics around this would be as follows.

- Comfortable Interactions.
- Design around your HMD*

Keep interactions in a comfortable space

Attempt to keep arm movement and interactions located around and above the player's waist and avoid having the player bend and move in ways that can cause stress on their body. This is even more important if the experience has a long playtime, if nothing else at least give the player downtime between the more intense sections.

In the case of Norn the tempo of the game was relatively low and we let the player dictate the pace more often than not. We did however implement a system where dropped or thrown objects would return to a default position as to alleviate having to bend down to pick up dropped objects, as well as remedy that fact that players could throw objects into unreachable locations.

Design around the HMD

Each HMD* has a default focal length at which visual conditions will be at their peak. This can be fine-tuned to fit individual players, but there will always be a default preference which

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
is worth taking note of and having in mind while designing interactions and the distance they will be performed from.

Accessible level design

Level design turned out to be an even bigger part of the design process of virtual experiences than we had originally anticipated. We were well aware of the importance and difficulties surrounding general level design but during the prototyping we ran into several new problems we hadn’t anticipated such as

- Psychologically safe locomotion
- Designing for the physical space
- World and player scaling

Psychologically safe locomotion

Due to having designed the project around teleportation as a mode of locomotion, we had to make sure that a player could immediately identify their location once the teleportation had finished. An example of an unsafe location would be the player suddenly appearing close to or inside a monochrome wall. Such an event would cause an abrupt disconnect as the player tries to orient themselves and would not only be bad for the immersiveness of the experience but could even cause discomfort for the user. One solution to this is making sure the player always teleports to open spaces, making sure to have some form of noise texture* on your objects and/or having several constants in the environment to orient by.

Designing for physical spaces

While the player is experiencing a virtual world, they are still acting in the physical one. This fact means that all of the playable areas need to oriented and designed around the player’s

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
physical space. Objects placed in the world and their uses need to be confined within the playspace and shifts in a player’s location and rotation need to be accounted for. If a player is standing in the corner of their playspace and then teleports to another one, if their rotation and location is not accounted for they could possibly be offset from their own center position and/or be located inside objects.

World and player scaling

Scale is another factor which can enhance the experience if used correctly, but be detrimental if not designed around. People have a sense of scale and proportions just from existing, as such entering a virtual world were such things don’t align can be very disconcerting and another factor of immersion disconnects. A good praxis when designing a virtual experience would be to scale the player character (or alternatively the world around them) at the start of the experience and only manipulate this for carefully designed moments or gameplay sections, this as scale can be a valuable tool to enhance feelings such as making the player slightly smaller to emphasize the feel of towering adversary.

Closing thoughts

In conclusion i found that our more practiced way of thinking when designing a game was only partway applicable to the VR* experience. The new modes of play enabled by this technology require so many of the commonplace design practices used today to be viewed through a new perspective, and thus be designed for a new form of playable experience.

Using the methodology of Zen Game Design (2007) enabled us to have several different ways to view and interact with the design process of Norn, while constantly having a cohesive idea of where the project was headed. Out of the 4 outlined design methods from Zen Game Design (2007) i believe that the expression of technology played the biggest part, as the technology is and should be front and center at this point in time. However if that had been our only perspective of this i believe only the spatial immersion would have been

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
present and we would have failed to immerse the player in the other areas. Instead we applied the method best suited for the area of Norn we were developing at the time, while constantly keeping the other perspectives in mind. This way of designing ultimately lead to Norn successfully giving the players the experience we had aspired towards from the start with them suspending their disbelief and existing in the virtual world, even if just for a short while. Players were immersed in the world and gameplay in short bursts during each of the activity nodes, in between these moments however they seemed to snap back into a state of mindful play where they realised they were playing a game. This however seemed to work fine as long as the transition between immersion and mindfulness was handled smoothly and the players weren’t shocked back into reality.

Conclusion

I believe this is where we stand at this moment in virtual reality. Designing around a person being fully immersed in a virtual world for long periods of time is extremely challenging, especially in the current state of VR* technology. Instead we as designers should focus on presenting this fully immersive, believable experience in short bursts, giving the player downtime in between to process and then immerse themselves when they themselves choose it.

To summarise i will return to the original research questions at hand and try my best to answer them with the newly acquired information.

*How do our current design methods and practices apply when designing for a new form of interactive media?*

In short they both do and don’t. They work as a basis for the design process but VR in itself is so centered on the technology used to represent it as well as the new modes of play brought forth by it, so much so that we need to form our methods based on the project and technology at hand and design with it constantly in mind.

Words and terminology marked with * will have definitions in the Dictionary Chapter
How do we design around higher immersion possibilities?

As previously stated, I believe that achieving fully immersive experiences at this time and with the technology at hand is extremely challenging, especially for longer periods of time. We can however work and evolve the field of knowledge surrounding VR so that when the technology is there to support fully immersive experiences, we will be ready to design for it.
List of References


Game Developer Conference [GDC]. (2017, 6 February). *Lessons Learned from VR Prototyping* [video file]. Collected from https://www.youtube.com/watch?v=G295PAPzZX8


*Words and terminology marked with * will have definitions in the Dictionary Chapter*
Dictionary

- **HMD**
  Head Mounted Display - The display used for Virtual reality devices such as oculus and HTC Vive containing the screen and motion trackers.

- **VR**
  Virtual Reality - The digital world used to experience VR Games and Experiences

- **Feedback Loop / Gameplay Loop**
  The Loop formed from players inputting commands into a system then receiving visual/auditory feedback which they then input new commands based upon.

- **Noise Texture**
  A Pattern added to textures as to give a sense of natural randomisation to objects. Can be used to make monotone textures seem more detailed or hide procedural tiling of textures.

- **Room Space**
  The area in the physical world the player is occupying and playing in.

- **Play Space**
  The area in the virtual world that the player is currently located in.

- **HTC Vive**
  One of several consumer ready Virtual reality devices. The HTC vive comes with 2 motion controllers, 2 base stations used for tracking the player’s position in the real world as well as a HMD* equipped with motion sensors.

- **Occlusion Culling**
  An optimisation technique where only the things the player sees are being rendered in which only the objects in line of sight of the player are being rendered at the current time.

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
Technical Specifications

- Unreal Engine 4
  - The game engine used to develop Norn, we used the blueprint visual scripting method as opposed to writing C++ code.
  - The built in material editor in Unreal Engine 4
  - The build in animation editor in Unreal Engine 4
  - The built in particle editor in Unreal Engine 4

- HTC Vive
  - The current generation VR headset used to design, build and prototype Norn.

- Maya
  - Used to create Static meshes for objects and characters as well as UV maps for texturing.

- FMOD
  - Unreal Engine plugin for implementing and mixing audio files in engine.

- Substance Painter/Designer
  - Used to create different textures and texture maps for ingame objects and characters

- Motion Builder
  - Create and edit animations for in game models.

*Words and terminology marked with * will have definitions in the Dictionary Chapter*
• Ikinema
  ○ A plugin used for Unreal Engine that allowed us to create dynamic IK-rigs and animations for characters. This was used to create animations and motion capture for Eira’s animation, as well as allowed us to have a full body rig for the player in game.