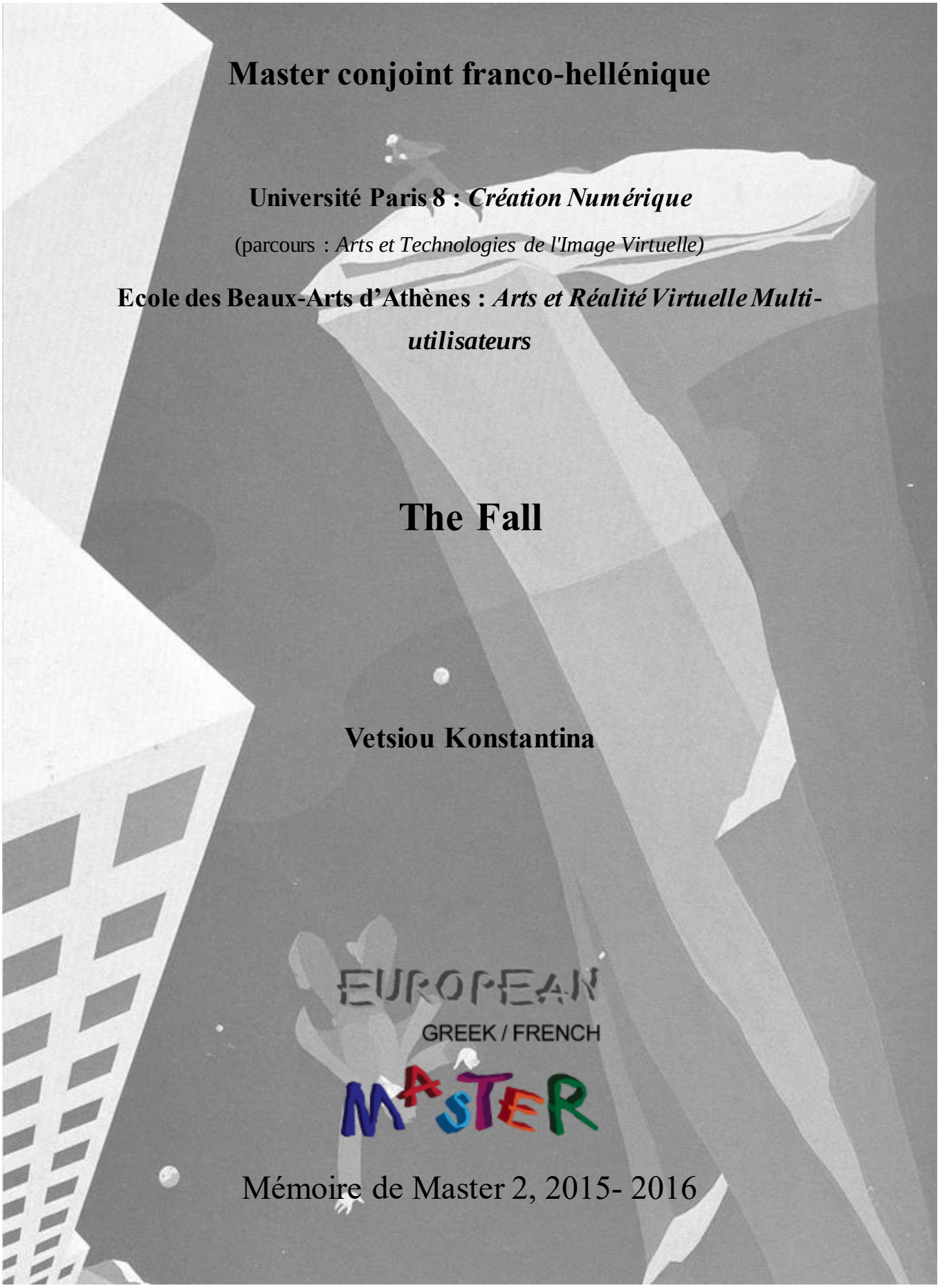

Master conjoint franco-hellénique

Université Paris 8 : ***Création Numérique***

(parcours : *Arts et Technologies de l'Image Virtuelle)*

Ecole des Beaux-Arts d'Athènes : ***Arts et Réalité Virtuelle Multi-utilisateurs***

The Fall

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EUROPEAN

GREEK / FRENCH

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Contents

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Abstract

The current thesis is an immersive virtual reality experience that illustrates different aspects of acrophobia. The project is called “The Fall” as it attempts to place the user in a position to empathize with a person that has such a phobia by providing some challenges that concern such a specific phobia.

The research that has been done parallel to the creation of the project regards the origins of fear and phobias, the anxiety disorders and the emergence of specific phobias, the virtual reality applications in clinical psychology and psychotherapy, the treatment of phobias through virtual reality, as well as the representation of fear in art and the principles of immersion and sense of presence in virtual environments. The research focuses especially on the aesthetic principles by creating such a virtual reality application as well as the technical elements in order to produce such an experience.

Keywords: Virtual Reality, specific phobias, exposure in vivo, VRET, acrophobia

Résumé

L'objectif principal de cette recherche s’articule autour de la création d’une expérience empirique et artistique sur la peur des hauteurs. Ce projet est appelé "La Chute" et sera un parcours dans un environnement de réalité virtuelle où certains aspects de la peur des hauteurs seront visualisés et le but principal est de provoquer à l'utilisateur une réaction sentimentale pareille à celle d'une personne ayant cette phobie.

La recherche qui a été faite parallèlement à la création du projet concerne les origines de la peur et les phobies, les troubles de l'anxiété et l'émergence de phobies spécifiques, les applications de réalité virtuelle en psychologie clinique et la psychothérapie, le traitement des phobies à travers la réalité virtuelle, ainsi que la représentation de la peur dans l'art et les principes de l'immersion et le sens de la présence dans les environnements virtuels. La recherche se concentre en particulier sur les principes esthétiques en créant une telle application de réalité virtuelle, ainsi que les éléments techniques afin de produire une telle expérience.

Mots clés: Réalité Virtuelle, Phobies Spécifiques, Thérapie par Exposition à la Réalité Virtuelle (TERV), Acrophobie.

Figure 1 Gustave Doré, The Mouth of Hell (engraving for Paradise Lost by Milton), 1870

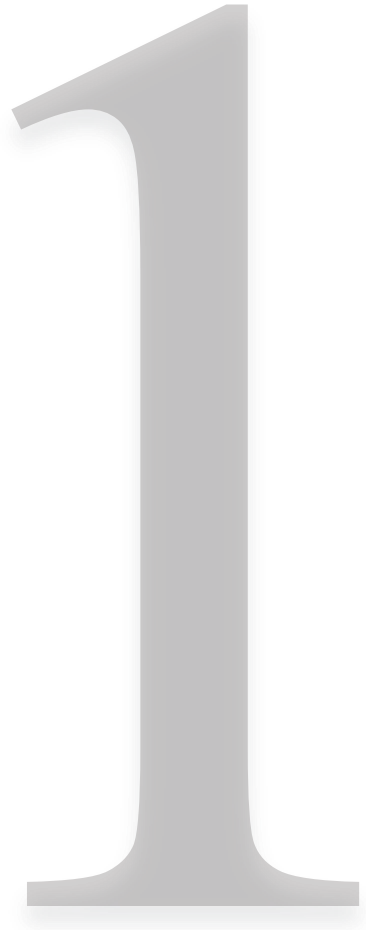
General Introduction

Fear is a common - innate and useful sentiment that helps people and animals to identify and escape from dangerous situations. However, when fear is enabled and triggered by certain objects that do not normally evoke such emotions, this is translated to a phobia. Anxiety disorders and phobias are concerning a great amount of people around the world and new means of treating them have emerged. Beside all of the above, fear as an emotion, anxiety and frustration have been commonly used as inspiration in various works of art, including art installations, movies, paintings and videogames.

The research that has been conducted regards the study of fear and phobias in the domain of psychology, in the theories of cognitive and behavioral therapy for anxiety disorders, the use of virtual reality exposure tools in treatment of specific phobias and the principles of interactivity and immersion within virtual experiences. The research focuses especially on the aesthetic principles of the creation of such an experience, as there is no intention of creating a clinical assessment of overcoming phobias but aims instead at creating an initial research upon this theme that will be continued later on.

"The Fall", is a virtual reality art project, the creation of which was driven by the urge of the author to communicate personal fears as well as a sense of this phobia to others. The project features a narrative – driven succession of different states of phobia, whose scenario and imagery is based on the author's experience and at the same time is greatly affected by the research conducted. The narrative is based on a gradual exposure to fear stimuli, accompanied with a series of sounds in order to make a more solid experience. The project recreates scenarios that could trigger fear and anxiety through the aesthetic approaches and its challenges similar to the ones (emotions) that a person suffering from a phobia has. The sense of falling and the vertigo effect drive the narration of the project and the user should overcome the challenges that are provided in order to reach a sense of relief and freedom.

CHAPTER 1: Fear Acquisition



Introduction

The theme of phobias has been a subject of speculation for numerous researchers, scientists, psychologists and psychiatrists over the years. From Hippocrates to Descartes and Freud to modern scientists that are using new techniques in rehabilitation and treatment of phobias. Virtual reality tools are considered from a great number of researches as a new, effective and easily adaptable means to treat anxiety disorders.

Virtual reality tools have also been used in medicine for a while, starting for example as experiments in the field of military in order to train or help overcome post–traumatic stress disorders in veterans that have returned from the battlefield. Military and game industries are amongst those who invested a lot on the development of virtual reality equipment, which led to the creation of new technology tools like head mounted displays (HMD) and the further development of the field with fully immersive and haptic environments.

Different scientific laboratories and universities around the world are experimenting with the potential of what a virtual environment can offer in different fields. Specifically in the field of fear acquisition, new developments in neuroanalysis and neuroimaging allow scientists to understand the crucial role of amygdala while stimulated by a fear situation. This allows scientists to conduct more appropriate treatments, while new technology allows experiments in which scientists can participate in real–time and at the same environment as the patient. Parallel to that, they can follow his or her internal brain functions and react accordingly in a direct manner.

Specific Phobias

Defining phobia, a concept originated from the Greek word "phobos" that means fear and also a term related with the Greek mythology name Phobos, the son of the God Ares, the God of War (Errera 1962). Ancient Greeks honored Phobos as godhead that defies fear and panic and for that reason they use his portrait in their shields to provoke the sense of fear to their enemies. Fear is considered to be the natural reaction to an actual and distinguishable danger, an emotion that works protectively in favor of the individual, whereas anxiety is translated to a general and incoherent feeling (Rachman 2004). Phobias are a certain type of fear which acquired their modern definition, as unreasonable and involuntary fear of an objectively non – threatening situation or object, during the 19th century (Marks 1969).

It is referred that one to ten people suffer from phobias, specific phobias or generalize anxiety disorders at least once during their whole lifetime (Marks 1980). However, most of them are not seeking for treatment to overcome their fears (Marks 1980, Rachman 2004). Phobias are anxiety disorders that are usually described as the constant fear of something, whether this is about an event or an object, from which the afflicted will do their best effort to avoid confrontation (American Psychiatric Association, 1994).

Figure 2 Roman Mosaic: Mask of Phobos, 1875, British Museum

According to DSM – IV[1] specific phobias are defined and subdivided into five certain categories: 1. Animal type 2. Natural environment type 3. Blood – injection – injury type (BII) 4. Situational type 5. Other type which include all other kind of fears that do not fit into the other certain categories (fear of choking, vomiting, contracting an illness). "Specific phobias (SP) consist of persistent fear of a circumscribed stimulus and consequent avoidance of that stimulus, which otherwise creates unpleasant emotions and symptoms to the sufferer" [2]. They are a clinically heterogeneous group of syndromes with common features of circumscribed fear and avoidance (American Psychiatric Association, 1994). Through the new – type of neuroimaging techniques such as positron – emission tomography (PET) and functional magnetic resonance imaging (fMRI) researchers had the opportunity to capture the brain activity during interaction with the "avoid object/ fear – relevant stimuli" and during its treatment, finding the crucial role of amygdala which triggers such phobias leading them to new diagnostics and targeted treatment interventions through this better understanding.

Figures 3,4,5: John Vassos, Phobias (Acrophobia, Batophobia or fear of falling objects, Aichmophobia or the fear of sharp and pointed objects), 1931

[1] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, DC, American Psychiatric Association, 1994.

[2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, DC, American Psychiatric Association, 1994.

Fear Desensitization[3]

As common treatment for pathological fears, anxiety-related problems and phobias, is considered to be the cognitive – behavioral therapy (Rachman 2004). Pioneers in this field of behavioral therapy movement are considered to be J. Watson[4] (inspired by Pavlov and stimulus – response theory), B. F. Skinner[5] and Joseph Wolpe[6], while cognitive psychotherapy was based on the work of Aaron T. Beck[7] while searching for an alternative explanation for depression causes (Rachman 2004). During the 1980s and 1990s following those studies, cognitive behavioral therapy emerged. In this kind of therapy – approach persons learn to identify their thoughts and behaviors that are causing them feelings or negative emotions and they learn how to manipulate and replace them with more positive ones.

One common concept in cognitive behavior treatments that is normally used in anxiety disorders is exposure in-vivo (Choy, Fyer et al. 2007). A common treatment for acrophobia is exposure in-vivo as well (Choy, Fyer et al. 2007). With certain treatment, the "problematic behavior" is gradually defeated by exposing the patient to a hierarchy of fear stimuli, whereby the fear will first increase, after which habituation will occur and the fear will gradually diminish (Emmelkamp, Bouman et al. 1992). In in-vivo treatment the patient is exposed to real stimuli. A

[3] "The inhibition of the receptor caused by sustained exposure to an agonist" Stolerman, I. P. (2010). Encyclopedia of psychopharmacology. Berlin ; London, Springer.

[4] John B. Watson (1878 – 1958) was an American Psychologist who is considered as the pioneer of the behaviorist movement in psychology. A famous experiment of Watson's was that of "Little Albert" classic conditioning study in which he teaches a small child to fear (condition of a phobia) of a white rat by repeatedly making loud noises every time the kid touched the rat. So, the child learned to be afraid of the white rat (a neutral stimulus that has been transformed to a conditioned one) but also to be afraid of any other furry object.

[5] B.F. Skinner (1904 – 1990) was an American Psychologist belonging in the behaviorism movement. Skinner created an operant conditioned chamber called Skinner box, to study animal behavior.

[6] Joseph Wolpe (1915 – 1997) was a South – African psychiatrist who was considered as the most influential figures in Behavior Therapy. Wolpe was famous for using systematic desensitization for treating phobias and anxiety.

[7] Aaron T. Beck is an American psychiatrist born in 1921 and he is considered to be the father of cognitive therapy. Beck's theories concerning depression are regarded as pioneering for clinical depression.

promising alternative is gradual exposure to the fear stimuli using Virtual Reality and amongst its advantages are the fact that the patient can be treated in the safety and privacy of the therapist's office and situations which are hard to find or costly to reach, can be recreated.

However, it is important for the therapist to fully identify if his patient really suffers from a certain type of specific phobia and not from another anxiety disorder or simply has a repulsive behavior towards to certain objects. For that reason, the American Psychology Association with the DSM – IV, separates the specific phobias criteria from those of other anxiety disorders. The diagnostic criteria for specific phobias according to the Diagnostic and Statistical Manual of Mental Disorders (4^{th} edition) are: 1. for the individual to experience the fear almost every time that he or she approaches the fear stimuli 2. Understanding that this fear is unreasonable or excessive 3. Constantly avoiding the unpleasant situation or face it with extreme distress 4. Experience significant impairment in functioning or clinically significant distress about having the phobia 5. Having the certain problem for a period of at least 6 months 6. And not suffering from another type of DSM – IV disorder that better accounts for the specific phobia symptoms. Specific phobias are of the most common types of phobias from which people are suffering (Kessler, Berglund et al. 2005) and they could excessively escalate, potentially leading the patient to a panic attack.

PHOBIC DISORDER ORIGINS

Different physicians, philosophers and generally researchers during centuries tried to understand and describe states of phobic behaviors and symptoms, resulting in changing terminology until the prevalence of the diagnostic term "phobia" (Barlow 2002). Before reaching this, a long research took place regarding the emotion and origins of fear and anxiety.

Phobic disorders began to be referred to as far back as the 18^{th} century by Hippocrates, but were not clarified at first as unique disorders rather than syndromes/ symptoms of another disease or neurosis (Doctor and Kahn 1989). Hippocrates, almost 2000 years ago, had described figures like Damocles, a person terrified of heights that could not stand on top of a bridge or near the end of a cliff

and also Nicanor who was terrified by the sound of the flute especially when he heard it during evenings, despite the fact that this "phobia" never occurred during the morning hours. Caelius Aurelianus, a Roman scientist that was one of the first that correlated phobias with manias and he also spoke about hydrophobia (Ahonen 2014).

Also, Descartes (1650), in the "Passion of the Soul" that he is describing a man that he is afraid of roses (Marks 1969). Furthermore, Sauvages (1770) described phobic anxious patients and their condition as "vertigo hysterique" or "vertigo hypocondriaque" (Marks 1969). During the eighteenth and nineteenth century several attempts were made to classify this type of "mania" or "insanity". Dr. Carl Friedrich Otto Westphal (1833 – 1890) was one of the first that used the term "agoraphobia" in 1872 and was from the firsts that contributed further in the dominance of term phobia through his monograph "Die Agorophobie" (1871) (Sinnott, Jones et al. 1981, Doctor and Kahn 1989) which completely changed and affected the modern thinking about phobias, while Henry Maudsley (British psychiatrist, 1835 – 1918) used the term melancholia in 1895 (Errera 1962). Also, Shakespeare described a type of phobic behavior in the "Merchant of Venice". Other reports exist from Robert Burton in the "Anatomy of Melancholy" and in Edgar Allan Poe's poems, until Freud's psychoanalytical theories referred to it as the result of hidden, suppressed sexual desires that unravel such behaviors.

There was a large dispute for so many years about the origin of phobic disorders and if they should be evaluated as a specific and isolated disorder or as a part of a certain type of "neurosis". This has been resolved today with DSM – IV in which it is identified that phobic disorders are a certain category of anxiety disorders.

Figure 6 Guillaume-Benjamin Duchenne déclenchant une expression de frayeur par la stimulation électrique (1862).

The Terms Fear – Anxiety – Phobias

Several researches and debates refer to the terminology, distinctions and similarities between the terms of fear, phobias and anxiety over the years. In general, anxiety and fear share some similar points. However, the sense of fear, anxiety and when those lead to phobias must be separately examined as they express different things. Anxiety is the unpleasant feeling that is directly linked to the notion of an imminent danger that is neither apparent nor defined by the person suffering from it (Kleinknecht 1991, Barlow 2002). Fear is a similar concept that is however triggered by a natural response to an existing danger or threat (Kleinknecht 1991, Barlow 2002).

Generally, fear is a survival emotion that functions as a defense mechanism in order to preserve a species and should be distinguished from anxiety. Many modern dictionaries follow that "distinction" but going into more depth and following the usage of those terms in literature we see that there is a great confusion in that part (a quick search to bibliography unravels a great confusion through translation). For example, Freud used the German word "angst" to describe the sense of anxiety emerging without the existence of an identifiable object while the term "furcht" was used when anxiety had an object (Barlow 2002). For Søren Kierkegaard (Danish philosopher, 1813 – 1855) on the other hand, the meaning of the word angst translates to a varied result of either anxiety or dread (Barlow 2002). Although, the psychiatrist Aubrey Julian Lewis (1900 - 1975) supports that the German "angst" is misinterpreted and loses its full meaning when translated to the English "anxiety". Also, it is referred that the word fear derives from the ancient English word "faer", which refers to a sudden calamity or danger. Moreover, the word anxious derives from the Latin word "anxius", which means trouble in thought deriving from an uncertain reason – cause. In terminology it is also connected to the Greek word "άγχω", which means to press firmly, to choke. Still, the term anxiety remains unclarified (Barlow 2002) but it is used through dictionaries to describe an uncomfortable feeling or worry for what could emerge.

On the other hand, the intense and irrational fears are classified as phobias. The aforementioned examples describe common attributes of a person suffering a specific phobia. Darwin is describing the bodily or physiological responses that are experienced when one is frightened or anxious. The French proverb is describing

the behavioral avoidance response and Stephen King is describing the related thoughts and cognitions.

"*I have awakened in the night, being slightly unwell and felt so much afraid. The sensation of fear is accompanied by troubled beating of heart, sweat, trembling of muscles*" by Charles Darwin (Ollendick and Hersen 1998).

"*He who is afraid of leaves must not come in the woods*", French proverb (Ollendick and Hersen 1998).

"*Sometimes the objects of my fear changes, and sometimes the quality of my fear changes – but I find too much fear, in a way. I can't go to sleep in a hotel without thinking. 'Who is in the room underneath me, dead drunk and smoking a cigarette and about to fall asleep so that the room catches fire?*" Stephen King (Ollendick and Hersen 1998).

Phobic anxiety is the stress that occurs only in relation to a certain situation or subject. Phobia is a specific fear category, which is disproportionately intense as compared to the cause that triggered it and cannot be explained or justified as it is above the voluntary control of the individual and leads to possibly avoiding the situation that caused it (Marks 1980).

Last but not least, a distinction should be made between phobias and obsessive thoughts or obsessions and the aversion that one can feel over specific subjects. The root of the word obsession derives from the Latin word "obsibere" which means to besiege, and the sufferer is indeed besieged by unwanted thoughts. As a side note to all of the above, panic can be translated as a sudden outburst of an intense terror.

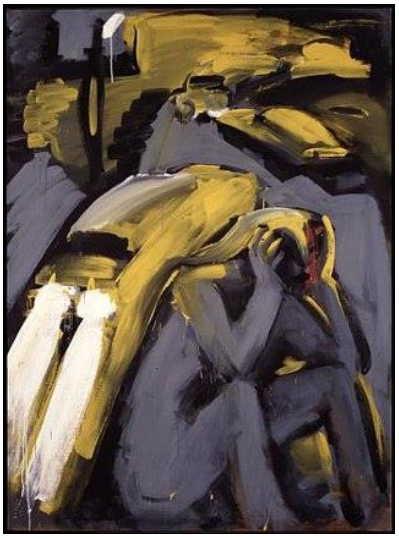


Figure 7, Karl Horst Hodicke Melancholy, 1983

Acrophobia

Acrophobia derives from the Greek words "akron", which means an edge and "phobos" which means fear and refers to an exaggerated fear of heights that could be stimulated under various circumstances such as being on a high floor, up a ladder, climbing stairs or even using the elevator. According to Diagnostic and Statistical Manual of Mental Disorders (5th edition), acrophobia is considered to be one of the most dominant type of phobias, influencing a high amount of people during their lives. Such people have a constant fear of falling down when they reach a certain altitude. This could start from simple anxiety and could lead up to panic attacks when exposed to such situations. Therefore, it is very common for people with acrophobia to simply avoid such confrontations. This can affect a wide variety of daily activities that not only may impact on the quality of life of the individual but also on their career choices, meaning that certain jobs will be avoided. For example, simple tasks such as changing a light bulb become frustrating and the individual can end up avoiding visiting a doctor if that office is located on a high floor, a decision that could impact on one's health and well – being. Research indicates that such phobias are not product of post – traumatic stress but seem to be linked in irregularities in one's balanced control and visual perception of movement, as well as sensitivity to bodily symptoms and space and motion discomfort. It is believed that one's reaction to acrophobia is an exaggerated response of the individual's body warning system that is known as vertigo. This leads to losing postural control as the result of having an increasingly large distance between the individual and the object. This distortion in the depth of field results in conflict between signal detection of the vestibular and somatosensory receptors of the body which leads to a loss of balance in an effort to reactivate visual control. Such people may confront difficulties with posture control and cognitive activity. Treatment of such a phobia is considered to be exposure therapy to the fear stimuli.

Figure 8 Louise Bourgeois, Untitled, from the series, Spirals, *2005.*

Anxiety Disorders Types

There are different types of anxiety disorders such as: generalized anxiety disorder (GAD), panic disorders, social anxiety disorder, post – traumatic stress disorder and specific phobias.

One type of anxiety disorder is the generalized anxiety disorder (GAD) which is a long lasting anxiety that is not focusing on any certain object or situation. Persistent fear and worry are overwhelming the people suffering from it, who commonly display symptoms such as fatigue, sleep disturbance, muscle tension, irritability and facing difficulties in concentration amongst others.

Panic Disorders are sudden and recursive attacks of intense terror and scare in which the specific cause is not always apparent. Symptoms are increased heart rate, sweating, breathing problems, dizziness, weakness and feeling hot or a cold chill.

Social anxiety disorder is considered to be the intense fear and avoidance of social interaction, in fear of public embarrassment or humiliation. A common example of social anxiety is fear of public speaking.

Post – traumatic stress disorder is an anxiety that occurs after a severe traumatic situation. For example, many reports of such anxiety are recorded amongst soldiers (i.e. Vietnam Veterans) after returning from a battle, experiencing difficulties in adjustment due to nightmares and unpleasant emotions that carry over troubling them for a long time after returning home. Other situations that irrigate such phobic disorders occur after natural disasters, serious accidents, rape or child abuse.

Specific Phobias, as mentioned earlier, are consisted of a certain category of phobias, according to the DSM – IV and are characterized as the unjustifiable fear of the individual concerning certain objects or situations. A certain type of specific phobia is acrophobia or fear of heights.

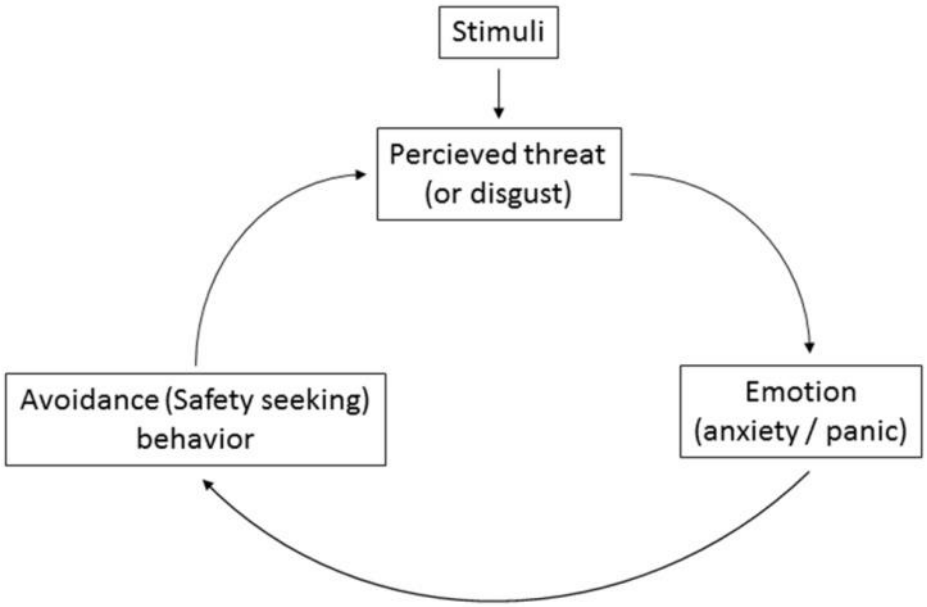


Figure 9 Fear acquisition and Avoidance Behavior Loop

Symptoms of phobia

Reaction responses include anxiety, avoidance, body shaking, increased heart rate, chest ache, sense of being off-balance, sweaty palms, blackout and faint. The patients generally express extreme reactions that may expose them to actual risks, becoming an obstacle on managing everyday tasks.

Certain attention should be paid in order to distinguish a specific phobia from other anxiety disorders, focusing on the fear stimulus and the type of panic attacks. Different types of fear are presented as mental disorders: fear of physical sensations (panic attacks disorder), fear of traumatic experience (posttraumatic stress disorder), obsessive – compulsive disorder, separation anxiety, hypochondria or delusional – psychotic disorders, these fears can create avoidance of objects or situations and should be evaluated properly in order to distinguish them from specific phobias.

Therapies

During current times a great deal of attention has been given to the field of mental health and generally to the psychological effect of the illness, trying to find a whole new fistful of approaches in prevention and treatment of anxiety disorders, as a large amount of the population suffers from such. Despite the fact that specific phobias are a common theme, treatment seeking is relatively rare (Barlow 2002). Different types of therapy approaches have been adopted by

therapists to help out patients more efficiently. In this frame, mental health computing has emerged, using VRET systems with applications in clinical and health psychology.

Beginning with psychological therapy or psychotherapy, this is an interaction between a therapist and someone suffering from a psychological problem, with the goal of providing support or relief from the problem. There is a huge number of psychological treatments, each of which has its certain goals, treatment methods etc. Freud, through psychotherapy, tried to analyze the cause of such behaviors and resolve it. For example, he described the rash expression of those fears through an example of a small boy being afraid of horses, thus fomenting the boy's sexual desire of his mother and afraid of the possibility of castration from the father, leading to the projection of this phobia to another phobic stimulus, like the horses in this case. According to Freud, phobias usually symbolized other hidden problems and subconscious desires that needed to be revealed. Therefore, once those problems would surface and be confronted with, the original phobias would disappear. The psychoanalytical approach was a long-term treatment which was not particularly effective in dealing with certain anxiety disorders. This was in contrast to exposure therapy which had visible results in a short term.

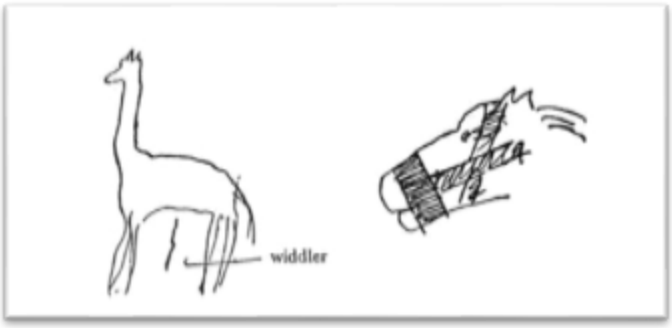


Figure 10 S. Freud, Analysis of a phobia of 5 year old boy, 1909

Unlike psychotherapy and Freud's psychoanalysis, behavioral and cognitive therapies are not focusing on the early stages of developments and the processes that take place upon that time but on current factors that create the problem, such as maladaptive behaviors and dysfunctional thoughts. More specifically, behaviorists are only focused on the behaviors that can be observed and not on "invisible" attributes that may occur in someone's unconscious. "*Behavior therapy assumes that disordered behavior is learned and that symptom relief is*

achieved through changing overt maladaptive behaviors into more constructive behaviors[8]" while in cognitive behavior therapy clients are learning to restructure a negative thought into a more positive one. Meaning, the problem is not the phobic stimuli by themselves but the individual's perception and assumptions about those stimuli.

Cognitive behavioral therapy is a combination of approaches and techniques that were used to treat anxiety disorders and depression[9]. It is problem focused, meaning that focuses on treating certain problems and is also action oriented as the client is expected to do things and also can be characterized as a transparent procedure, meaning that the client knows every step of the way what follows next along the treatment.

Exposure therapy

Exposure therapy is a sub – type of cognitive behavioral therapy that is usually suggested as a treatment method for overcoming anxiety disorders. In this certain type of approach, it is suggested to the patient to either expose himself in in – vivo conditions, meaning direct exposure to the fear stimuli (ascend on excessive heights etc.) or to follow an imaginary exposure in which the patient is asked to recall in his memory a traumatic situation that he had experienced or imagine the repulsed stimuli.

Virtual Reality Exposure Therapy has been considered as an effective tool for facing different phobias such as: social phobias, acrophobia, flight phobia, fear of driving, claustrophobia, agoraphobia, arachnophobia as it treats or trains the individuals into eliminating the levels of their fear and depression. Virtual Reality Cognitive Behavioral Therapy (VRCBT) is perceived as a significant tool since it helps out without the drawbacks that a common therapy has, such as the lack of control of the therapist over the whole treatment experience or how confident the patient feels about the treatment.

[8] Consulté le April 17, tiré de https://quizlet.com/21140088/psychology-202-chp-15-flash-cards/

[9] Micallef-Trigona, B. (2016). The Origins of Cognitive Behavioral Therapy. Psych Central. Consulté le April 17, 2016, tiré de http://psychcentral.com/lib/the-origins-of-cognitive-behavioral-therapy/

Phobia Causes

There are different factors that are responsible for the emergence of phobias: genetic factors, biological preparedness according to Seligman (1971), meaning that all species are innately equipped with fear to certain stimuli, neurological reasons (fight or flight reaction, physiological arousal), behavioral, cognitive, social theories of learning and conditioning, psychodynamic models (psychoanalytic theory of Freud), family history background, sociocultural reasons or traumatization. Generally, the nature of phobias is consider to be controversial.

Concerning the learning and conditioning causes, one could concentrate in the way that information – processing procedure, the learning process and condition take place. An individual can acquire a fear through informational and instructional processes (the instinct of survival and learning of threats and perceptual information of the environment that has been received from the person since childhood). For example, through verbal communication or through other means of information the individual can acquire a certain fear with the continuously negative referring stimuli. Also, vicarious fear learning can take place on teaching the individuals to react emotionally to a harmless stimulus after watching others suffering from it, learn through observation and more certainly can one feel empathy and overcome a fear through watching another person's reaction when facing a difficult situation. A determinant cause of acquiring specific phobias is conditioning (a reference of Pavlovian fear conditioning theory). More specifically, a previously neutral stimulus is transformed to a phobic one that evokes a fearful reaction. A common type of behavior that accompanies such situations is avoidance through which the individual avoids being in contact with the fear stimuli, resulting to a sense of relief.

Furthermore, despite factors such as modeling, learning by association and negative reinforcement, genetic factors are playing an essential role in the acquisition of fear, as over 30% of first – degree relatives of people suffering from a certain type of specific phobia also have some kind of phobia (Fryer at al., 1990). For example, having first degree relatives that have phobias is likely

to lead to such patterns in the following generations. Extensive studies on twins have revealed that there is a genetic predisposal to phobias. However, these studies also reveal that these genetic traits do not manifest themselves on specific phobias rather than transcend on a per – individual basis, that means that each person would eventually express a different type of phobia sometime in their lives. An exception to this rule appears to be blood – injection phobias (Merckelbach, 1996).

The environmental and genetic factors form a unique formula for each individual. Although those particular emotional disorders are not directly inheritable, the vulnerability to those disorders can, however, be passed on from one generation to another. Whether those will manifest themselves or not, this is clearly dependent upon the environmental factors. As it was described before, studies on twins and identical twins have revealed that genes hold a key role in that vulnerability. The influence of genetics can also be observed by the fact that members of the same family respond to a similar manner to treatment. Genes contribute to certain influences in regards to the whole vulnerability issue. As far as the environmental factors are concerned: Upbringing and early experiences, diseases, drugs or alcohol etc. all play a part. The combination of two factors (genetic and environmental) confirms that a sequence of events is necessary in order to develop into depression or stress disorder.

The temperament, whether it is genetically determined to be timid, bold, happy or sad and the personality, with genetic characteristics comprising of overall temperament, upbringing, social relationships, trauma and other environmental stressors, are factors that help to predict vulnerability. Other agents include having the patient suffer from some form of depression, or an existing anxiety disorder.

One possible theory for such widespread emergence of phobias is the preparedness theory of phobia (Seligman, 1971) according to which people are predisposed to certain fears, a theory that is supported by research according to which people and monkeys can be conditioned to have a fear response for stimuli such as a snake etc. but not for neutral stimuli like a flower (Cook and Mineka 1989).

Also, an individual can acquire a fear through having a personal traumatic experience with a specific object or situation that will work like a catalyst for triggering a certain phobia. Moreover, having a traumatic experience only by observing someone suffering from the negative consequences of an act, can lead into acquiring the same fear.

Furthermore, socioeconomic factors and different cultural beliefs can work as triggers for the appearance of phobias that emerge only on those cultures.

Last but not least, physiological causes such as brain malfunctions on cognitive and emotional pathways can predispose individuals on acquiring a fear. Neurobiological factors play an important role in the appearance of phobias. For example, high levels of activity can be observed in the amygdala of people that suffered some kind of phobia in their life (LeDoux , LeDoux 1998, LeDoux 2000). The role of amygdala is very important in the acquisition and expression of observational fear learning so that the indirectly attained fears may create the same intensive emotions and feelings as the fears originating from direct experiences[10].

Amygdala

Different researches examine how brain interprets stimuli, the emotional processing and the type of the relation between memory and emotion, which is called "emotional memory". Researchers are focusing especially in the study of the emotion of fear and how through a stimulus the individual can acquire this emotion. As many anxiety disorders are a result of malfunctions in brain mechanisms, it is considered important to examine the neurological foundations of fear elicited by such stimuli. Different researches have come to the conclusion that the amygdala system plays an essential role in the acquisition, storage and expression of the emotional memory and consequently in fear conditioning and anxiety. A growing argument is that of the relation between the emotional and

[10] Olsson, A., et al. (2007). "Learning fears by observing others: the neural systems of social fear transmission." Social cognitive and affective neuroscience 2(1): 3-11. Consulté le April 17, 2016, tiré de http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2555428/

declarative memory and if it is possible to alter the emotional memories that were captured in our brain unconsciously.

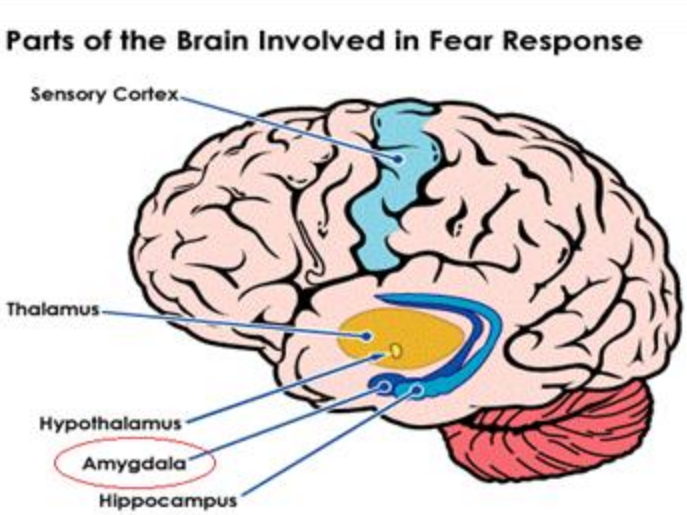


Figure 11 The brain's position of Amygdala and its role concerning fear

The research in emotions and how brain mechanisms react in acquiring or capturing a certain emotion needs further investigation. By understanding how fear is developed, this would help to adopt more appropriate and effective treatments to overcome phobias and anxiety disorders in general.

Demographic Cues – age onsets

People are commonly suffering from phobias at very high rates, for at least one time in their lives (Kessler, Berglund et al. 2005) and although widespread, serious cases concern only a small portion of the population (Kessler, Chiu et al. 2005). For example, people that experience social phobia in their lives reach the percentage of 11% for men and 15 % for women (Kessler, Berglund et al. 2005). It has also been found that women are more commonly suffering from specific phobias in comparison to men, in a 4 to 1 ratio (Kessler, Berglund et al. 2005). (Merckelbach, 1996).

Research suggests that almost one in five people suffers from some type of anxiety disorder (Narrow, Rae et al. 2002). Apart from the personal perspective, this is also a really heavy economic burden which is estimated to cost almost 42.3 billion only in the United States[11]. Another issue is that while there are

[11] "The Economic Burden of Anxiety Disorders," a study commissioned by ADAA (The Journal of Clinical Psychiatry, 60(7), July 1999). Consulté le 17 Apr. 2016, tiré de http://www.adaa.org/about-adaa/press-room/facts-statistics

high rates of anxiety disorders in the average population only a 30% receive an appropriate treatment for it (Young et al., 2001). There are many reasons for this, varying from diminishing the severity of the problem, the economic cost, nurturing false believes of self–healing to even not having any idea in regards to the methods of treatment or where to find help.

Specific fears are quite commonly presented in young children (transitory phenomena) and sometimes those fears can become chronic through classical conditioning (Merckelbach, 1996) or disappear as they manifest as part of the developmental phase. In general, it is predicted that specific phobias have an early onset[12] but this varies according to the type of phobia. More specifically, animal phobia has the earliest age onset at approximately seven years of age, while other follow such as social phobia (sixteen years), claustrophobia (twenty years), agoraphobia (twenty-eight years).

Virtual Reality Applications – Serious Games

During the last years with the advancements of technology and the development of virtual reality tools, new achievements come by in the field of fear desensitization. Virtual reality exposure therapy (VRET) has become an alternative to exposure in vivo or cognitive behavior therapy that is usually used for the treatment of anxiety disorders (Parsons and Rizzo 2008). Specific phobias like acrophobia, phobia of spiders and social phobias can now be cured through virtual reality experiences that enable the user to face or overcome his fear. Such experiences are considered more efficient, safe due to the lack of actual risk, affordable compared to the high cost of doing such experiments in real life conditions, provide a shorter healing time with significant better results.

[12] "Specific Phobia." (n.d.) American Center Psychiatry and Neurology. Consulté le 17 Apr. 2016, tiré de http://www.americancenteruae.com/specific-phobia/

At the same time, a whole new category of games labelled as "serious games[13]" seems like a promising path to educational or health enhancements, with the game and military industries funding significant amounts, believing in its inherent potential of delivering efficient and timely results.

The emergence of virtual reality

During the past years there have been tremendous advancements in the field of virtual reality and in immersive technologies leading to their dominance in the fields of art, education and health. Interaction with users and immersiveness in virtual reality worlds are some of the characteristics that lead to their dominance and complete acceptance by the wider scientific community. The term Virtual Reality was used for the first time in 1985 from Jaron Lanier (founder of the company VPL research, that was based in visual language programming) and was established during the 90's with the publication of the article "Virtual Reality is for Real" in the magazine IEEE Spectrum. In the following years, there was a divergence between the definitions concerning the term virtual reality with Lanier define "*virtual reality as a computer-simulated three dimensional environment with and within the people can interact*".

Virtual Reality technology emerged as the result of the combined efforts and investments of NASA, the military and the entertainment industry. Its roots can be traced as far back as the early 1800's, when environments were simulated in order to attribute a feeling of motion as well as a savage environment using animated plates. It was only during the 1900's that actual commercial feature rides emerged, using animated lighting, sound effects as well as artificial scents in order to exhilarate the senses and trigger emotions, adding realism to the experience. Later on in 1975, it was NASA that came up with the concept and realization of a VR helmet prototype, a Head Mounted Display system that is similar as a concept to the current ones. This would feature stereoscopic and

[13] Originally the term "serious games" derived from the homonymous book by Clark Abt. As he describes these games primarily having an educational function but not excluding being entertaining nevertheless. Abt, C. C. (1970). Serious games. New York,, Viking Press.

wide-angled views, in order to simulate an immersive experience as well as provide a different perspective. During the 80's, despite the technological advances, the headset devices remained hidden from the public. However, public coverage by the media of the time (TV and movies) kept it in the public's attention and helped it develop further. During the 90's Virtual Environments became more and more popular, featuring interactivity with added realism, as well as advances in areas such as liquid crystal displays, 3D audio and interactive inputs through the use of special gloves. Even then though, this "product" was directed towards government usage and not a common, public market. Nowadays, with the continuous evolution of technology and the rise of real-time graphics, virtual technology is widely known and constantly gains ground, not only as a mental health and behavioral tool, but also as a unique entertainment experience of the next century.

New virtual reality applications constantly emerge concerning different fields such as education, art and health. Especially in the last field there have been tremendous opportunities and developments. In psychotherapy virtual reality offers something like a new boon to mental health and behavioral science.

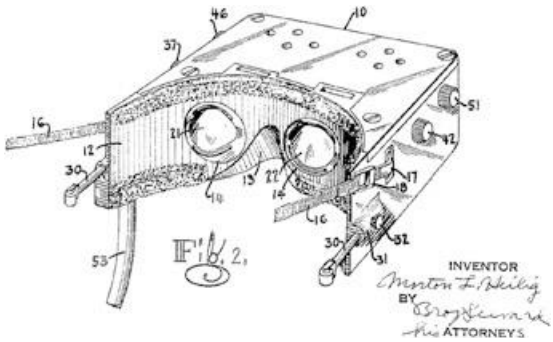
Until now fear desensitization and overcoming phobias were based on either the process of imagining the fear stimuli or by using exposure in vivo[14] (Bellack, Hersen et al. 1990). These new therapy interventions help to mitigate the negative impact, combat stress and they are considered by many researches as a notably effective treatment with results shortly after sessions, causing less damage to the psyche of the patients and diminishing the long – term stress reactions. They provide superior usefulness for reducing intensity and patients seemed to form a more sympathetic arousal. And without distressed people, in contrast to the other treatments, the virtual world gathers elements from both approaches. Especially now with the high – level of realistic graphics and the more powerful computer processors, patients can really feel like they are experiencing a real-life situation. Scientists and psychologists have now the

[14] McLeod, S. A. (2008). Systematic Desensitization. Consulté le 17 Apr. 2016, tiré de http://www.simplypsychology.org/Systematic-Desensitisation.html

opportunity to follow the treatment in unison with their patient, as the therapist can be inside of the virtual world as well. The stressors can be presented gradually without any risk of further traumatization of the person because they are controllable while habituation with the fear stimuli can be achieved inside a safe virtual reality environment.

Virtual Reality Applications

During the past years, thanks to the advancements in technology and virtual reality tools, different researches for different laboratories have taken place in order to examine the potential social and educational benefits of VR, helping people to combat fears, be more empathetic, live healthier, reduce prejudice, manage difficult situations like natural disasters, pain and raise ecological awareness. By sharing experiences, exposing to real – like situations, people have genuine, emotional reactions to virtual reality and virtual experiences can impact on how they behave in real life as Segovia, a PhD student and manager of the Virtual – Human Interaction Lab, says.



Figures 12 (top left) Morton Heilig, Sensorama, 1956 (top right) Heilig, Simulation Mask (HMD), (bottom) latest advancements

The real world instructs us on how to design virtual reality, and how we act in virtual realms, but the virtual can also change the real and it seems those two are becoming less distinct, so this leads to illustrate/ visualize different scenarios, for example to help people overcome fear of heights, help someone with an eating disorder etc. The human brain is easily swayed into believing the images and situations that our eyes see, reality is a figment of our imagination, as reality is perceived and determined under our beliefs and with our means of perception, so it's a subjective point of view.

In virtual reality there are different ways in order to find out which reaction is triggered by a certain stressor – fear stimulus. There is a whole different range of tools such as: tests - surveys, physiological devices, biofeedback equipment measuring the heart rate or equipment that measures the peripheral skin temperature or the muscular tensions by electromyography technology (EMG).

Different kind of researches and pilot studies have been conducted in certain fields such as: Wiederhold, Bullinger virtual reality application to reduce the influences – the effects of combat stress (Wiederhold, Bullinger et al. 2006). The Department of Psychology and the Tripler Army Medical Center in Hawaii that gathers and examines the efficiency of VR in distress warfighters (Weinick, Beckjord et al. 2011). Also, relaxation exercises accompanied with technology applications produce better results in patients that suffer from chronic pain. PTSD treatment via VR has a success rate of approximately 66% to 90% and stress inoculation training (Wiederhold and Wiederhold 2008).

A whole different range of experiments have been done, from different institutions around the world. Stanford University in its Virtual Human Interaction Lab researched those fields and collected data from large groups of participants on a wide range of scenarios and in motivational factors that encourage empathy (immersiveness of the simulation, emotional valence of treatment, strength of group affiliation) and examined the effects of multiple virtual reality treatment sessions.

Many researches also are testing matters such as: the efficacy of the VR exposure treatment (Krijn, Emmelkamp et al. 2004), the healing period of the treatment, the diversity of the approach, utilization of the effectiveness of

various media such as VR – AR technologies, adaptive environments etc., researches in the fields of "presence", "immersion"(Krijn, Emmelkamp et al. 2004), "fidelity" and the specifications, evaluation of low – cost mechanisms in treatment of specific phobias, applications on vicarious fear learning, the effectiveness of VR instead of exposure therapy (Foa and Kozak 1986), the advantages of using VR (Botella, Banos et al. 1998, Emmelkamp, Krijn et al. 2002, Cavanagh and Shapiro 2004).

Figure 13 Stanford Virtual Human Interaction Lab, "Using Virtual Reality to Overcome Fear, Reduce Prejudice at Stanford Lab, USA Today

Serious Games

Video games are immensely present in everyday life with their market expanding over the past years from stationary to portable gaming devices. Games consist of a combination of various features and mechanics that aim at the user's entertainment. Therefore, those gameplay aspects have been utilized and implemented in applications that aim beyond entertainment purposes, the so-called "Serious Games" (SG).

Serious Games are being used in a variety of purposes such as healthcare, education, military, corporate, etc. Although there is no exact definition for SG, according to Michael & Chen those are "*games that do not have entertainment, enjoyment or fun as their primary purpose*". It is considered that SG have some characteristics like "*voluntary, enjoyable and challenging activities with varying conditions which can specify goals, objectives, rules, moves, constraints, feedback, payoffs and consequences*" (Boyle, Connolly et al. 2011), by focusing on educating the player whilst remaining motivated and intrigued by the game. It has been referred that SG must be designed balancing three equally important components: "Play (e.g., engagement, fun, immersion); meaning (e.g., reflection, relevance,

transfer) and reality (e.g., fidelity, realism, validity)" (Harteveld, Guimarães et al. 2010).

Nowadays, SG are being applied in the field of healthcare with considerable success. Different areas where SG are being used in that field were identified such as: physical fitness, education in health, distraction therapy, recovery and rehabilitation, treatment of mental illness, memory empowerment and physical control (Susi, Johannesson et al. 2007). Also, a small number of serious games have been created on treating phobias such as: Audition, The Game (Lavender and Gromala 2012), Multi-touch Automated Teller Machine (Carvalho, Bessa et al. 2012), Cockroach Game (Trigo Algar 2014).

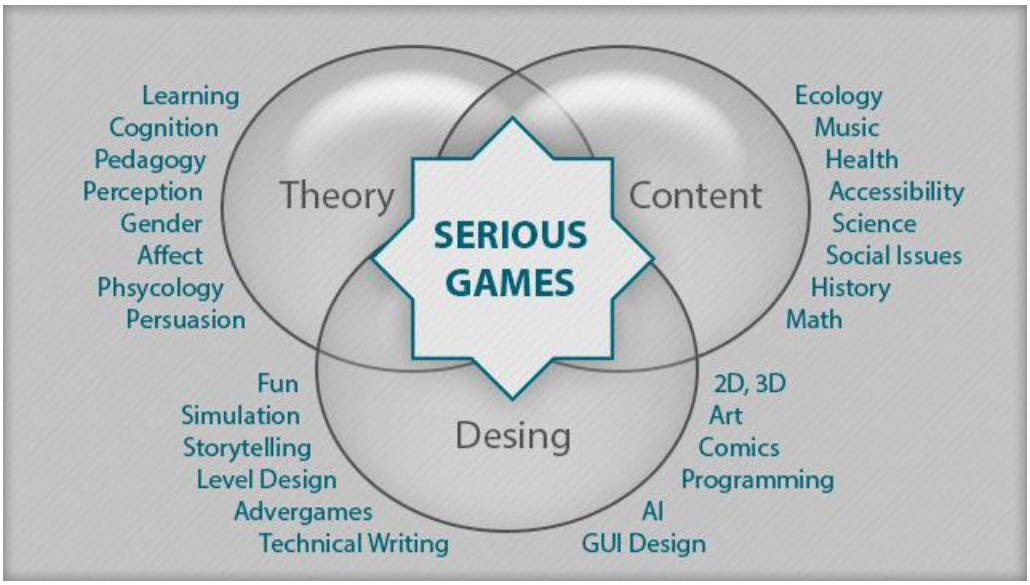


Figure 14 Serious Games Purposes

Researches in VRET (Examples)

An Augmented Reality System for the Treatment of Acrophobia: The sense of presence using immersive photography

According to this research that examines the efficiency of using AR (Augmented Reality) technology and immersive photography rather than using VR technology in treatment of acrophobia. It was an experiment in which 41 people participated, in a scenario that took place in both a virtual and a real

terrace. The participants were instructed to pay close attention and look down a staircase, examining the area for 7 minutes, after which various questions regarding scene details would be imposed. After gathering results using SUS questionnaires, they concluded that SUS is a measure capable of distinguishing between real and virtual experiences, and secondly that immersive photography is a means that offers a great immersion and sense of presence, although not at the same degree as a physical experience would.

Figures 15 An Augmented Reality System for the Treatment of Acrophobia using Immersive Photography

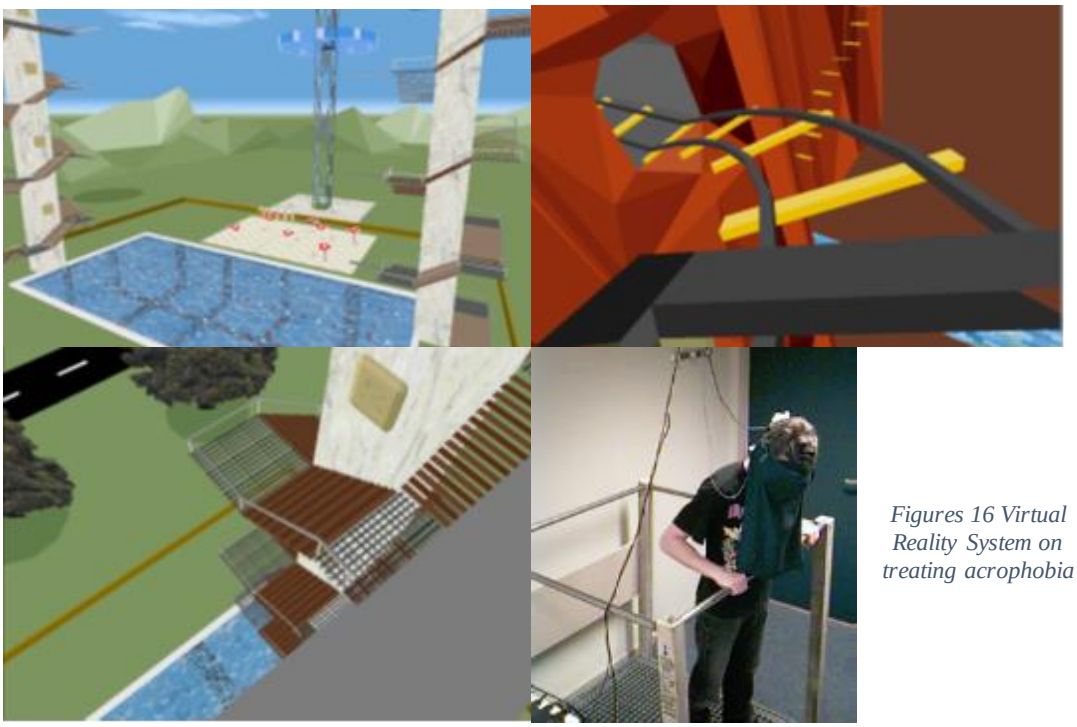
Treatment of Acrophobia in Virtual Reality: a Pilot Study

In another experiment, a total of 16 people took part, with different degrees of acrophobia. The aim of the experiment was to study the immersion effect and the possibility of using VR equipment in treating acrophobia. Three different worlds were constructed, such as: A roller coaster, a swimming pool with diving towers and a glass elevator. Many useful results emerged, varying from the importance of sound design in the VR world, the ability of the users to fill-in the missing details of the environments, to the addition of physical elements in the real-world, to emphasize and carry out the virtual experience. This experiment concluded that VR systems can be utilized for treating acrophobia, even using low-cost equivalents and without complex environments built by professionals.

Virtual Reality Exposure for Fear of Flying Therapy (IEEE Computer Graphics & Applications)

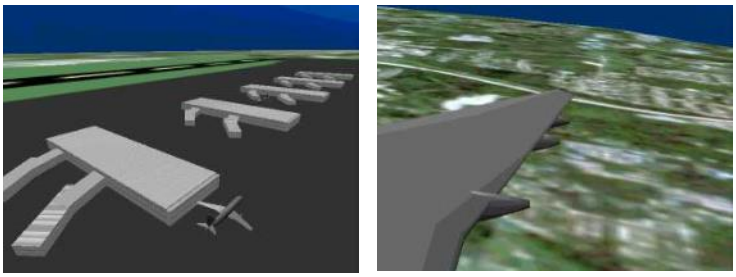
Another experiment that concerns the utilization of Virtual Reality technology in order to help an individual to overcome fear of flight, using a virtual airplane

so as to help him in relation to anxiety management techniques (AMT) to treat such a phobia.



Figures 16 Virtual Reality System on treating acrophobia

During the experiment it was found that the user experienced a variety of classic anxiety symptoms that are found in a person afraid of flying during an air trip. Fear of the patient is gradually reduced after following training in anxiety management techniques and after VR exposure to fear stimuli. In the research it is suggested that a combination of high – quality graphics and up to date tracker technology could help out improving the presence feeling. Furthermore, using low - cost technology would make this directly available in every therapist's office.



Figures17 Virtual Reality System on treating acrophobia by flight simulation

Contrasting the Effectiveness and Efficiency of Virtual Reality and Real Environments in the Treatment of Acrophobia (PsychNology Journal, 2008)

A very significant research regarding the efficiency of VR treatment and the time of healing that have been concluded between 10 subjects in three sessions that have been exposed in virtual and real heights in order to overcome their fears. Participants complete and succeed in a different number of tests such as Behavioral Avoidance Test, Attitudes toward Heights Questionnaire, Acrophobia Questionnaire that illustrate a greater advantage of VR treating of acrophobia.

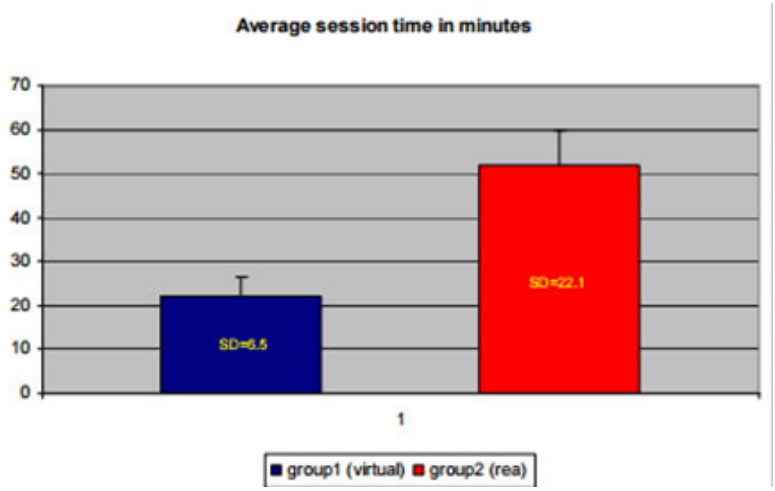


Figure 18 Virtual Reality System vs reality rates on treating acrophobia

Stanford University - Virtual Human Lab

http://vhil.stanford.edu/projects/

During this project, the aim is to place the user in the perspective of a victim of a phobia, racist behavior, bullying and other scenarios in order to study the emotional response as well as the empathy of the users. Another project deals with raising awareness about ocean acidification and the user will follow the trip of CO2 molecules and how these end up in the ocean affecting all living things. Another similar project asks for the user to "adopt" and observe virtual fish that are animated in real – time by their live counterparts through the use of motion

capture technology. Other types of researches focus on the degree of the immersion and realism that a virtual world has to offer, concerning the sense of presence that is captured from the user. The fields that are researched include: Field of View (FOV), Image Persistence, Update Rate, Latency, and Tracking Level using technologies such as optical and magnetic tracking of head and body motion and physiological sensors. Experiments also are conducted in the field of education and how virtual environments can help study, focus attention and improve learning, through improving the technics and educational methods used in VR. Research also takes place in the ability of the user to interconnect and remap physical attributes to a different number of virtual ones. This examines the nature of learning tasks and the ability to adapt to remapped information. A study that concerns body gestures during interpersonal interaction.

Anxiety and Presence during VR Immersion: A Comparative Study of the Reactions of Phobic and Non – phobic Participants in Therapeutic Virtual Environments Derived from Computer Games (CYBERPSYCHOLOGY & BEHAVIOR, 2003)

It was an experiment in order to investigate whether or – not VR tools can be used in treatment of specific phobias. More specifically, the experiment consisted of 13 phobic and 13 non – phobic participants who underwent trials related to their phobias or phobic tendencies as determined by the pairing software used. The results of the research have identify that a low – cost equipment can be used efficient for the treatment of specific phobias, the sense of presence and emotions (anxiety etc.) are linked empirically and act synergistically and last but not least it was observed that low levels of simulator sickness did not affect either the sense of presence or anxiety.

Virtual Reality Treatment in Acrophobia: A Comparison with Exposure in Vivo

During this experiment, in which ten individuals suffering from acrophobia take place, it was examined whether virtual reality exposure therapy was more efficient than exposure in vivo. According to this research more significant

results were achieved with virtual reality treatment, using low – cost equipment and in shorter period of healing time comparing with the classic type of exposure in vivo. The same levels of anxiety were reported in both of those approaches but due to the fact that the group was initially exposed to VR "ceiling effect" was observed meaning that exposure in vivo would not offer any further significant improvement.

Conclusion

New important achievements occur in the field of treating anxiety disorders. The fear acquisition field has been expanded through the emerging theories of fear acquisition and the new technologies of neuroimaging that allow scientists to connect the role of amygdala with fear – learning theories and produce more effective treatments. Virtual Reality offers a fistful of new tools that can alleviate suffering by the contemporary scourge of anxiety disorders that affect a great amount of population. Serious games are a promising alternative in the field of education, healthcare amongst others that will help people, with great efficacy, to heal and even educate themselves.

CHAPTER 2:

Introduction

Fear has always been a sentiment that gathers a lot of attention, not only regarding the speculation of its origin but also as an artistic inspiration. In this chapter I will concentrate in works that represent, evoke or are inspired by fear and phobias. The research will consist of different types of works, for example commencing with works of art that illustrate a sense of anguish, such as Edvard Munch's "Anxiety" and phobias like the fear of heights as depicted in the movie "Vertigo" by Alfred Hitchcock. Also in this chapter I will refer to works whose eerie atmosphere evoke a phobic sensation despite not having direct references to that theme. Finally, in this chapter I will include games that have a unique aesthetic approach or those that create a thrilling, horror – like atmosphere. The main purpose is to examine the artistic and narrative means and the techniques that are followed from all those works as personal inspiration. For example, the highly contrasting black and white approach, like in the movie "The Cabinet of Dr. Caligari" and in the videogame "Limbo", or even the violent forms depicted combined with the hazy and foggy imagery. The sound design of the given works will be examined, as sound is playing a key role in the narration and immersion of those projects.

VIDEOGAMES

Many game designers have as inspiration works from famous artists. Gustav Klimt, Giorgio de Chirico, Escher, Piet Mondrian and Hayao Miyazaki are some great examples. So, an analysis will follow bellow of the games that consist of an inspiration to this thesis, considering their visual style and the elements that provoke the sense of danger and fear to the players. At this point we should clarify that an individual suffering from a specific phobia is possessed by an excessive and unjustifiable fear to his or her certain fear stimulus. That stimulus comprises a threat for him or her, leading to an avoidance behavior pattern and many times feeling helpless without having a "weapon-tool" to overcome the situation. In such circumstances, the fear is derived from the individual's own mind and doesn't appear when dealing with an enemy or a monster but the only enemy will be the stimulus of the certain phobia. It is not needed for someone to present a threat in order to frighten a person suffering a certain phobia but merely expose him to his fear stimulus. According to that, this thesis approaches a certain phobia, the fear of heights, so the "threat" would be to deal with different altitudes and face the various challenges. Since this experience is mainly addressed to people that don't have such kind of phobia, I will try to adopt a more eerie and dark atmosphere in order to simulate and make them feel and empathize with a person that suffers from such a phobia. For that reason, the most relevant genre is horror and it would be examined in certain videogames.

In this section the analysis will concentrate on games that evoke an eerie atmosphere, regardless of their gameplay, meaning that the sole focus will be on their aesthetics. The prevailing game mechanics to immerse a player in a "virtual horror" are to be analyzed later on.

The journey

The Journey was produced by "thatgamecompany" and was released in 2012. It unravels an adventure-like experience, where the player traverses miles of desert in a bid to discover what the goal of the journey is. At times the player's journey intersects with the other travelers who the player can attempt to communicate with, either to journey alongside, or to continue alone. The haunting atmosphere and the music both play with the emotions of the player and elevate the experience to a level of artistry, alongside with this "ethereal wonder – part adventure, part meditation on life and death"[15].

Having characteristics like no potential to fail, no time dependency, no physical interaction with any other player, there is only the exploration having one and only conclusion that can be interpreted differently by each player. So, almost avoiding a typical game structure, the game points only, as its creators said, at creating an emotional response to each user, through the astonishing graphics, the empathetic scenario, a form of bonding with your companion that follows you throughout the trip and helps you survive in difficult situations. The game offers no typical enemies to confront, no potential of skills training or character empowerment (level-up), with the only reward system a cloth collection type of challenge. The player's scarf is getting longer according to the experiences gathered and it is the vulnerable point in which enemies can "hurt" the player. The character's emotions are illustrated in the physical gestures that he performs, from jumping freely and gracefully (considering the movement of his trailing scarf as well) inside of peaceful environments, to jumping more abruptly and with difficulty while approaching more menacing environments, such as ascending the mountain. The Journey with a unique art style using triangular forms for both the environment and the character shapes, which creates a contrast as this edgy character performs more delicate movements and jumps in circular patterns. Also another element of the gameplay is regarding the pathways that the player can follow through the game which begin by offering freedom of movement in the initial scene while becoming more confined and restricted during the darker scenes of the

[15] Stuart, Keith. 15 Mar. 2012. "Is Journey a Game or a Piece of Interactive Art?" The Guardian. Guardian News and Media. Consulté le 17 Apr. 2016, tiré de https://www.theguardian.com/technology/gamesblog/2012/mar/15/journey-game-or-interactive-art

game later on. The game conveys meanings through its use of colors and the environment design, the wandering around the environment and the sound design, in order to let the player gradually discover who he is, what this place is and what his purpose is.

Figures 19 The Journey, Thatgamecompany, 2012

Limbo

The art game "Limbo" (2010) is a 2D puzzle – platform game by Playdead. The character is wandering in a dangerous and full of traps environment, with gravity shifts (like a limbo state, meaning the in-between phase of life and afterlife) as he is searching for his sister. The aesthetic style of the game is characterized by a high contrast palette following an approach similar to Film Noir or German Expressionism Art movements.

Certain elements of the gameplay, like using shapes and outlines to convey objects, environment and characters are used like a "gap of missing knowledge" in order to enforce the player to unravel what is hidden, so as to fill-in the missing premises. The shallow depth of focus throughout all of the game, in combination with the grayscale palette and the outline of shapes that were used, convey a sense of uneasiness and mystery that indirect calls to the player in order to investigate it.

The name "Limbo" reflects perfectly this dark and unsettling visual style and succeeds at creating the state the term refers to. Limbo, according to Catholic theology is "*the border place between heaven and hell where dwell those souls who, though not condemned to punishment, are deprived of the joy of eternal existence with*

God in heaven"[16]. So, concerning the story of the game and its interpretation, some gameplay elements are successfully used in order to convey the sensation of an eerie atmosphere (a limbo state), elements such as the sister figure that is always portrayed illuminated by sun shafts, working as a guiding figure for the boy or the fact that flies and maggots accompany the player throughout the game or the final scene where the boy is called to traverse through a glass wall that when shattered, the following scene is identical with the initial scene of the game. Another significant element of gameplay is that through the whole duration of the game the player is respawned several times as he constantly dies during the different challenges of the game.

Every single aspect of this world aims at eliminating this frail child whose only quest is to find a way out. The protagonist himself is a shadowy figure whose only distinguishable characteristic is his white, shiny eyes. By adopting a minimalistic style, the game design creates a sense of distress (existential angst) towards the player with the usage of gigantic scale for the environment as well as for most of the enemies and traps. In spite of that difference in scale and the sense of anxiety the enemies cause to the player because of that, another factor of immersion for the user, is the fact that bodies and corpses that he comes across, disturbingly share the same size as the child. The audio, designed in a minimal way as well, enhances the experience of "Limbo". In some cases the user should be very careful concerning the sounds because they provide explanations and cues regarding the given puzzles. Despite the practical significance of sound, the lack of music and the great presence of silence contribute to creating an uneasy and suspenseful atmosphere, while the ambient sounds further immerse the player.

Figure 20 Limbo, Playdead, 2012

[16] Limbo. 2016. Dans Encyclopædia Britannica Online. Consulté le 17 Apr. 2016, tiré de http://www.britannica.com/topic/limbo-Roman-Catholic-theology

The Night Journey

Bill Viola's "The Night Journey" (2010) illustrates the story of an individual journey towards enlightenment, as was said: "*the archetypal journey of enlightenment through the mechanics of the game experience*"[17]. The Night Journey, unlike other games, does not implement a risk/reward logic, but rather an action/reward logic (Fullerton 2009). The visual content of the game has integrated excerpts of previous works of Viola in a three dimensional environment in which the player is called to navigate. This integration resulted in the creation of a black and white environment, which experiments with light, shadow, abstract forms and illusions. Moreover, various techniques and filters were used, such as a grainy overlay in order to successfully emulate the different works of Viola into one, without the usage of realistic graphics since the main focus is the user experience. The audio of the game uses often a sharp background wind noise, with combination of other environment sounds. A large part of the sound design is taken from Viola's original footage, therefore it enhances the blurriness of the atmosphere.

The goal was the creation of an "expressive geography" in which the user will navigate and through the game mechanics, evokes in the player's mind a sense of the archetypical spiritual journey[18].

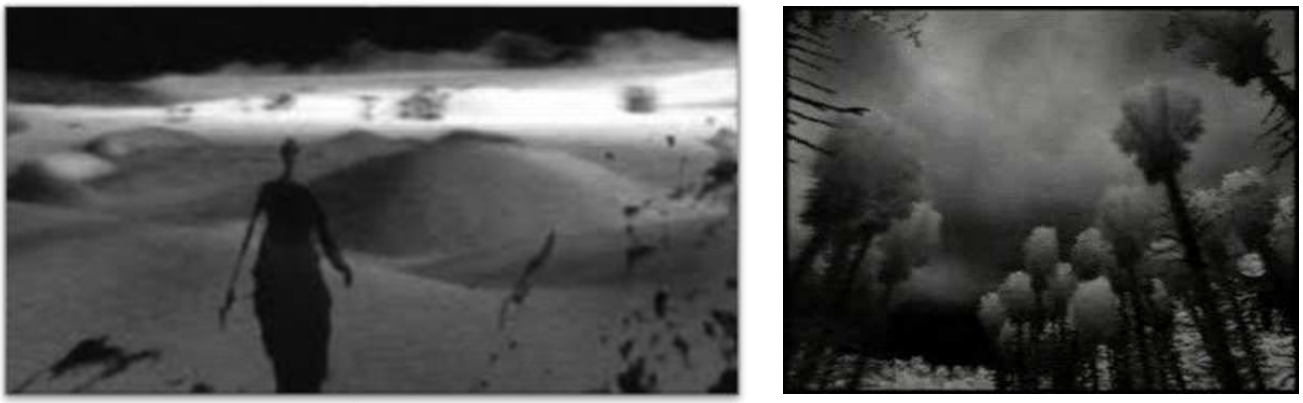


Figure 21 Bill Viola, The Night Journey, 2010

[17] As stated in the website of the project "The Night Journey". (n.d.). Consulté le 17 Apr. 2016, tiré de http://www.thenightjourney.com/

[18] Ibid.

Silent Hill

One of the most popular video games to induce successfully the feeling of living a terror, is the survival horror game called the "Silent Hill". The aesthetic elements of the Silent Hill series as a characteristic sample of the horror genre, were innovative enough so as to create a subcategory of the genre, entitled "psychological horror games" (The game successfully utilizes elements that create a reference on psychological horror game genre (Mortensen, Linderoth et al. 2015)). *If previous survival-horror games had tended to rely on tactics such as suspense, panic and the general threat of attacks to evoke unease in the player, Silent Hill ploughed far deeper into raw, psychological territory, making use of environments and events that were designed to toy with commonplace fears on an almost primeval level*[19].

Fear of the dark is only one of the common fears exploited by the creators of Silent Hill (Perron 2009), as its creators have made a survey before its release in order to investigate what fears are most common amongst people in order to take advantage of them in-game. *It was probably the first 3D horror game to actually make maximum use of darkness as a fear tool*[20]. The total absence of a permanent light source at many points in the game, force the player to illuminate his path either with a lighter or a torch, not to mention the pervasive presence of fog in outdoors environments. Using darkness as an atmospheric mechanism (Perron 2009), in Silent Hill 2 the color palette that was used was based on cold colors so as to induce a feeling of uneasiness, mixed with tones of red to color traces of blood. Moreover, the creation of realistic and architecturally familiar environments is an aesthetic choice that succeeds in immersing the player, since the places that would normally evoke a feeling of comfort and warmth have been transformed into places that cause anxiety, loneliness and uneasiness (Perron 2009).

Nevertheless, Silent Hill's frightening sensations are not only conveyed by the images, but by the audio as well. Akira Yamaoka's music that blends distorted melodies with violent percussion, combined with the environmental sounds and the

[19] Butler, Mark. September 13, 2011. "Opinion: Silent Hill Retrospective : FMV Magazine." FMV Magazine RSS". Consulté le 17 Apr. 2016, tiré de http://www.fmvmagazine.com/?p=1545

[20] Ibid.

voices, enhance even more the uneasy and foggy atmosphere imposed by the visuals. One of the most characteristic sounds that has been used in Silent Hill series[21] is the radio static sound when enemy is approaching (Perron 2009).

ART INSTALLATIONS

Chris Milk art installation "The Treachery of Sanctuary" (2012), it's an interactive installation that captures the human figure of the visitor and transfiguring it according to the art concept. The installation consists of a triptych of nine-meter high panels placed above a reflecting water-floor, and utilizes three Kinect systems. Each Kinect captures the people that are standing in front of it, and their silhouettes are projected on the corresponding panel. However, depending on the panel, the visitor is going to view a different reflection of himself. The three panels represent "birth, death, and regeneration"[22].

For Milk this process not only reflects the experience of being human, but also symbolizes the creative process[23]. The first panel, representing birth, transforms the visitor into a flock of birds. The whole of the visitor's body disintegrates, as the birds are born and start flying away. The artist explains the connection of the creative process to this visualization as "*That represents that initial moment of conception of both for the human and for the artistic inspiration*"[24]. The second panel depicts "*the critical creative response*", the momentary death of inspiration: "*This panel is a manifestation of self - doubt*". The birds that previously represented the birth, turn back to the body and start pecking it until it is destroyed. However, in the third panel, represents the moment of transcendence. The body grows immense wings itself, replacing the arms and symbolizing the rebirth of the creative process, the actual incarnation of the idea that results from the initial inspiration and its consequent death. The silhouettes of the participants, the bird flocks, and the wings are

[21] "Radio in Silent Hill Game." (n.d.). Silent Hill Wiki. Consulté le 17 Apr. 2016, tiré de http://silenthill.wikia.com/wiki/Radio

[22] "Chris Milk | The Creators Project." (n.d.) The Creators Project. Consulté le 17 Apr. 2016, tiré de http://thecreatorsproject.vice.com/show/chris-milk

[23] Ibid.

projected as black shadows on the white panels, creating an imposing result. Moreover, the clarity of the forms and the fact that the projections are immediately responsive to the visitor's gestures contribute to the aesthetic value of the installation.

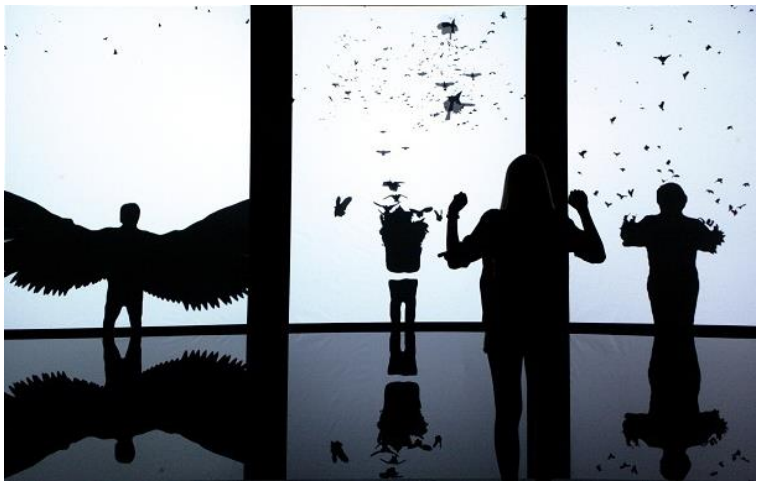


Figure 22 Chris Milk, The Treachery of Sanctuary, 2012

Alec Maassen interactive installation named "PHOBIA" is a projection – mapping installation that tends to create a notion of claustrophobia. Viewers step inside the structure to experience an audiovisual environment which is meant to create emotions like discomfort, anxiety, even paranoia[25]. Firstly, the environment appears charming with flashing black and white dots but soon the animations become increasingly intensive followed by edgy electronic sounds in order to create a sense of enclosure, referring to the pressure that the digital world imposes to the individual.

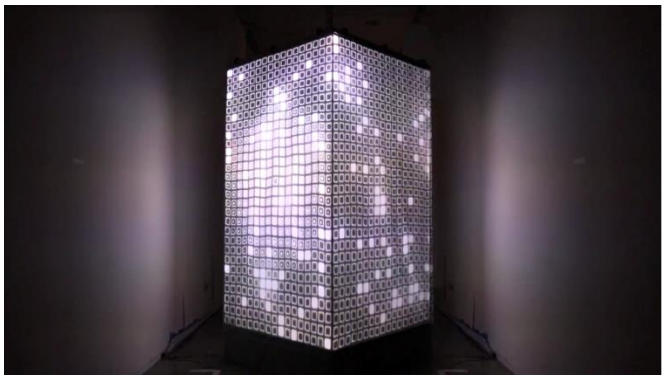


Figure 23 Alec Maassen, Phobia, 2015

[25] Pangburn. (2015). "Claustrophobia Goes Digital in a Terrifying Immersive Environment." THE CREATORS PROJECT. Consulté le 17 Apr. 2016, tiré de http://thecreatorsproject.vice.com/blog/claustrophobia-goes-digital-in-a-terrifying-immersive-environment

The Mending Project by the Chinese artist Beili Liu (2011) is an installation - performance that is consisted of hundreds of scissors hovering above the performer's head while mending, creating a sense of fear, violence, worrisome. Characteristic is the contrast between the calm and relaxing act of mending with the sharp scissors that hovering above of the artist's head. The artist, Beili Liu is sited in front of a black table mending different parts of fabric that is cut by the visitors of the installation which is mending, growing in size taking the whole floor.

Figure 24 The Mending Project, Beili Liu, Women and Their Work Gallery, Austin TX, 2011

Argentinian architect and artist Tomás Saraceno created an aerial interactive installation called ("In Orbit") in which you can walk on air through three levels of transparent nets that can be explored while suspended several stories off the ground. This installation was presented in the Art Museum «K21 Ständehaus" in Dusseldorf, Germany. Under the dome of the building at a height of over 20 meters, a 3-layer web-like grid was formed, enriched with huge reflective spheres. Much like spiders, the visitors could move around the air design, not seeing the floor under their feet, balancing on a swinging grid. The more daring ones could reach the higher levels, leaving them "floating" over a transparent net structure, looking down at the ground floor filled with other visitors, at a height of over 20 meters.

Figure 25 Tomas Saraceno, In Orbit, 2013

CINEMA

Vertigo, by Alfred Hitchcock, is a psychological film that illustrates the life of a police detective that suffers from fear of heights after an incident that costs the life of his partner. A phobia that costs him also the life of his lover as he couldn't overcome his vertigo and fears in order to prevent her from suicide of the top of the church's bell tower. A fact that costs him a lot and destroys his later life, forces him to search for his love in the face of another woman that looks similar to his lost love. There are several characteristic scenes in the movie that unravel the phobia of the protagonist: in the scene at the office of his friend Midge where he tried to "test" his phobia by ascending upon a chair and looking up and down consequently, falling down by dizziness after several minutes, in the scene in which he chases after his lover and the staircase starts to distort under his feet and in the nightmare in which he experiences an infinite vertigo drop. All those moments depict the difficulties of a person that suffers from a certain phobia has on a daily basis.

The story is based on a crime novel called "D'entre les morts" (1954) by Boileau and Narcejac, which Hitchcock adapted to create Vertigo. A characteristic technical element of the movie is the use of dolly zoom for the creation of the effect of the distorted perspective needed to illustrate the acrophobia of the protagonist. The title sequence, which was created by Saul Bass, has a unique characteristic style with a spinning spiral pattern which frequently appears in the film. That visual motif is reproduced throughout the film, for example in the staircases, in Madeleine's hair, in the nightmare of the protagonist while he falls etc. This spiral constitutes a symbol of obsession and madness but also illustrates desires of self – preservation and being drawn towards something that attracts us. A sense of repulsion and attraction, emotions that are both unraveled in the film. Also, the nightmare sequence that the protagonist suffers from, was created by the American painter John Ferren, whereas the sound of the film was created by Bernard Hermann, who successfully completed the narration of the film through his instrumentation.

Concerning the vertigo that the main character felt after chasing his lover, this can be attributed to the dolly zoom of the camera that subverts the normal visual perception. In that scene there are conflicting sensations of repulsion and attraction, while the shot was successfully used to transfer the feelings and terror of the character to the audience. Hitchcock was influenced by Freud and Psychoanalysis, an influence that is present in the movie like the illustration of the psychological problem of Scottie in the scene, for example, in which Midge said that her doctor told her in order for Scottie to overcome his phobia he should experience another emotional shock. The idea of overcoming problematic behaviors in the unconscious is key element of psychoanalysis and this element is presented in Scottie's nightmare. The color palette of the film has some idioms such as the use of green (eerie and uncanny images) and red (obsession and passion) colors to unravel different emotions.

Figure 26 Alfred Hitchcock, Vertigo,1958

Figure 27 Victor Burgin, The Bridge, 1984

Lost Highway by David Lynch is a thriller with film noir and psychological horror elements that is considered as a reference for dream situations, like a nightmare, since the main character inexplicably morphs into other characters, living different lives, portraying us the emotions and the thoughts of the main character through the other characters that are presented. Like a dark journey inside of the different levels of the unconscious, it has no linear structure. Characteristic is the initial scene of the movie with a car racing down an ominous dark highway, having the highway like an entrance into the main's character subconscious which is disoriented as he kills his wife, submitting him to a constant torment of punishment and guilt. As characteristically David Lynch said "*I learned that just beneath the surface there's*

another world and still different worlds as you dig deeper", like the existence of two different worlds and another between them. The dreamlike, hallucinatory set of images that illustrate one man's psychic journey down a lost highway of his own steam of consciousness and thoughts.

Figure 28 David Lynch, Lost Highway, 1997

The Cabinet of Dr. Caligari (1920) by Robert Wiene, is a movie consisted of elements of German Expressionism that tells the story of an insane hypnotist (Dr. Caligari) who uses a sleepwalker (named Francis) to commit murders. Unusual angles, distorted shadows and perspectives, high – light contrast are dominated in the film. The movie, was written by Carl Mayer and Hans Janowitz and directed by Robert Wiene, is identified by an imposing atmosphere that transfers "a distortion of the reality", using an obscure and eerie visual style. The imagery of The Cabinet of Dr. Caligari is characterized by violent contrast of light and darkness, a common attribute of the German expressionism movement. The aggressively distorted sets of Hermann Warm, which consist of sharp angled structures and the combination of intense chiaroscuro with distorted settings abides by the insanity of the narration itself (Eisner 1969).

Figure 29 Robert Wiene, The Cabinet of Dr. Caligari, 1920

The objects by which the set consists of seem to share the protagonists' madness, and, as Eisner states the most aggressive abstraction and distortion in the setting, can be located in the prison-cell vision, where the oppression of the prisoner is illustrated onto the cell itself. Black and white arrow-shaped forms decorate the walls cell, heightening its imposing nature, and crossing on the floor where the prisoner is sitting, chained (Eisner 1969). As Georg Marzynski in his book "Methode des Expressionismus" (1920) refers that a selective and creative distortion gives the artist a means of representing the complexity of the psyche, by linking this psychical complexity to an optical complexity and he can then release an object's internal life, the expression of its "soul" (Hruby 1941).

Repulsion (1956) by Roman Polanski is a drama movie that illustrates the fears of a sex – repulsed woman that disapproves of her sister's boyfriend, leading her to depression and suffering from horrific visions of rape and violence. Carol exhibits a pathological shyness and repression that transforms into madness when her sister leaves for holidays. Carol starts having hallucinations and obsessions like hands reaching out of the walls, walls shifting and trembling, clocks ticking constantly etc. The obscure, grayscale palette, the use of camera angles (wide angles and close – ups), the sounds of everyday life all convey the message that illustrates the Carol's fear and obsession.

Figure 30 Roman Polanski, Repulsion,1956

PAINTINGS

The depiction of an eerie and fearful atmosphere can be found in various forms of art such as painting, cinema and games, presented in various art movements. Paintings illustrating anxious emotions, delirium and terrifying situations can be found among artistic movements like the Romantics, the Expressionists, the Symbolists etc. Artists like Hieronymus Bosch Francis Bacon, Goya, Vincent van Gogh etc. through their artworks evoked an eerie atmosphere.

There is a vast majority of works that create a dark and hazy atmosphere or depict people that suffer. Paintings in which the use of light, color, shadows, lines and boundaries as well as their theme, transmit the feeling of the sufferer, whether this is the painter or the person portrayed. That said, we will examine various works of art created by different artists in concern to the anguish and turbulent atmosphere that many evoke due to their theme or personal experiences of the creator.

Edvard Munch

Edvard Munch (1863 – 1944), was a Norwegian painter that belongs to the expressionism movement. He used mixed media and techniques in his artworks in order to express a particular mood or psychological state, having as seminal inspiration memories of his past or self-experiences, as he characteristically said "*I paint not what I see but what I saw*" (Trosman 2000). Art according to Munch "*is the pictorial form created by the human nerves – the heart – the brain – the eye*"[26]. "*We want more than a mere photograph of nature. We do not want to paint pretty pictures to be hung on drawing room walls. We want to create, or at least to lay the foundations of, an art that*

Figure 31 Edvard Munch, The Sick Child, 1885–86

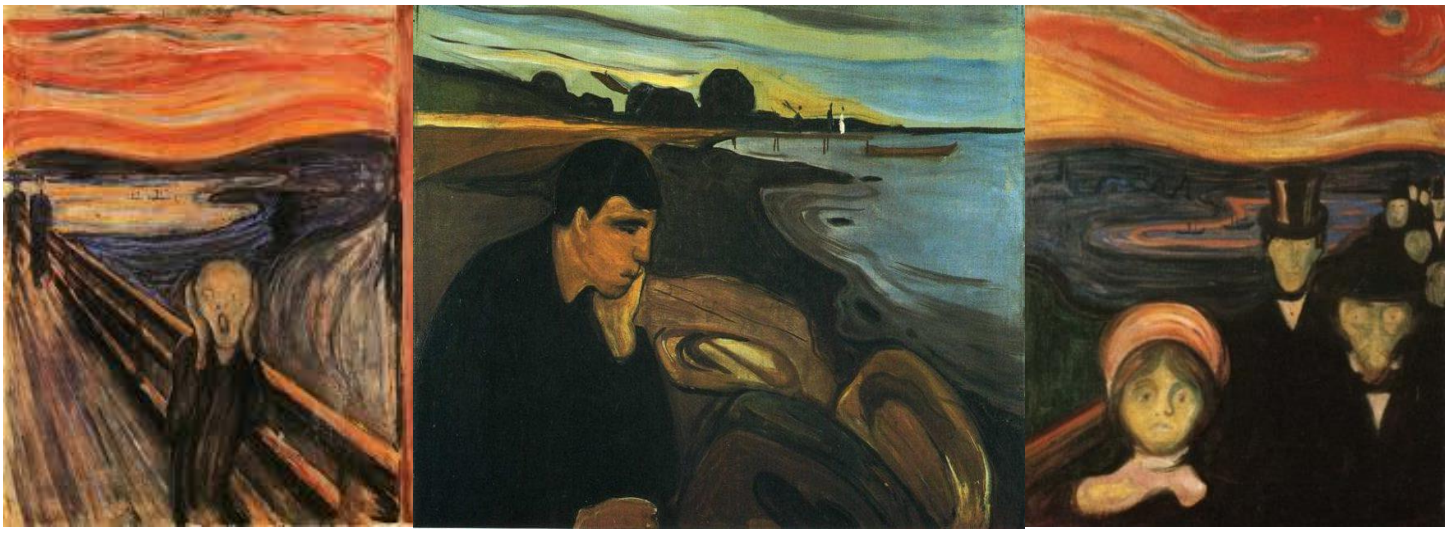
[26] Byatt, AS. 22 June 2012. "Edvard Munch: The Ghosts of Vampires and Victims | AS Byatt. "The Guardian. Guardian News and Media. Consulté le 17 Apr. 2016, tiré de http://www.theguardian.com/artanddesign/2012/jun/22/edvard-munch-ghosts-of-vampires-and-victims

gives something to humanity. An art that arrests and engages. An art created of one's innermost heart"[27]. Munch's art is characterized by intense expression of raw human emotion and interest on depicting different psychological states that make his artworks uniquely appealing. His art was very influenced from various traumatic events that happened on different periods of his life, such as childhood tragedies, personal pain, grief and his peculiar relationships. *"Disease and madness and death were the black angels standing over my cradle"*[28]. His paintings illustrate the macabre and ambiguity that he suffered, translated through the artistic style and theme of his paintings. For example, the painting of his younger sister having as theme her sickness or the various memories of his childhood or other paintings that illustrate him in anguish and turbulence. Intense colors and curved lines often characterize his works. Munch was very influenced from the losses that he experienced in his family circle, especially those of his mother and younger sister who occupy several of the main themes of his paintings. He had a personality that suffered from different types of psychosis and phobias and for a short period of time was hospitalized, suffering from chronic depression. Paintings that are considered as landmarks of his work that illustrate his suffering can be considered the following: The Sick Child, The Cry, The Dead Mother, Self – Portrait in Hell, but also paintings that describe different emotional states such as the series of paintings that exhibited under the title "Frieze of Life" that includes: The Scream, Anxiety, Melancholy, etc. In these images the color is used emotively, and they were made to be displayed collectively as a symbolic celebration of the "poetry of life, love and death". Concerning his most famous oeuvre entitled "The Scream", the dominant colors of the vibrant sky enclose the centered, almost uncanny figure of the painting, being on "*the mercy of external forces or his own thoughts*". As the artist referred about that sensation himself: "*I was walking down the road with two friends when the sun set; suddenly, the sky turned as red as blood. I stopped and leaned against the fence…shivering with fear. Then I heard the enormous, infinite scream of nature".* The painting, by expressive brushwork and color, illustrates the

[27] Ibid.

[28] Edvard Munch. (2016). In Encyclopædia Britannica. Consulté le 17 Apr. 2016, tiré de http://www.britannica.com/biography/Edvard-Munch

overwhelming anxiety and emotional turmoil, distorting the natural world, in which the screaming figure is swept in. Also, in "Anxiety" the dark figures convey a similar emotion, the sense of isolation and alienation, a common sentiment in the modern urban environment. All of his works are inspired by a sense of mortality, a quest for self-discovery and transferring a constant suffering from ambiguity and anxiety. Munch in the last decades of his life, would create more peaceful artworks, even though he would always return to his more dark themes.



Figures 32, 33, 34: Edvard Munch, The Scream (1893), Melancholy (1891) and Anxiety (1894).

Francisco Goya

Francisco Goya was a Spanish artist that belonged to the Romantic and Expressionism art movement. Goya's works can be categorized in two different periods (Felisati and Sperati 2010): the first one was devoted in creating portraits and tapestries as he was working as the main painter of the Palace Court in Spain. In the second period, being able to express himself freely and due to his illness (1973) that led to deafness, he became influenced and his works consisted of darker paintings such as: "Les Caprichos" (a series of works that point out to criticize the individual's bad habits or criticize the authorities), "the Disasters of War" (that referred to the terror and violence of war between France and Spain) or "the Black Paintings". Many theorists support that this change was a result of his severe illness (Felisati and Sperati 2010). As he

characteristically wrote in his friend of him, Bernardo de Yriarte, in 1794, "*my illnesses, and to compensate in part for the great wastes of time they have cost me, I have dedicated myself to painting a group of cabinet pictures in which I have succeeded in making observations that ordinarily find no place in commissioned works"*[29]. Worry, anxiety, madness (with horrific and fantastic imagery) dominated his works due to his fears for both the political situation in Spain and the fear of deterioration of his own health (psychological and social influences). Monstrous, tragic, dark figures expressed the desperation of the creator's condition. Almost absence of light, figures that constantly appeared off centered, grotesque faces with wide eyes, limited palette of colors: ochre, grey, brown and black characterize his work of that period. Differences in the usage of color and style illustrating the figures can be observed between Goya's artworks of the two different periods. A characteristic example of this is the painting *Prateria di San Isidro*, produced in 1788 that was created before his illness, depicting a calm and soothing crowd gathering for a fest, using joyful colors. *San Isidro Pilgrimage* (1820-23) however, was recreated by the artist after his illness, and depicted the same scene with a very different aspect. The colors and mood are grim, the characters are now monstrous and despaired, and the whole painting evokes a sense of despair and insanity.

Figures 35,36: Francisco Goya, Prateria di San Isidro, produced in 1788 and San Isidro Pilgrimage,

[29] "Goya's Unflinching Eye." 04 Oct. 2003. The Guardian. Guardian News and Media. Consulté le 17 Apr. 2016, tiré de http://www.theguardian.com/artanddesign/2003/oct/04/art.biography

John Vassos

John Vassos is an artist that created a number of illustrations considering phobias. He produced a great number of pop art illustrations based on grey scale colors and sharp edges, influenced by art nouveau, art deco. An industrial style characterizes all of his illustrations, by which he tries to illustrate types of fear from which people are suffered in. As characteristically said by himself "*A phobia is essentially graphic. The victim creates in his mind a realistic picture of what he fears, a mental image of a physical thing*". As he by himself starts his book by saying "*I must begin by apologizing. I am not a psychiatrist*", starts to write about that book when himself becomes to suffer from a type of phobia, needed the help of psychiatrist. Short texts accompany each type of phobia that he illustrated, like acrophobia, for example. The sufferer fears heights both because of being afraid of falling and to restrain himself from the giant leap of release. In his illustration regarding acrophobia he depicts the individual diving into the void, risking to cease to be.

Figures 37, 38, 39, John Vassos, Pantophobia, Batophobia,,Astrophobia, 1931.

Conclusion

Concluding, every work of art, regardless of its thematic, is unique because of its creator's perception, whether this work is a painting, movie or a virtual application. Besides, art has a unique role in conveying the creator's emotions and feelings, by illustrating thoughts and desires that could even be hard to express. It plays the role of exhilaration-catharsis for both the creator and the spectator. In a work of art, man beholds himself as the creator of an autonomous world, in which he merges the experiences of self and the perceived world. Through art, not only emotional upheaval is unraveled through the spectator's response to the artwork but also a change in cognitive attitude occurs as well.

Although common elements can be identified among the works of art regardless of the artistic means used, what makes the depiction of their theme so imposing, most of the times, is the sincerity of the artists towards their own experiences and emotions. Nevertheless, the identification of these elements is a powerful tool in the creation of a new work of art that is associated with fear and an imposing atmosphere. The common characteristics among these works of art can be divided in two interconnected categories. The first category concerns their theme, while the second category relates to the materialization of this theme. As far as narrative is concerned, the given artworks evoke emotions that induce fear, anxiety and tension even though some may not have direct references to that certain theme.

Among the works of art stated, many are visualized using a potent chiaroscuro, or even highly contrasting black and white imagery, like in "The Cabinet of Dr. Caligari", where even the forms of the settings are violently sharp. Other works use hazy and foggy imagery, like Viola's "The Night Journey" and induce an eerie atmosphere merged with fear of the unknown. Violent colors, mingled with darkness, are often used from Goya to describe his depiction of reality. Sound on the other hand, contributes uniquely in the creation of fearful atmospheres. Noise and generally indistinguishable sounds deliver a perpetual feeling of anxiety and doubt. The equally high pitched sounds of various elements, such as the sirens in "Silent Hill", elevate the fearful atmosphere. The presented elements however do not ensure, if incorporated in an artwork, the artwork's success on conveying feelings. As stated, the personal inspiration and experiences of the creators is the key-attribute to the generation of these works of art.

CHAPTER 3:

Chapter 3

In this chapter begins with a brief analysis of contemporary applications of virtual reality in the field of medicine. This includes the new technological advancements that occurred in this specific field, such as adaptive environments that can evaluate the state of the user in real –time and manipulate the environment accordingly, dynamic perceptual stimuli and methods of capturing, testing and studying the behavioral responses that are used in order to create virtual clinical assessments. Although, an important issue that is unraveled is how the sense of presence can be amplified in Virtual Environments in general.

More specifically, the research conducted concerns the terms and key factors of immersion and presence inside of a virtual application. Emerging issues occur regarding how users can identify themselves in the virtual space and how embodiment can be better achieved, without feeling motion sickness or a sense of uncanny.

Also, in this chapter gameplay is examined as a means to create immersive environments. Psychological horror gameplay elements are analyzed as the most relevant genre in creating an intimidating atmosphere. Examples of gameplay and interface are being investigated concerning the means deployed to create atmosphere and challenge the player. Emphasis will be given to the elements that can be used to simulate a phobic state.

The use of VR in clinical assessments

Virtual Reality Simulation Technologies have emerged for medical and clinical training purposes, amongst others, through technological developments in computer processing power and speed, in computer graphics, advances in image resolution and real-time rendering, body and facial tracking, haptic devices, artificial intelligent systems and overall virtual reality optical systems (HMD) that expand accessibility by establishing low cost systems that can run even on a personal computer. This gives scientists a great tool to create and control stimuli through virtual spaces and methods of capturing, testing and studying the behavioral responses of their patients which lead to be the base for training, experimenting and even creating clinical assessments with stunning results. Adaptive virtual environments, artificially intelligent systems and virtual actors are thriving in the field of health care. Through the beneficial results and positive feedback from the users along with the available technology and research, those become the factors that fueled the evolution of medical virtual reality. Therefore, the use of virtual reality in assessment and rehabilitation of human cognitive processes is becoming even more dominant.

Virtual reality is a powerful tool that helps to examine brain functions and the neural mechanisms that underlie sensory – motricity human system (Parsons 2011). Virtual reality applications experiment in order to control – modify the sensory information (vision, touch, proprioception, vestibular signals) that the nervous system uses in order to perform a motor task, or the mechanisms to perceive a stimulus (Parsons 2011). Also, adaptive virtual environments measure the behavioral, biological and psychophysiological data of the user, processing them in real–time in order for the system to evaluate the state of the user and in order to dynamically manipulate and improve the characteristics of the environment and interface so as to facilitate the achievement of the specific behavioral goal.

A whole new growing trend is the use of computational technology and virtual reality in the fields of psychology and neuropsychology (Parsons 2011). This begs an emerging question regarding the use of virtual immersive environments for producing ecologically valid neuropsychological assessments that will combine the psychometric rigor (“veridicality”) / veridical control of laboratory measures and

the verisimilitude of real life conditions (Parsons 2011). The opportunity that virtual technology offers is such that it creates and manages dynamic perceptual stimuli (vision, sound, haptic conditions etc.) providing neuropsychologists with significant statistical and clinical tools in order to record and store different neurobehavioral responses that unravel from complex stimuli (Parsons 2011).

It has been observed that many virtual reality assessments pay more attention on verisimilitude of the virtual worlds, meaning focusing on realism in graphics and spending less attention on the domain of veridical control and the way of measuring, collecting and storing the data of the experiments (Parsons 2011). For example, the lack of information regarding the sense of presence, immersion, anxiety and phobia duration, demographics clues, leads to not being able to generalize, test and conduct the experiment to every patient, for example, suffering from anxiety disorders. Virtual reality experiments that are not addressed to certain control groups or that have not been tested randomly as clinical trials, they cannot offer potentials to identify possible moderators of affective improvements, type of treatments, duration of sessions etc. (Parsons 2011). The existence of a module/ mechanism that will provide a constant pace of data regarding the state of the user during the exposure to the simulated world as self–reporting data, in combination with a proper recording, measuring, storing of the appropriate data, will allow scientists to create ecologically valid experiments. High and low fidelity environments can be adopted regarding the type of study is necessary. High fidelity environments are more accurate for tests that want to succeed ecologic validity because they recreate like real world situations in which is better captured the user's performance (Parsons, Iyer et al. 2009).

PRESENCE – IMMERSION

The appropriate level of fidelity of a virtual reality environment raises numeral questions regarding the "usage" of presence and immersion in a simulated environment. The part of presence and immersion has been significant not only for medical applications dependent on VR but also for the overall virtual experience while participating in such environments.

By the term presence, it is considered to be the response of the user to the environment, meaning the feeling of existence and awareness of the person

(Parsons, Iyer et al. 2009). There have been whole new discussions regarding the experience of presence in a virtual world. Every developer that begins to create an application has as a primary focus to make his user feel like "alive" in the virtual world. *Presence is considered the subjective experience that a user has of being in a virtual world even if he isn't physically on that environment* (Witmer and Singer 1998). According to Carrie Heeter there are three dimensions of presence: Personal presence, Social presence and Environmental presence (Heeter 1992). Personal presence is a measure of the degree in which the user relates to and which causes drive him to feel like he is really in the virtual world. For example, if someone can see his nose inside of the HMD or if the 3D world evokes a sense of familiarity to the user. Social presence refers to the extent that other beings that exist in the world, appear to react with the user. Finally, Environmental presence concerns the way the environment reacts to the user input, making the player feel like being there. Additionally, according to Sheridan presence is a subjective sensation and he suggests three physical variables that determine presence: extent of sensory information, control of relation of sensors to environment and ability to modify physical environment (Heeter 1992).

Presence is often related to the focus and attention of a virtual stimulus, alongside involvement and immersion (Witmer and Singer 1998). According to Witmer and Singer involvement is considered to be the state of mind which derives from focusing the individual's attention and effort on a specific range of stimuli or related trigger activities (Witmer and Singer 1998). Involvement is relevant to the interpretation of the individual of the importance of each related stimulus, acting accordingly. As the user pays more attention on the artificial environment, this renders them more involved in the overall experience, leading to a greater feeling of presence inside of the Virtual Environment. In order for the involvement to work, the user must be intrigued and challenged, with all the related game techniques acting in his favor in order to push him deeper into the virtual reality experience. However, this involvement is many times compromised due to various factors occurring outside the Virtual Environment, such as personal preoccupations of the user, distractions or motion sickness and discomfort.

On the other hand, immersion is considered to be the state of mind in which the individual considers oneself to be part of and surrounded by an interactive

environment that feeds him with a constant flow of information and stimuli. Directly related to the quality of the immersion a virtual environment has to offer, is also the experience of presence. In order however for the immersion to be successful and truthful, a number of factors must be taken into consideration. Achieving complete isolation from the physical environment is required in order to make the virtual environment more believable. The user must be navigating in a very familiar manner, interacting and controlling elements closely to their physical counterparts.

In order for the immersion to work, a key element to this is the visualization method used, such as a helmet-mounted display like Oculus Rift that corresponds to user head movement, creating the illusion of presence within the virtual environment. A crucial part comes then into play that is directly linked to the visual quality of the HMD (Head Mounted Display), (its analysis), its response time as well as its comfort factor in order for the user to feel as comfortable and familiar with it as possible, forgetting its existence whilst in the virtual space. This cannot be achieved using different visualization technologies, such as a monitor display for instance, since the user becomes a mere observer and needs to provide separate input so as to control the head motion, failing to feel immersed. Poor control input can affect the overall immersion experience, making gameplay and accessibility two separate factors that influence immersion by themselves. Therefore, most virtual environments are focusing on presenting the user a set of controls, stimuli and virtual options in order to succeed immersion and enhance the sense of presence for the end user.

Concluding, the parameters to create immersive experiences are multiple and vary depending on the nature of the experience the creator is aiming for. Especially, as far as interactive virtual reality experiences are concerned, every aspect requires consideration. Moreover, under the spectrum of virtual reality, narrative, interface, gameplay and audiovisual stimuli, all have to be taken into account both as separate elements and as an interconnected system where every part affects and enhances the other.

Types of Immersion in Games

Immersion plays a very important role in perceiving a virtual environment, that may not necessarily be realistic, but still makes the user feel immersed. Immersion could be categorized in four different types. The first type that is referred to as "Tactical immersion" according to Ernest W. Adams or "Sensory-motoric immersion" according to Bjork and Holopainen (Bjork and Holopainen 2005), concerns the fast and skillful execution of a series of challenges, as the ones presented in a first person shooter game. Those can be reflex-based, with quick hand to eye coordination maneuvers that are facilitated by sharp interface design, predictive enemy patterns and an overall adrenaline-based experience. A good example of this is the "Call of Duty" series, a fast-paced first person shooter game. Its gameplay relies heavily on the challenges and objectives presented to test the player's reaction skills, providing a sense of immersion that although appears to be "simplistic", is in fact very addictive in nature.

The next type is referred to as "Strategic Immersion", or "Cognitive immersion" and challenges the user in a mental state of immersion. This is very similar to the mentality of a chess player, as the user is deeply immerged into the logical outcome possibilities that will grant him access to the next challenge. A very popular game series of such mentality is the "Command and Conquer" games. The player is controlling resources, building a base, managing and developing an army, with utter purpose to eliminate all other players on the map. The game is viewed from a top-down, three-quarters perspective. Key factor of this immersion is the "greedy" gathering of as much resources as quickly as possible the game has to offer, and the use of a cunning strategy to defeat the opponents.

Another type is the "Narrative Immersion" or "emotional immersion" in which the user empathizes with the characters through the gripping storytelling, much as presented in other forms of media such as cinema and literature. The game becomes in a sense an interactive adventure, much like the "Assassin's Creed" series. The player empathizes with the main character further, since he is observing the character immersing himself into a virtual machine, in order to unfold the memories of the hero's ancestors. The gripping storytelling, the game mechanics,

the immersive narrative and the convincing virtual performance of the actors, all play key roles to the player becoming the alter-ego of the main character.

Finally, there is also "Spatial immersion", which refers to delivering a virtual world that is so convincing that the player is deceived. An example of such immersion seems to be offering the game "The Division". This third-person shooter delivers a great deal of realism, providing a cityscape so rich and detailed that the player actually feels immersed. With the ongoing development of real-time graphics however, spatial immersion will become a common standard.

Concluding, computer games nowadays come in many flavors as they are available to a wider audience than ever before, with a greater variety of end-devices and means of interaction. Despite all that, one common factor successful games share is that of user immersion. In order for a game to become and stay appealing to a user, it must trigger his attention in order for him to devote time. The immersion factor is what plays a key role to not only transfer mentally the user into a virtual world, but also to tell a story in such manner so as to keep the user hooked. Immersion is not always associated with realistic computer graphics, as many might believe. On one hand, it can be related to the technological advances of an era, as in the case of "Wolfenstein 3D", the game that is considered to be the father of the "first person shooter" genre. ID Software in 1992, changed the perspective and freedom of the player at the time. For the first time ever the user would have a point of view of the action, directly from the main character's perspective, thus emerging the terminology "first person". This would not only give a great sense of immersion for the player at the time, but also a great deal of freedom since the player would be able to roam free inside 3d environments. Despite the scenario and gameplay, this technological achievement was a major step for computer entertainment, as well as Virtual Reality. From the CRT monitors of over 20 years ago and the pixel-based entities, to the VR (virtual reality) helmets and the 3D avatars used for interaction nowadays, immersing the user more than ever into virtual, alternate universes. On another hand, immersion can also be achieved by clever storytelling and interactive decisions the player's persona must take, a combination of which sinks the player into character. A good example of such tactic would be Telltale's "The walking Dead: Season one" of 2012. Despite the cartoonish graphics, Telltale not only managed to revamp the adventure genre, but also to create empathy for

their main protagonists, so that the user would follow up on the next episodic release of the game. The game creates a sense of immersion through storytelling, character development and the timed interactive decisions the player has to make, achieving different results and plot twists. This is similar to the empathy levels one may feel watching a movie and mentally assuming the role of the protagonist, but thanks to the virtual environment and interactivity, evolves from a passive state to a more active one.

Last but not least, a great deal of progress as far as the user input is concerned, was the development and implementation of various input designs over the years. Although not all successful at first, the constant need for innovative, responsive and familiar ways of input devices evolved means such as the "joypad" to motion tracking cameras such as "Kinect". The player is no longer constrained to the physical limitations of a fixed input device, nor needs to be already trained and familiar with the functionality a joypad has to offer. Now with the use of full body motion tracking, the user can act out a set of moves that will translate inside the game that will allow a great deal of immersion and presence.

Horror Games

Fear is one of the most dominant and inherent emotion that works protectively. Game industry shows a big interest to the recreation of the sense of fear and the development of games that evoke such a sense to their players. Different games, from Resident Evil to Amnesia: The Dark Descent, have defined the survival horror game genre by successfully engaging fear, tension and anxiety to the players.

Anxiety is from the most prominent emotions that are created through videogames, but is not an emotion that arises according to a certain threat like fear does, rather than a feeling of excessive ambiguity for the future outcome of a situation. An emerging threat results in anxiety that rises the attention and sensitivity reaction of the player. For example, the demand of solving a riddle while the enemy is running after you, is a key element to peak the tension and anxiety of the player. In Silent Hill, it is usually asked of the player to solve a puzzle or a riddle in order for the story to be unraveled, whilst pursued by threatening creatures.

More specifically, there are a lot of elements that define horror games and their mechanics in order to be successful. In an immersive game the player actually

projects himself into the experience than simply watching or empathizing with the actor of a movie. The choices that are given to the player, even in a trivial degree, offer him the feeling of "presence" in the game and a sense of being a part of the story. With the player fully immersing himself in the world, fear becomes much more intense. A very important emotional response that such games are providing to the users is the sense of achievement, by reaching a high score or by helping and saving someone's life after following the game's scenario. Also, if his avatar dies, the player must replay the certain scene of the game in order to move forward in the game's story. The early Resident Evil game featured fixed camera angles forcing the players into some pretty terrifying experiences, such as walking down a dark hallway towards the camera and thereby not seeing what was ahead.

When the player confronts horrific content, in combination with ambient noises and creepy soundtracks, those will increase his feelings of excitement and anticipation. Moreover, the similarity of the content with real life scenes and familiar experiences can increase the immersiveness and fright levels of the game. Immersion is an important factor for experiencing the story delivered by the game. Also, it is important to have consistency throughout the game, with direct feedback between the player and the environment and even in the case that there is an illusion of interactivity, it is crucial for the player to feel that he can alter the outcome or achieve something inside the game. Challenge is the core of the gameplay and a trick to keep someone constantly focused on the given task is to provide him with clear goals, no distractions and give direct feedback. Gradual difficulty on gameplay is the way to create an increasing stress experience to the player, or by including brief intense interruptions that will thrill the player.

Regarding the sound design of the game, it is important in order for the player to feel like he is really within and relate to the situations, to have a solid sound structure that follows the narration of the game. Sound can work like a narrative that establishes the story and environment of the game. Also, it helps the player by providing him relevant information to achieve goals or warning him of dangerous situations. When such feedback is established through the game, the player feels the whole experience more subjectively, as he feels that he has access and feedback from the world. In horror games, sounds play an essential role in order to create an unease environment and to provoke to the players the sense of fear and terror,

create contradictions and affect the player's psychology in both conscious and subconscious levels. In Silent Hill for example, the villagers turned into nightmarish figures when the siren would begin to sound.

Also, the graphics define the visual style of the game, trigger the player's focus and create anticipation for the upcoming events. For example, beautiful environments, many times, work like a reward to the player, in contrast to grim images that aim at creating fearful emotions and responses to the players. Horror games focus on creating tight and ambient environments, through the use of intense contrast in color and shadows.

In a horror game an important element is to create a sense of unfairness, based on the player's given abilities and the game challenges. Also, it is essential for the game to have a constant flow, in order for the player to not feel frustration and the difficulty to gradually increase, so as to progressively expose the player to the different level of skills and abilities. This creates a balance in the game, despite the fact that horror games are considered to be more demanding by positioning the player constantly in a state of worry and with the possibility of failure.

Gameplay

Interactivity and gameplay are the elements through which the player responds to a videogame. When a player performs an action, he expects a certain response from the game. This action – reaction system and its route is the key element, and if broken, it can surprise the player and make him experience feelings of fear, agony, anxiety and uncertainty. Games are unique in the way that they give to the player the chance to almost "live" the experience, take decisions and actions unlike passively watching a movie or reading a book. They are considered more immersive because the player can relate closely with the protagonist and feel empathy towards him.

Regarding the type of games that exploit relevant technics, psychological horror games is the most suitable genre to examine in regards to phobias as it successfully induces tension and fear to the players without the existence of an identifiable enemy. As the purpose is to create a user-experience that will simulate a phobic

environment, analyzing examples of psychological horror gameplay is essential in order to accumulate methods and techniques used to trigger such reactions. Fear could be described as a defense mechanism our nature offers, in order to survive and face various threatening situations. The hidden satisfaction of being thrilled is a common recipe that the entertainment industries use.

More specifically, fear of the dark is a common theme that many games have explored and exploited over the years. One such game for example, that uses real-time lights and shadows to intimidate and terrorize the player is Alan Wake. The main hero is a screenwriter, exploring an altered, dark world dominated by shadows. Using light as his weapon, he must escape shadowy nightmare figures that pursue him as he fights or runs to salvation. Fear of the dark is a primal response many experience, since from human nature and neurobiology our bodies are built to function in a daytime circadian clock. This means that we consider daytime to be the safe and normal state of things, directly opposite to a nocturnal entity.

Concerning the research on psychological horror videogames gameplay, amongst the common key elements that are usually found in such games is for example the sense of disempowerment. This means that the user is deprived of any means to defend himself in a dangerous situation, enabling a sentiment of helplessness. The only "escape" is running or hiding from a present or implied danger. A great example of such type of game in which the player doesn't have any type of defense mechanism is "Amnesia: The Dark Descent". An identical feeling possesses a patient of a certain phobia when facing the fear stimulus, by which he feels completely helpless, unprotected and vulnerable. Other games have taken this concept further, leaving the player weak and helpless, as in the "Silent hill" series. Those games place the player in a situation where he is forced to run in order to survive. The threat is near, or at least that might be the impression given to the player in order to keep his anxiety levels high. Being unarmed also increases the tension to the user. Frightful emotions are successfully transmitted despite the fact that most users are subconsciously aware that there is no real threat in the actual world, no matter what they may experience in the virtual one. Another element to increase the effect of disempowerment is through cutscenes, which are used in

order to present a part of the story after which the player is suddenly left to face the dangerous situation.

Another gameplay element of the horror games is the rise of tension. Tension is connected to disempowerment, since most of the times it is the helplessness of the player that leads to situations of increased tension. Many times in games the player will be forced to solve some kind of puzzle while running to escape from a certain enemy, or be called to perform more complicated tasks like following directions, raising the pressure and the agony of the player.

Many games will use a combination of fears, or make associations with fearful events in order to trigger anxiety to the player and keep him alert. Dead Space for example, uses many such gimmicks. In one of its most famous sequences, the main hero lies down in a medical bed and the user has to drive a needle in the main character's iris. The tension and anxiety levels are constantly rising by watching the virtual heartbeat of the hero and his fear response, as the needle approaches his pupil. The user is placed in a very awkward position and must overcome this trial in order to continue the game, without accidentally killing his avatar.

Uncertainty and discontinuity is another element of horror games. Making the player feel like a lost soul, doubting of the necessity of his actions as he rambles around the world. "The Void" is one of such games that leaves the player wandering and restarting the game in order to see different types of outcomes. The motifs of dark, foggy environments, narrow corridors with multiple doors and environmental noises are considered as elements that transmit fear and uncertainty to the player. Also, the backstory of the protagonist many times plays a crucial role in survival horror game genre because he is usually presented to be suffering from a condition such as certain phobia, amnesia, insanity etc. that deteriorates his performance.

Last but not least, another element is priming, which in the psychological terminology, has to do with the association of a stimulus with certain object or situation. That means that a bad experience with a specific stimulus in the game, will have the user associate that stimulus with the feelings it triggered, as is the case with fear. For example, the game design may be using a specific object as the spawning ground of an enemy creature, such as the air vents in Dead space. Once

the player experiences a sequence in which he is found under a stressful situation from a creature that lunged from an air vent, he has then associated that experience with the particular object and is constantly alert whenever an air vent is insight. This, on the other hand, can be used to trick the player while traversing a region of the game that is considered to be safe. In Doom 3 for example, early on in the story the areas the user accesses offer a sense of security. Later on in the story however, the developer is taking advantage of this "false safety" sensation the player has associated with the area, presenting new threats that will startle the user.

VIDEOGAMES ANALYSIS

A well know game title is Resident Evil, taking its name from the original title in which a SWAT team is trapped in a mysterious mansion and must solve riddles while fighting zombies. A poor input mechanism would have the player first rotate the character around his axis in order to turn, instead of moving the joystick directly to the desired direction, so this became an extra anxiety factor for the actual user as he would try to escape a situation. Later on, throughout the game, an unstoppable force is pursuing the player, that is indestructible, giving the choices to either run or die. This was also used in several games, such as Silent hill and Amnesia, where the player must use the environment and shadows to hide. Depriving control from the player whilst in a threatening environment, causes an increased feeling of fear and anxiety. By being virtually helpless, one is bound to endure the threatening situation and empathize further with the virtual protagonist.

Silent Hill

Silent Hill 2 by Konami unravels the story of James, who receives a letter from his ex – wife telling him to meet her in their special place, a place called Silent Hill. With distorted realities and obscure locations, this certain game plays with the psychology of the player, who balances between sanity and madness. The style of the game follows a realistic approach with sort abnormalities to promote confusion and disturbance. Faint colors are used varying from sepia tones to blue – grey tones for the outside environment, which creates even subconsciously the sense of isolation and loneliness. The use of color creates this sense of a hostile environment while red color is only used to symbolize blood and violent scenes that previously took place. Also, the use of thick fog creates a difficulty for the player's vision, hiding the potential danger, increasing the sense of terror and the tension. The monster-characters of the game have a

characteristic artistic style, like the style of the "Mannequins" by Hans Bellmer, which concern photographs of dolls in bizarre poses. Another intriguing character was the one of "Pyramid Head", with a large metallic pyramid – shaped helmet, unusual animations and actions that created a sense of uncanny and an eerie feeling.

Figure 40 Silent Hill 2, Monster Pyramid Head, 2001.

Figure 41 Hans Bellmer, Mannequins, 1935 – 1938.

Alan Wake

Alan Wake by Remedy Entertainment was published in 2010. It describes the story of a writer that tries to unravel the mystery of his wife's disappearance. The whole story is based in the fight between darkness and light. A characteristic of the game is the certain tension that is triggered when time runs out as the player tries to accomplish certain missions or when the beautiful environment is turned into menacing when danger appears. The protagonist suffers from temporary amnesia, which increases the confusion and ambiguity. The day and night difference symbolizes the different states of the mental illness and paranoia of the protagonist.

Figure 42, Remedy Entertainment, Alan Wake, 2010

Amnesia: The Dark Descent

It is a survival adventure game by Frictional Games, published in 2010. The story of the game concerns an amnesia suffering protagonist who is forced to explore a dark and terrifying castle and avoid creatures in order to discover and "restore" fragments of his lost memory and identity, finding clues while unarmed. The atmosphere of the game and its visual style are inspired from the 19th century, taking place inside a medieval castle, while the whole structure assists in creating a creepy and horrific atmosphere. Sepia tones are used throughout the whole game while the vision of the player is limited in both light and dark environments. A sense of claustrophobia is evoked as the player needs to wander around the labyrinth – like construction of the castle, with (the) narrow corridors. Creatures are designed carefully, mainly with distorted and surrealistic faces. For example, the enemy called "Gatherer", when encountering the player, the later becomes insane, while the main enemy "Shadow" works like an infected presence that gradually transforms the castle. An essential part of the game is that the more the player fears and loses his mind, the more the view changes and he loses control. For example, as the player suffers from panic attacks, the camera shakes slowly and becomes blurred.

Figure 43 Amnesia: The Dark Descent, Frictional Games, 2010

Conclusion

In this chapter various types of gameplay aspects regarding psychological horror videogames were examined in order to attribute a greater feeling and phobic experience. The initial idea was to examine the game mechanics used to trigger phobic emotions to the players, in order to evaluate and implement them in aspects of this project as psychological horror is considered the most relevant genre. Also, the notion of immersion and presence were studied along with the key elements to their success, in order to make a virtual experience more believable and solid.

Many elements have been found that contribute to the immersion, such as the visual and sensory fidelity, the perception of self when inside of the virtual environment, the perception of self-movement and environmental response to the user's actions amongst others. Concluding, immersion in a virtual experience plays a crucial role and its correct design and implementation will enhance the sense of presence and believability of that experience. With the advancements in technology new means became available that augment the immersion and lead to the creation of fulfilled experiences. Spatial immersion can be captured in such a degree through realistic graphics that offers an unprecedented experience for the user. For example, the upcoming title from Crytek called "The Climb" will be a first person virtual reality videogame that places the player in the role of a climber, accurately simulating that real-life activity.

CHAPTER 4:

Chapter 4

This chapter will present the narrative, the structure and the visual style of the project. It is a project that in which I will try to share my perspective on this theme by providing challenges related to the certain phobia and visual elements to create a certain emotion, fear – like sensation to the player, similar with the one having this phobia.

Project Analysis

The idea came from my own personal fear of heights and the sense of falling that I usually see in my dreams and I was further influenced by the various virtual reality applications that are used on treating phobias. Virtual reality unravels a whole new world of potential that can be used to immerse the player and help him reenact difference scenarios. However, the current project does not aim to be a medical application or a clinical assessment but rather to be an art project that has as initial inspiration the theme of fear and phobias and wants to recreate an experience for the player utilizing high altitudes and dark, foggy environments. The scope was to create a real sensation of depth examining all the different parameters (for illustrating it).

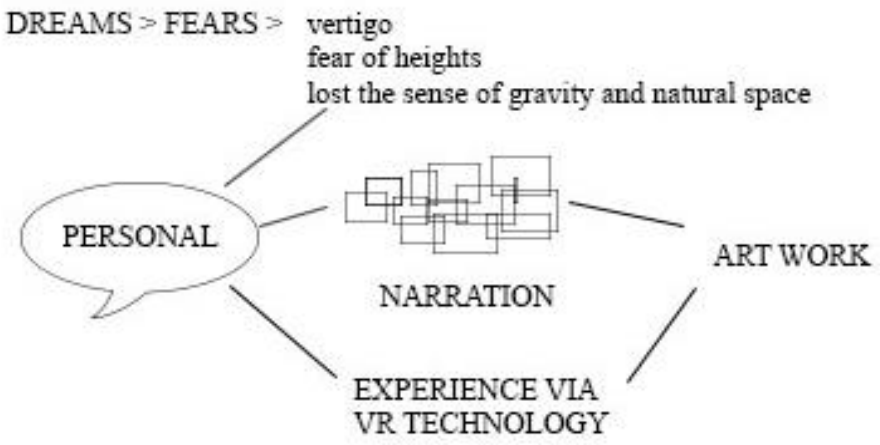


Figure 44, Personal Project "The Fall", Source of Inspiration.

The player's reward is the journey, the collective experience that one gathers from the whole trip and the point of view from the different perspectives and altitudes. In one of the scenes you can experience the ascent on the mountaintop while observing the exhilarating drop underneath. The game is designed to be best played using Oculus Rift in order to get the best experience and feel almost like ascending the different levels. In order to simulate the sense of height further and stablish scale, certain elements were added to assist in this, like flocks of birds soaring around, the sound of the wind changing according to the difference in altitude, the clouds circling the mountaintop as well as rocks falling down in order to make the narrow path even more challenging to the player. The user can look down in various points, testing his boldness and fear.

This experience offers to the player a variety of different scenes and circumstances, which challenge him to progress since the only way to succeed is by completing the different tasks. The scenes present a progressive increase in the challenge of height, placing the user in more and more difficult situations. Every scene comprises of unique elements that relate to and trigger a sense of vertigo, height and a fearful atmosphere. In order to conclude to the present result, different experimentations took place upon themes such as: testing if there is a difference in immersion in a more realistic environment or if it is important to have points of view in the horizon or other elements that would unravel an identifiable measure of actual size. The goal was to not only construct the environment, but to also enrich it with other visual elements and sounds in order to achieve a fearful sensation.

Aesthetic Choices

Some of the scenes used are based on environments and situations that were found to be the most common "triggers" that unravel such a phobia or as familiar elements that can be used to easily identify height and depth. Darkness and vagueness in the depiction of the world is a common choice amongst various artworks, like in the videogame "Limbo". Light is an element that creates a delusion of safety while its absence creates uncertainty and doubt. Inside the game most environments are under lit in order to evoke a sense of anxiety to the user, while when light is used in excess, like in the first sequence, it induces a violent contrast.

The usage of color is relatively scarce. Many elements are either textured with a greyscale palette or subtle sepia tones. The objects that do not follow that concept and are illustrated using more vibrant colors serve as purpose to be identifiable cues of depth and height. More specifically in the scene with the cityscape, the usage of red color signs on various rooftops consists of such an example.

The usage of animation is considered to be important inside of this project. A crucial parameter that is recreated by implementing animations is the notion of a "living" world. The virtual reality scenery becomes enriched through motion such as using flocks of birds, moving cars etc. On the other hand, disruptive animations are used to enhance the fearful atmosphere and create anxiety to the player. For example, during the intro sequence the user becomes overwhelmed by an aggressive displacement of

cubes that are following the player's course giving a sense of a claustrophobic drop, forcing him or her helplessly to the next area.

The sound follows the same principles that are set by the visual elements and the animations. At times the sound follows the overall narration of the experience, whilst other times abstract noises occur in order to raise tension to the player. Sound works for both narration and immersion and is generally considered to be an important part of the project's design.

The falls become transitions between certain scenes and this is utilized because the fall closely relates to the fear of falling, a common type of fear that not only exists in people suffering from acrophobia but in all people when dealing with high altitudes.

Project Specifics

Overall I followed a specific direction on the general look and aesthetic approach of the experience. One of my main goals, was not only to achieve a highly stylized environment, but also to mimic and immerse the player into it, while approaching people that do not suffer from acrophobia. This was simulated with the alteration of the in-game camera perspective, as well as the usage elements such as vision blur when encountered with great heights, or the increasing camera shake when crossing such areas. Overall the use of various visual effects was in order to recreate feelings of anxiety, stress and similar loss of control that a person suffering from acrophobia would experience.

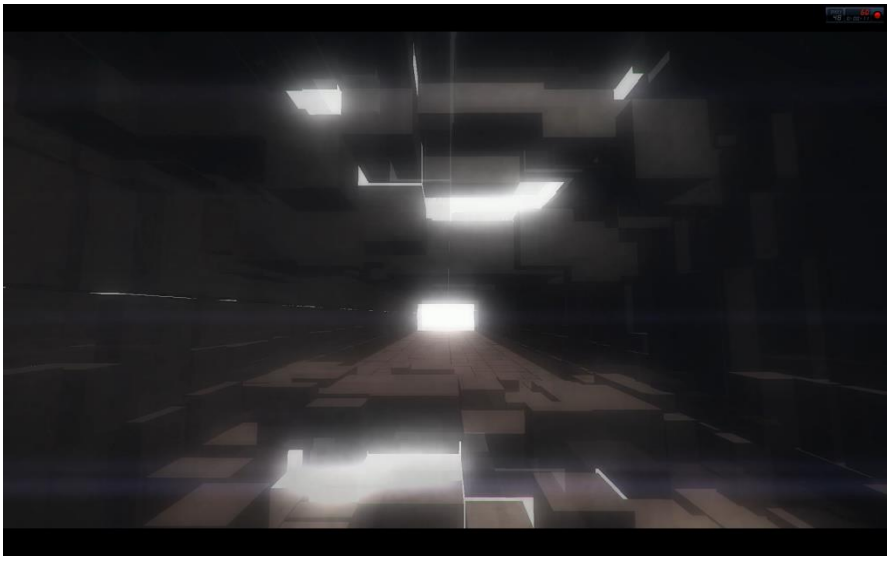


Figure 45, Personal Project "The Fall", Initial Corridor.

In the beginning the player finds himself in a distorted and unfamiliar environment, where he is not certain whether he is moving forwards or falling downwards. The corridor is claustrophobic and means to build up tension as the animated walls gradually explode inwards alongside with the player's movement. The moment of tension is gone as the corridor ends, revealing a large area where the main focus is on floating figures. This is meant as a symbolism to the people trapped in their phobias, whilst others submit to them (phobias), feeling overwhelmed and fall down. As the player moves on observing the figures he notices that the path seems to be narrowing down, leading to a drop. Forced down this path, the player has to face his phobia as this challenge is unraveling in front of him and is led down a downwards spiral and onto the next phase.

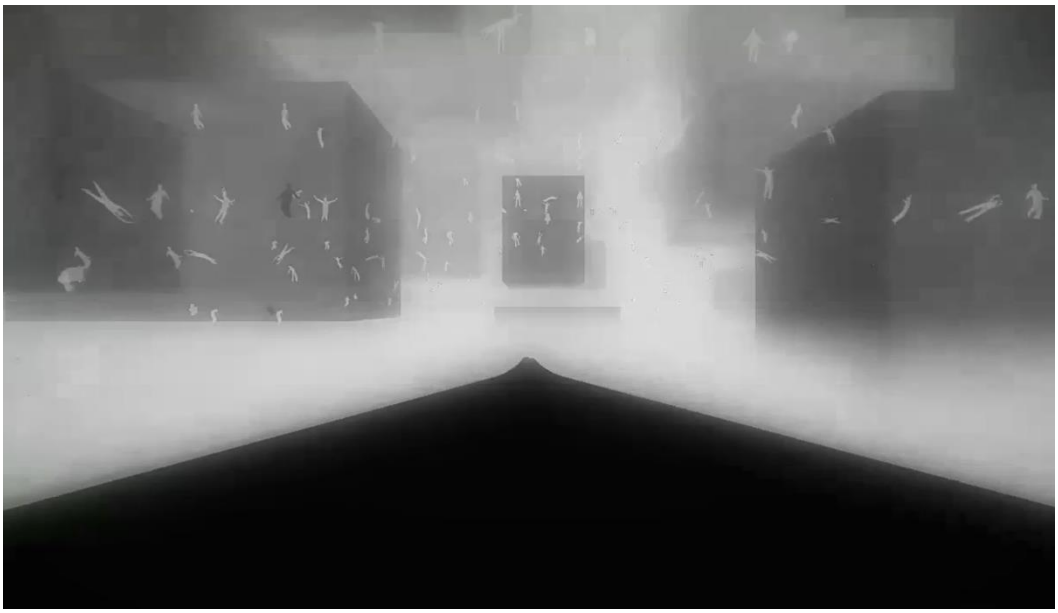


Figure 46, Personal Project "The Fall", Floating Figures.

After several approaches and experimentations in 3D Studio Max, concerning the overall aesthetics of the areas, I concluded in a minimal, faceted-stylized geometry in an overall grim style. Due to the limitations of real-time 3D engines as far as lighting goes, I had to bake visual effects such as ambient occlusion within the diffuse texture maps in order to achieve a similar effect in Unity. The main corridor was initially created from a single box, then placing several animated boxes into a specific formation in order to create a tile of the corridor's section that would loop. Each box was animated in succession with a small offset, while linked to "dummies"(null objects) for grouping purposes. After the first animated tile was created, this was looped and offset along the length of the corridor. The floating figures were created

from scratch, and were given a basic skin and skeleton in order to pose and animate. Each one was animated in a loop, randomly offset from another in order to break up the continuity of the group. They were also linked into "dummy" objects for grouping purposes, and then cloned and offset in-game where needed as "prefabs". As for the shattered figures, those were created with a constant downwards trajectory in 3D Studio Max. I then broke up the figures in the parts that would shatter and used MassFX physics in order to define the ground as a collision object and the figure as a dormant kinematic object, until the frame it meets the ground. I then "baked" the animated result for every frame of the motion and exported this into Unity. For the downwards spiral near the end of the level, I used a similar approach to the faceted models, only this time I defined the geometry more clearly by using a "lattice" to create geometry in the place of every polygonal edge. This allowed for a very transparent look, while following the same art style.

Figure 47, Personal Project "The Fall", The Mountain Path.

The player then lands in the beginning of a steep mountain path. As the player moves forward, the path keeps ascending and narrows down, making it increasingly difficult to follow. At some point, as the camera increases shaking, the mountain starts collapsing with several rocks falling off the top. The player must cross the narrow path and rise above the mist in order to proceed in the top of the mountain where he finds a cave entrance. This area was challenging as I wanted to create an escalation as far as height is concerned and tension for the player.

This was done, not only through the physical ascension of the path, but also by using clouds to define a certain altitude and the collapsing rocks in order to stress the player but also to have a reference to the fall that can occur from such a cliff. The mountains and the path were modelled in 3D Studio Max, following the same artistic style of creating triangular facets in the geometry. I then created a variation of random rocks and through the use of physics, simulated a rockslide between the mountains. As far as the fog that can be seen down the chasm and the clouds that cover the mountaintop, those were created by using Unity's particle system and varying the parameters to achieve the desired effect.

Figure 48, Personal Project "The Fall", The Bridge Transition.

As the player enters the cave, he is overwhelmed by a foggy environment and finds himself in front of a long bridge that fades out into the horizon. Following this, the player doesn't have a point of reference anymore as the bridge is completely surrounded by the fog. Near the end of the route the fog begins to clear up, leaving the player stranded on top of a very high building. This is the peak of the experience, as far as height goes, and is the tallest point of the journey. Looking around the environment, the player can look down a bizarre cityscape, and the only way forward is to cross over to the other building. As his vision blurs when looking down, shaking, this is the ultimate challenge to overcome. For this scene, the camera can switch to third-person, so that the user can identify more to his avatar and emphasize the height and scale of the environment.

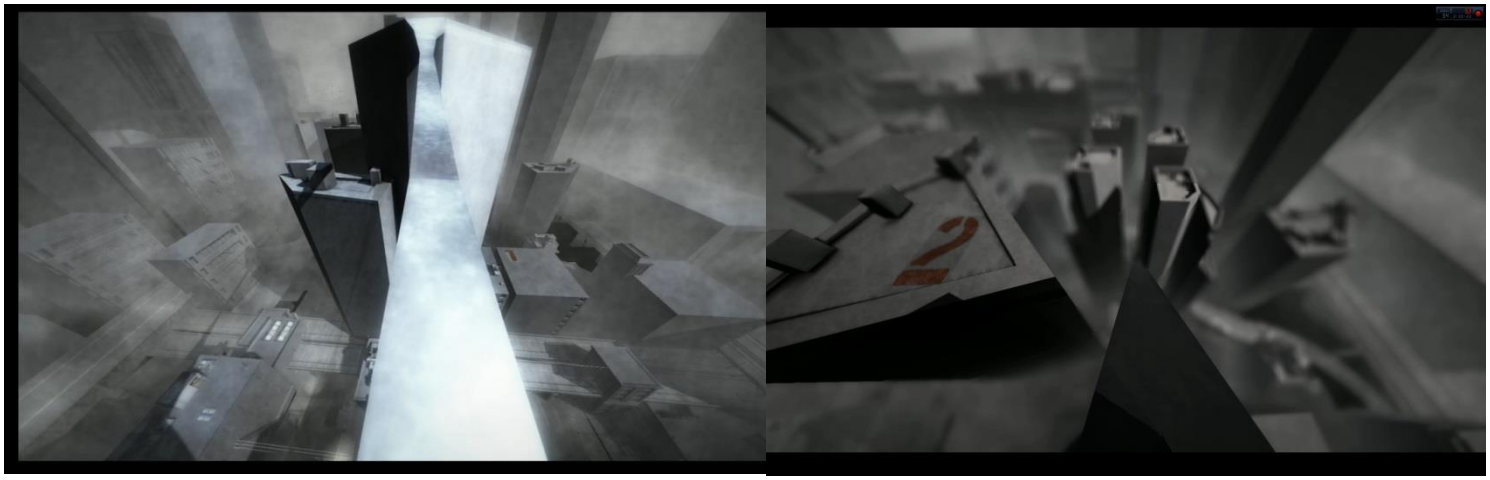


Figure 49, Personal Project "The Fall", CityScape.

The whole city was created in 3D Studio Max, as low polygonal geometry and was "unwrapped" in order to bake the shadows and detail onto the "diffuse" texture. Other elements such as the sky-dome and the collapsing parts were created and exported to Unity as well. Elements such as moving cars and birds flying were added in order to help establish a sense of scale and "life" in the scene. The use of shadows played a very crucial part on not only believability but also on the depiction of height and depth. A lot of attention was paid in this scene in order to offer a sense of height, with several versions of the city created before concluding to the current design. Various versions were built and studied, with even more detailed buildings, different style of cities etc. as part of the research concerning height perception. Finally, leaving this scene, the player descents a path with a false sense of security since this path collapses and forces the player in a fall towards the next area.

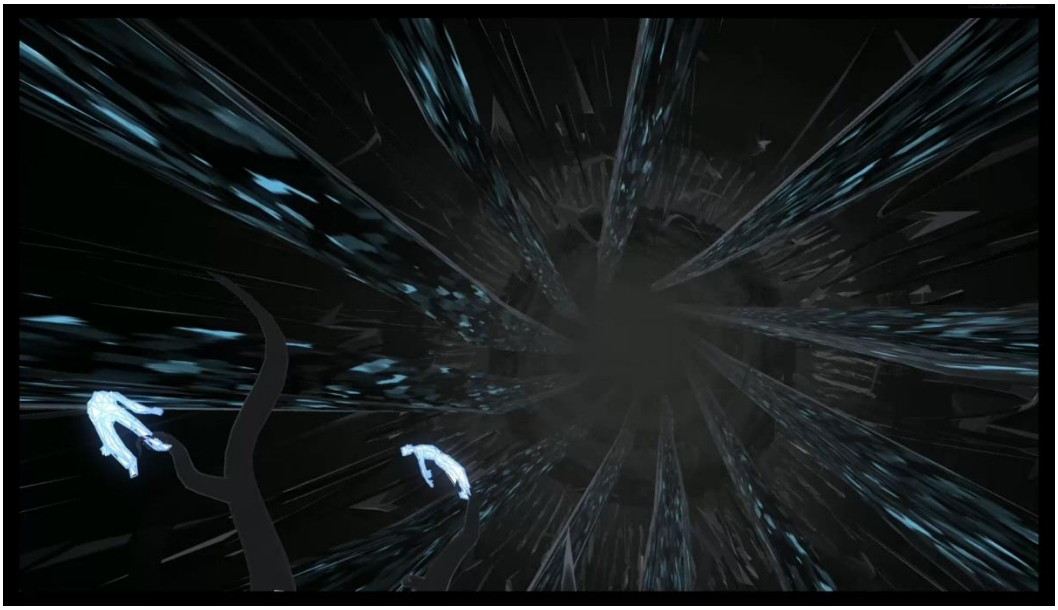


Figure 50, Personal Project "The Fall", Wormhole.

In the following sequence the player falls down a wormhole. As he travels through it, he notices various figures tied-up to its walls, hovering around him. Those figures, much like him, are trying to overcome and escape this phobia, yet are still bound by it. As the wormhole ends, a bright light leads to the next level.

The wormhole was initially created as a slice of a cylinder, which was modeled with every detail and was textured accordingly. "Ambient occlusion" details where baked-in and alpha maps were created for the transparency of the texture vines in order to add more detail, without producing a more complex geometry. After an initial segment was complete, I cloned it several times in order to create some variations. It was then merged into a single tube-like shape, and I created a curved spline line in order to define this as the deform path for the wormhole geometry. I then also used this path as the main path for my camera, in order to fully control the movement while following the twisted shape of the wormhole precisely. The trapped figures were created from the same basis as the floating ones, only that there was an additional outer shell created using a "lattice" modifier. That was in order to emphasize the inner layer, as it was given a different, glowing material. A short animation was created as a loop, and this was then exported into Unity and created as a prefab, in order to be placed easily along the length of the wormhole.

Figure 51, Personal Project "The Fall", The Final Path.

For the final part, the player lands at the beginning of a large stone path. As the player observes this area, he soon discovers that the path starts collapsing behind him. There appears to be a gateway at the end of the pathway and the player starts running towards it, only to find out that there is no exit there. As the path continues to collapse, the player will find himself floating instead of falling. He then realizes that the only exit is by flying up, having liberated himself from the fear of heights.

The path was the main challenge in this level, as I needed to make it break up behind the player, yet be impressive enough for the player to observe it and not fade down abruptly into the void. Several approaches of this level were created with variations such as floating monoliths and impaled figures that were later discarded in order to keep the player focused on the path collapsing. After creating the main geometry and measuring the desired course for the player to travers, I broke down the path into the various pieces that it would collapse to, and then I used physics with a certain amount of gravity force as well as a "dummy" object that would act as a collision force in order to direct appropriately the "path of destruction" and hurl the rocks upwards by this invisible force. With the correct settings of collision and gravitational forces I managed to achieve a slow motion look in order to give time to the player to realize his surrounding and react to the environment.

Technical Details

The aim of the project is not to "punish" the player if he should fall, but to help him familiarize with and focus on the sensation that the altitude offers. In the sequences in which the player does fall, this happens in a controlled manner and a fade to black was used in order to have a smooth level transition while keeping the user immersed. Interestingly, the feeling of falling, the tension and excitement involved still remained. The user can get a sensation of exhilaration from a fall, while combining this experience with sounds to enhance it.

Concerning the player movement, despite the fact that he can control the camera and look anywhere, in certain points a fixed camera was used in order to make the player feel trapped and "unarmed" thus inflicting psychological stress. In this type of scenario, the player faces situations that he may never confront in real-life conditions while it is interesting that the sense of vertigo and falling can be really captured inside of a virtual world. Experimentation was done on how mechanics concerning heights can be realized inside of a virtual world, and what sensation those trigger to the player. Also various experimentations were made concerning the texture fidelity. Since the focus was on creating an artistic project, realistic textures were eventually avoided, both for reasons of aesthetics and optimization thus choosing to use more abstract textures. Moreover, regarding collisions, a minimum amount was created in order to secure a good framerate and to avoid geometry intersection. Furthermore, the levels' geometry was optimized in order to secure a smooth flow of motion, as the majority of the scenes contained complex geometry with a lot of elements. Effects like depth of field, motion blur and other camera-dependent lens effects were avoided as they don't function with Oculus Rift or are very demanding. Concerning the movement of the player, a gamepad is used as the input method while different tests took place for the interaction and immersion of the player while avoiding motion sickness.

Also, during the process of research and development regarding the attribution of height, the following elements were found to contribute in a great degree: The environmental influences like the sound of the wind, the usage of clouds or mist. Also elements in order to establish the sense of scale, like a road with cars underneath a tall building. Secondary motion of the environment like a flock of birds, changes in the

weather etc. in order to portray a "living" environment. Response from the environment to the user's actions, for example if the user is walking across a beam and this starts to bend, or even the usage of sounds that indicate such response. Usage of layers of depth, if the user is on a high altitude, other elements should be placed on various, lower levels in order to better establish scale and height. For example, treetops, peaks of buildings, pedestrians, etc. Also, using an avatar to represent the user's body and a third-person camera, as it is easier to identify with somebody you can observe. The difficulty in the first person camera is that there are no visual elements of the user's body inside of the virtual world. It also seems that a more realistic environment can increase the immersion however the sense of vertigo can be also achieved in a minimalistic environment. Familiar environments however, add believability to the experience because the user already has the sense of scale. For example, a highly-detailed cityscape will be more persuasive regarding altitude than a fantasy environment. Also, the usage of direct motion tracking input like the Kinect sensor helps immersion since using other input devices such as controllers, keyboard and mouse diminishes the immersion experience. Last but not least, the usage of physical elements that enhance the virtual experience and correspond to their virtual counterparts. For example, a wooden plank placed the same way as the virtual one, or a fan blowing from the same direction as the virtual wind was placed inside the environment, could increase immersion. Taking this concept further, a completely immersive experience can be built using a system such as "Birdly"[30].

A series of different altitudes are presented throughout the journey. A script was added so that when the player looks down from a very high altitude, the screen will blur resembling the sensation that a phobic person has in a similar situation. Also, in order for the user to be more immersed, in a specific scene of great height, a script was also added that allowed for the camera to change to a third person camera. The user then can identify even more with his virtual avatar and the sense of scale and height becomes even more apparent. There are sections that it is required to climb both upwards and downwards, near the edges of a rocky strip so as to see the different points of view. The visual fidelity, the sense of achievement and challenge are all

[30] http://www.somniacs.co/

important in succeeding a feeling of immersion and presence. The player should sense that he is somewhere and is experiencing the traversal of a precarious space.

More specifically, the Oculus Rift DK2 has been used. Utilizing an HMD delivers a visually "inclusive" experience in terms of immersion, which is also "surrounding" the player due to the Oculus Rift's stereoscopic view. Equipped with a gyroscope, an accelerometer and a magnetometer, the Oculus Rift grants to the user three degrees of freedom, allowing him/her to look around the virtual world by rotating the head to the desired direction.

Some of the actions in Unity are triggered by physically moving towards the desired item. Some other actions occur when the player actually reaches a certain spot. In order to have an even more "inclusive" experience, headphones are recommended. This way, following the HMD's logic of obstructing real-world visual input, the headphones isolate the player in that environment.

It was observed that a diminishment in immersion occurs when the player looks down at a void and does not see his own body. To increase the sense of immersion for the player I have implanted "Kinect" input in the cityscape scene. In this scene the player can look down and see his own virtual body that moves the same way as he does. This procedure enhances the sense of embodiment especially while working with a device such as Oculus Rift.

Challenges

Various animation techniques that I use in 3D Studio Max, especially modifiers or noise-pattern (random) animations, won't work while exporting on the Unity engine due to restrictions of the exported file format. I had to take this into consideration and recreate the same final result, using techniques that would work on a real-time environment such as Unity.

Various experiments took place on the visualization of the landscapes. For example, tests were made using software such as Vue, due to its capability to produce high detailed environments. Unfortunately, export from Vue proved difficult as this produced very dense geometry and the texture resulting could not be efficiently used.

Creating the cityscape was a challenge as well, since various versions of buildings and skyscrapers were created in order to test the sense of height and depth. Through this

procedure the necessity of using visual cues was unraveled, as well as the importance of light and shadows.

Experimentation was done in order to conclude to the current mechanic, that is to prevent the player from falling off the level. Tests were made by respawning or limiting the tries a player has, but this seemed to be referring to certain game-mechanic systems that punish the player while this doesn't suit this project and its cause.

More experimentation took place regarding the creation of the project's geometry and one concept was to use fractals. However the resulting geometry needed to be optimized in order to be displayed in real-time, due to the high resolution of the exported geometry and this resulted in altering its initial quality.

Research took place in order to determine what are the most relevant and familiar environments that illustrate altitude, concluding on a cityscape and mountain landscape because they consist of familiar scenery that are commonly associated with height.

An incentive can be utilized to distract and motivate people having phobias to overcome their fear and react to the given task. For example, by providing them with a task to accomplish, such as rescue a cat that is hanging from the peak of a high building, would provide them with a good motivation to neglect their fear.

CONCLUSION – FUTURE TRENDS – CONCLUDINGS

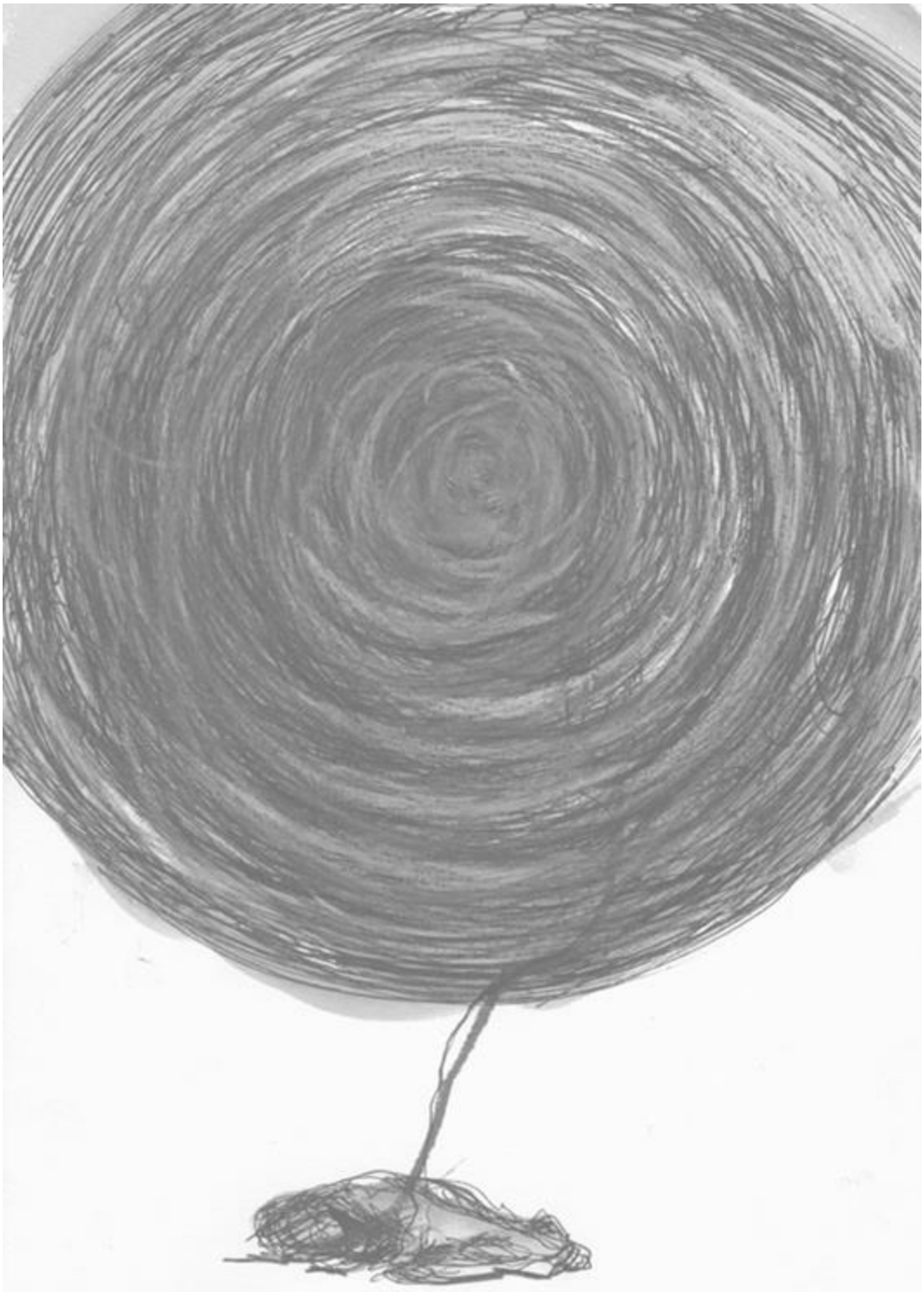


Figure 44, Chiharu Shiota, Untitled, 2005, Oil paint stick on paper, 7 x 9.5".

Personal Goal

Gathering and processing the whole range of elements of those researches and using them as a base to apply those principles and utilize them to create an artistic project that will visualize different aspects of this phobia. The direction, the visual style, the narrative and technical approach of the project had as initial inspiration the works presented above.

As I am focusing on fear of heights (acrophobia) my plan is to place the user in a series of scenarios of this nature. By exaggerating those stimuli, I intend to trigger to the audience emotions similar. More specifically, in one scenario the user will be trapped on the ledge of a mountain and forced to escape through a narrow path against the intimidating fall. On another instance, the user will experience a vertigo effect with the use of a distorted field of view as well as the environment mechanics. I aim at creating a highly stylized artistic experience where the user would be able to empathize with the phobic person through the imposing atmosphere (visual elements, sound design, camera perspective etc.) but also to overcome a number of challenges related to aspects of the phobia.

Furthermore, I would like to continue the current research to a doctoral level as I'm very interested in further researching the potential of creating a more detailed and immersive environment, which can be used as the base concerning the quest of if virtual reality can positively assist on treating phobias and if game elements can help achieve a better user response. A more intuitive research must be done on the fields of perception, identity, believability and involvement.

General Conclusion

As stated before, the drive and inspiration to create a project based on phobias was from personal experience. Nevertheless, the research conducted and the project itself started off under the scope of a certain problematic such as the creation of a virtual experience representing different aspects of a phobia, with an artistic aesthetic, and narrative approach and secondly the techniques and mechanics that can be utilized to illustrate such an experience, like the fields of immersion and depth amongst others.

As far as the first problematic is concerned, regarding the visual, auditory and narrative representation of phobias, involvement and immersion are the keys to make the experience real for the player. If the experience is not immersive enough it will never succeed into convincing the player of its believability. Also, the usage of color and sound are contributing a lot on the atmosphere. A whole narration can be based almost exclusively upon sound. More specifically, in scenes in which high altitude should be present, sounds can be used in unraveling such altitude.

As far as the second problematic is concerned, the project needs to be tested with far more players in order for a quantifiable conclusion to be drawn. In order for the project to become a complete work, systematic playtesting is required within a diverse audience and with people that either have a phobia or not.

Both the research and the project can be developed further. In the domain of psychology, it would be valuable to investigate the current developments on anxiety disorders in-depth, examine how an experiment of measuring phobias can be conducted, monitor a patient's reactions (heartrate, respiratory etc.) or use relevant questionnaires to better evaluate the whole experience. More specifically, a more immersive environment could be created through accompanying the virtual experience with some type of physical construction that matches the virtual one. For example, a wooden plank can be placed in the real world whilst having the user walking on the same one in the virtual world. Also, it would be necessary to investigate more the role of embodiment and how can the user feel like "being" in the virtual world, for example the user to be able to see his own body in the virtual world or having an augmented experience using his own hands and getting feedback from the environment.

As far as the graphic representation is concerned, further work can be done in order for the user to participate in a complete scenario of a certain phobia, which will be defined by certain rules in order to be valuable as a scientific experiment and medical application. It is essential to follow a gradual exposure to the fear stimuli in order for the user to have the time to familiarize himself with the stimuli.

Interactivity and immersion are domains that could be explored further as well, since research on them constantly expands, not only due to new technologies, but mostly due to the accessibility of these technologies. The project itself can be greatly elaborated on as well. The scenario of the project can be expanded in order for the experience to last longer and enriched by utilizing new means of input.

The possibilities, both in terms of research and artistic creation, are limitless, and in any case inspiration around the subject of phobias will never cease. Anxiety disorders and phobias afflict and discomfort a large amount of population all over the world and new solutions of healing will continue to expand.

Bibliography

Abt, C. C. (1970). Serious games. New York,, Viking Press.

Ahonen, M. (2014). Mental disorders in ancient philosophy. Cham, Switzerland ; New York, Springer.

Barlow, D. H. (2002). Anxiety and its disorders : the nature and treatment of anxiety and panic. New York ; London, Guilford Press.

Bellack, A. S., et al. (1990). International handbook of behavior modification and therapy. New York ; London, Plenum.

Bjork, S. and J. Holopainen (2005). Patterns in Game Design, Charles River Media.

Botella, C., et al. (1998). "Virtual reality treatment of claustrophobia: a case report." Behav Res Ther **36**(2): 239-246.

Boyle, E., et al. (2011). "The role of psychology in understanding the impact of computer games." Entertainment Computing **2**(2): 69-74.

Carvalho, D., et al. (2012). "New Interaction Paradigms to Fight the Digital Divide: A Pilot Case Study Regarding Multi-Touch Technology." Procedia Computer Science **14**: 128-137.

Cavanagh, K. and D. A. Shapiro (2004). "Computer treatment for common mental health problems." J Clin Psychol **60**(3): 239-251.

Choy, Y., et al. (2007). "Treatment of specific phobia in adults." Clin Psychol Rev **27**(3): 266-286.

Cook, M. and S. Mineka (1989). "Observational conditioning of fear to fear-relevant versus fear-irrelevant stimuli in rhesus monkeys." J Abnorm Psychol **98**(4): 448-459.

Doctor, R. M. and A. P. Kahn (1989). The encyclopedia of phobias, fears, and anxieties. New York, Facts on File.

Eisner, L. H. (1969). The Haunted Screen: Expressionism in the German Cinema and the Influence of Max Reinhardt, University of California Press.

Emmelkamp, P. M., et al. (2002). "Virtual reality treatment versus exposure in vivo: a comparative evaluation in acrophobia." Behav Res Ther **40**(5): 509-516.

Emmelkamp, P. M. G., et al. (1992). Anxiety disorders : a practitioner's guide. Chichester, Wiley.

Errera, P. (1962). "Some historical aspects of the concept, phobia." Psychiatr Q **36**: 325-336.

Felisati, D. and G. Sperati (2010). "Francisco Goya and his illness." Acta Otorhinolaryngologica Italica **30**(5): 264-270.

Foa, E. B. and M. J. Kozak (1986). "Emotional processing of fear: exposure to corrective information." Psychol Bull **99**(1): 20-35.

Fullerton, T. (2009). "Reflections on The Night Journey: an Experimental Video Game." Kritische Berichte: The Ludic Society-The Relevance of Videogames, Print.

Harteveld, C., et al. (2010). "Balancing Play, Meaning and Reality: The Design Philosophy of LEVEE PATROLLER." Simulation & Gaming **41**(3): 316-340.

Heeter, C. (1992). "<italic>Being</italic> there: the subjective experience of presence." Presence: Teleoper. Virtual Environ. **1**(2): 262-271.

Hruby, N. J. (1941). "Expressionism in the Twentieth Century American Drama."

Kessler, R. C., et al. (2005). "Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication." Arch Gen Psychiatry **62**(6): 593-602.

Kessler, R. C., et al. (2005). "Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication." Arch Gen Psychiatry **62**(6): 617-627.

Kleinknecht, R. A. (1991). Mastering anxiety : the nature and treatment of anxious conditions. New York ; London, Plenum.

Krijn, M., et al. (2004). "Treatment of acrophobia in virtual reality: the role of immersion and presence." Behav Res Ther **42**(2): 229-239.

Lavender, T. J. and D. Gromala (2012). "Audition, The Game." Procedia Computer Science **15**: 187-192.

LeDoux, J. E. Emotion, memory and the brain : the neural routes underlying the formation of memories about primitive emotional experiences, such as fear, have been traced.

LeDoux, J. E. (1998). The emotional brain : the mysterious underpinnings of emotional life. London, Weidenfeld & Nicolson.

LeDoux, J. E. (2000). "Emotion circuits in the brain." Annu Rev Neurosci **23**: 155-184.

Marks, I. M. (1969). Fears and phobias. London, William Heinemann.

Marks, I. M. (1969). Fears and phobias. New York,, Academic Press.

Marks, I. M. (1980). Living with fear : understanding and coping with anxiety. New York ; London, McGraw-Hill.

Mortensen, T. E., et al. (2015). The Dark Side of Game Play: Controversial Issues in Playful Environments, Taylor & Francis.

Narrow, W. E., et al. (2002). "Revised prevalence estimates of mental disorders in the United States: using a clinical significance criterion to reconcile 2 surveys' estimates." Arch Gen Psychiatry **59**(2): 115-123.

Ollendick, T. H. and M. Hersen (1998). Handbook of child psychopathology. New York ; London, Plenum.

Parsons, T. D. (2011). Neuropsychological Assessment Using Virtual Environments: Enhanced Assessment Technology for Improved Ecological Validity. Advanced Computational Intelligence Paradigms in Healthcare 6. Virtual Reality in Psychotherapy, Rehabilitation, and Assessment. S. Brahnam and L. C. Jain. Berlin, Heidelberg, Springer Berlin Heidelberg**:** 271-289.

Parsons, T. D., et al. (2009). "Neurocognitive and psychophysiological analysis of human performance within virtual reality environments." Studies in Health Technology and Informatics **142**: 247-252.

Parsons, T. D. and A. A. Rizzo (2008). "Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: a meta-analysis." J Behav Ther Exp Psychiatry **39**(3): 250-261.

Perron, B. (2009). Horror Video Games: Essays on the Fusion of Fear and Play, McFarland, Incorporated Publishers.

Rachman, S. (2004). Anxiety. Hove, Psychology Press.

Sinnott, A., et al. (1981). "Agoraphobia: a situational analysis." J Clin Psychol **37**(1): 123-127.

Stolerman, I. P. (2010). Encyclopedia of psychopharmacology. Berlin ; London, Springer.

Susi, T., et al. (2007). "Serious games: An overview."

Trigo Algar, A. R. (2014). "Serious Games For Overcoming Phobias: The Benefits of Game Elements."

Trosman, H. (2000). Contemporary Psychoanalysis and Masterworks of Art and Film, NYU Press.

Weinick, R. M., et al. (2011). Programs addressing psychological health and traumatic brain injury among US military servicemembers and their families, DTIC Document.

Wiederhold, B. K., et al. (2006). "Advanced technologies in military medicine." NATO SECURITY THROUGH SCIENCE SERIES E HUMAN AND SOCIETAL DYNAMICS **6**: 148.

Wiederhold, B. K. and M. D. Wiederhold (2008). "Virtual reality for posttraumatic stress disorder and stress inoculation training." Journal of CyberTherapy & Rehabilitation **1**(1): 23-35.

Witmer, B. G. and M. J. Singer (1998). "Measuring Presence in Virtual Environments: A Presence Questionnaire." Presence: Teleoper. Virtual Environ. **7**(3): 225-240.

Ziefle, M. and C. Rocker (2011). Human-centered design of e-health technologies : concepts, methods and applications. Hershey PA, Medical Information Science Reference.

ANNEX A: EXPERIMENTS

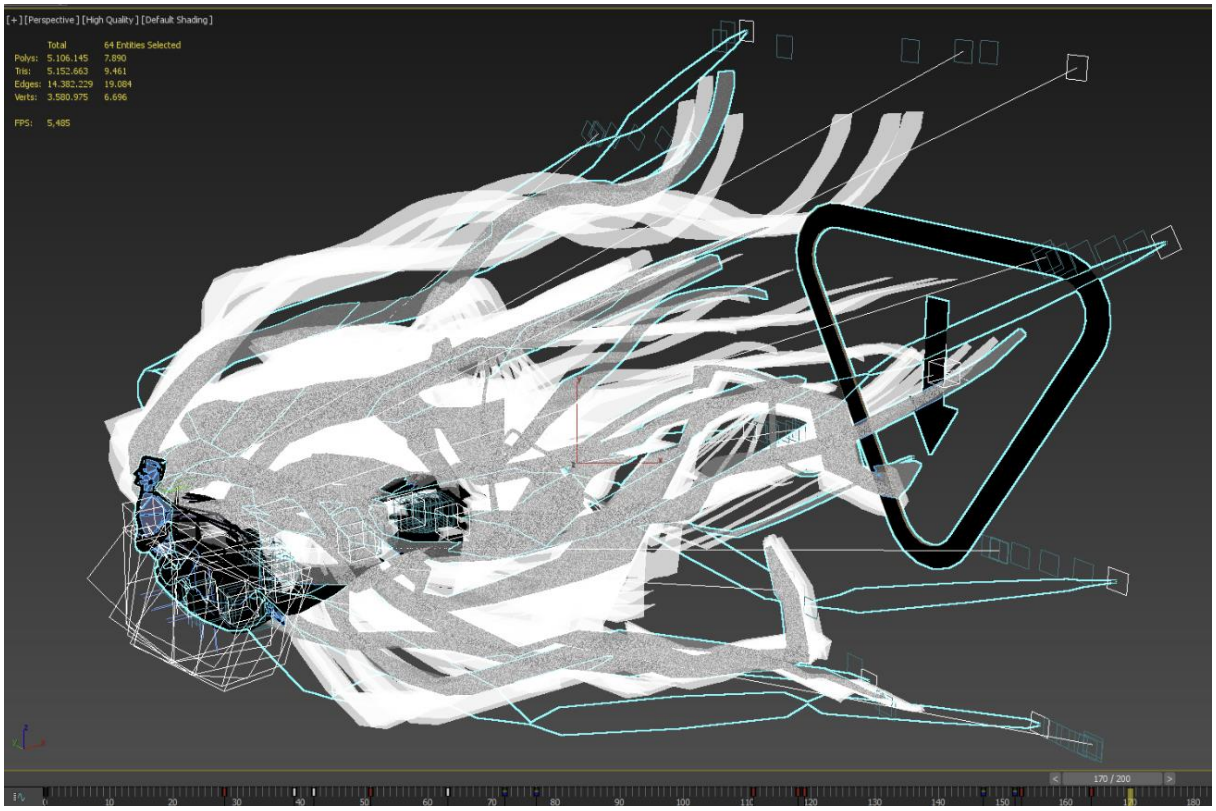
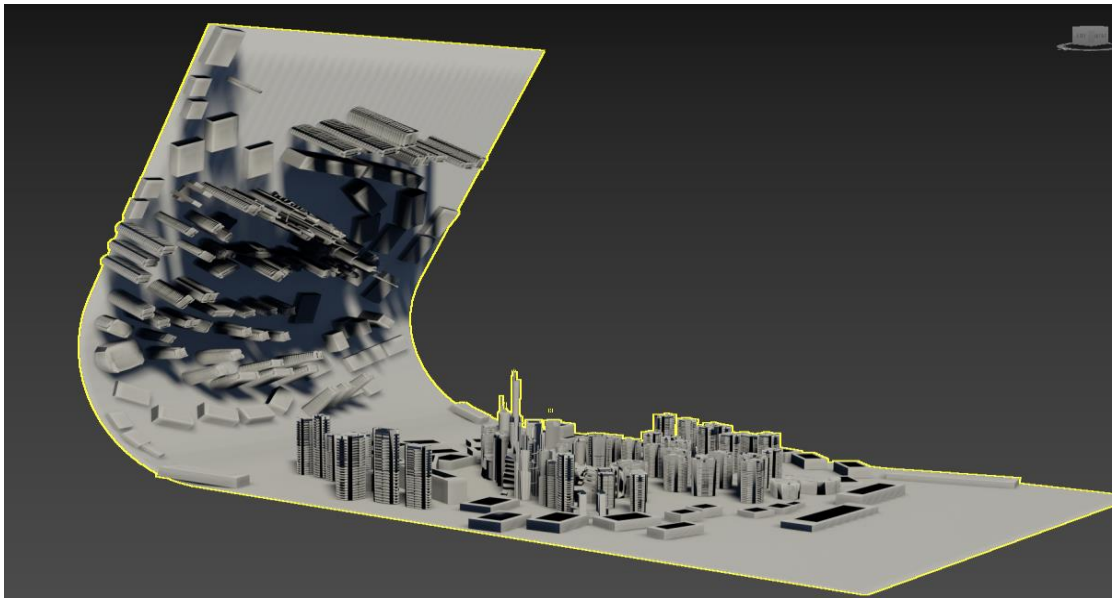
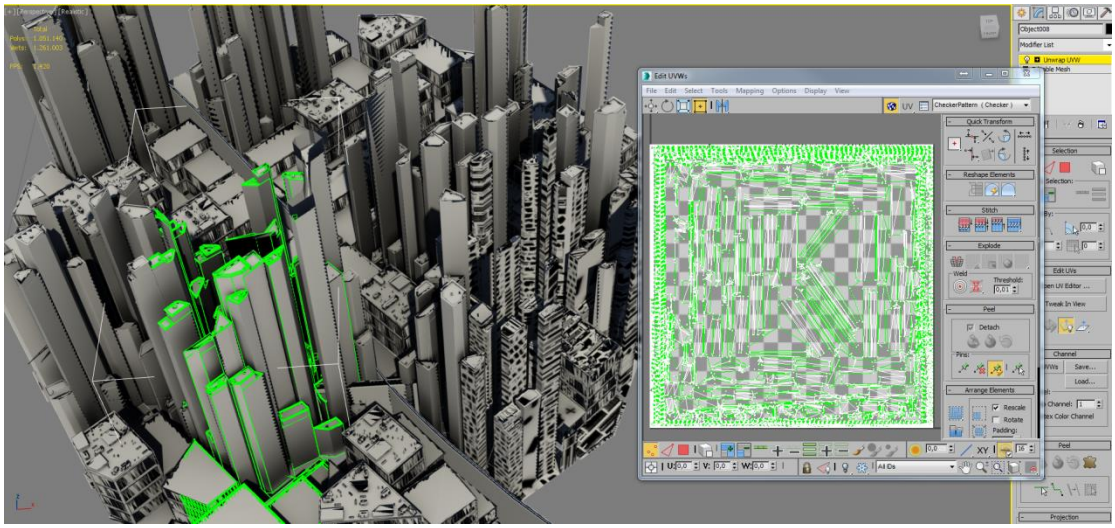


Figure 55 Advanced Animation Rig Test with multiple leg elements in 3ds Max.

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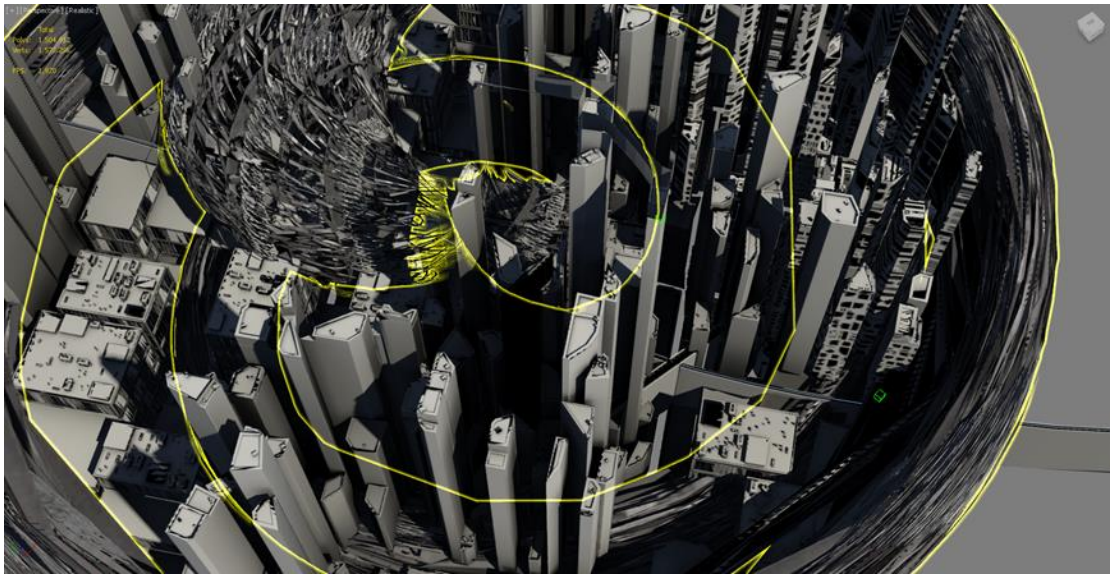
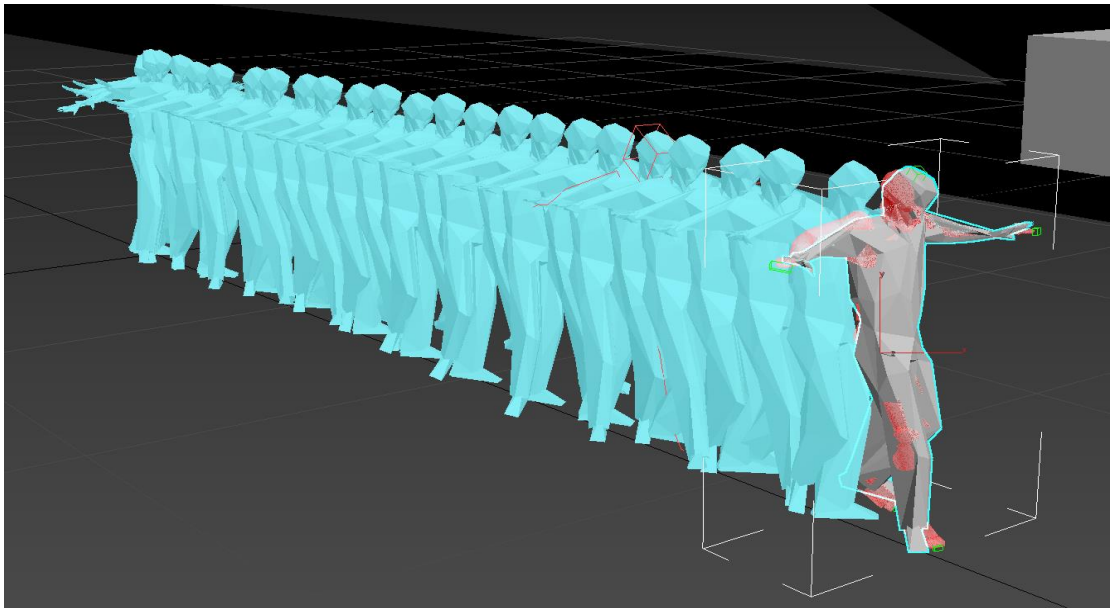
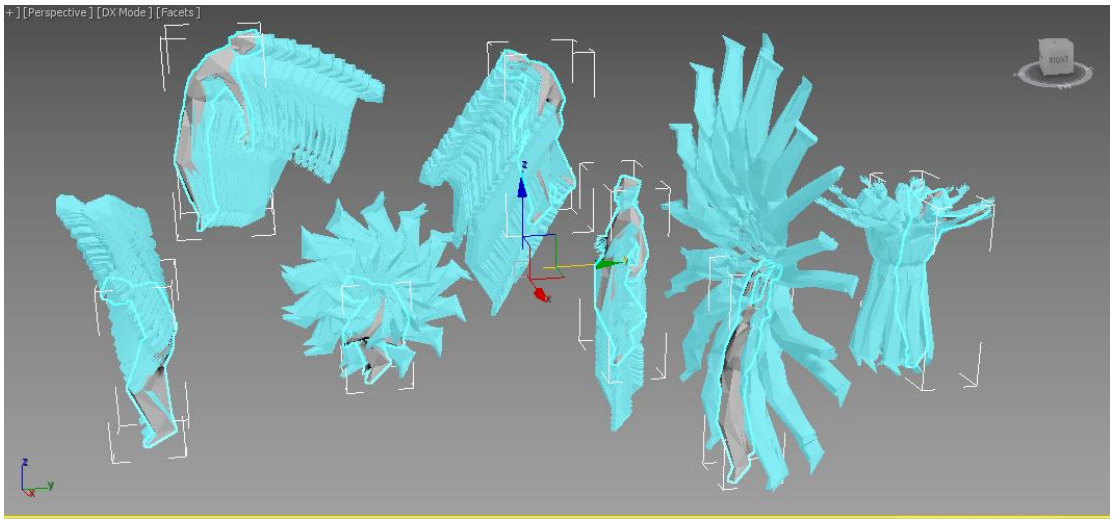
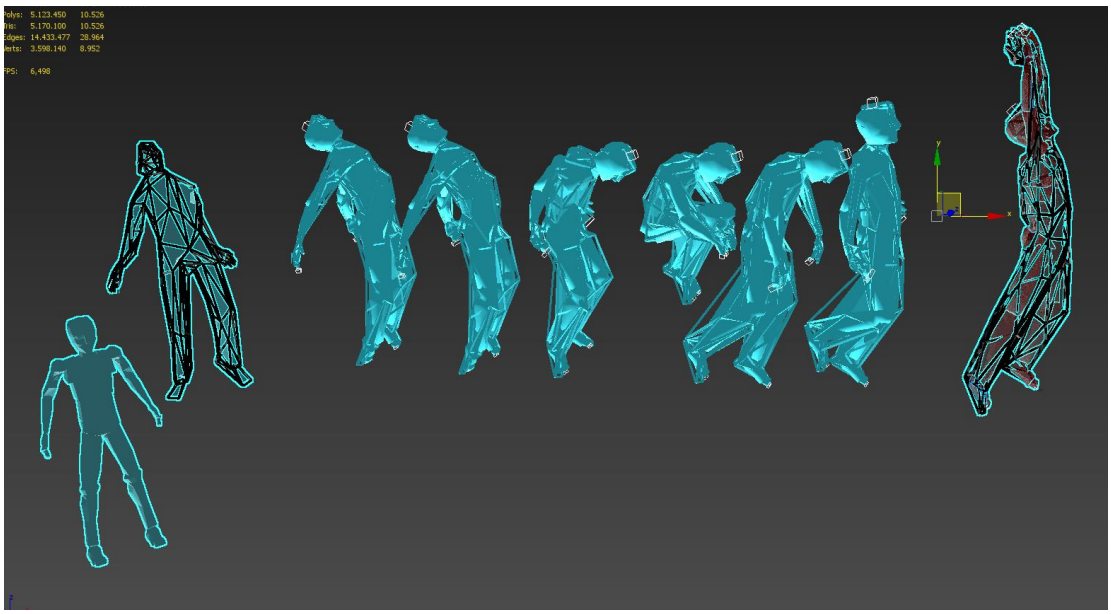


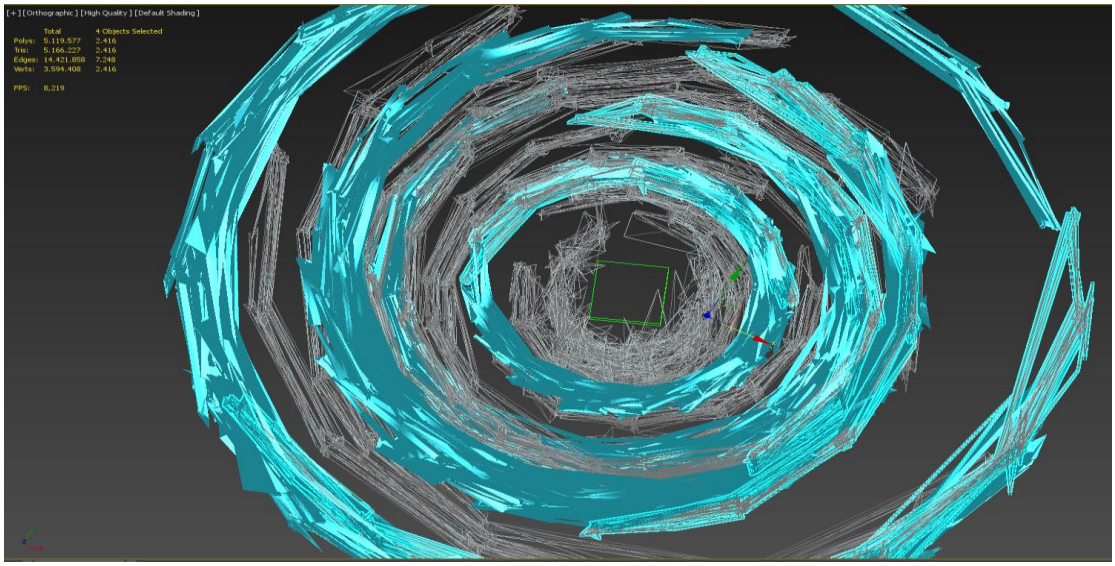
Figures 56 Cityscape experiments and variations

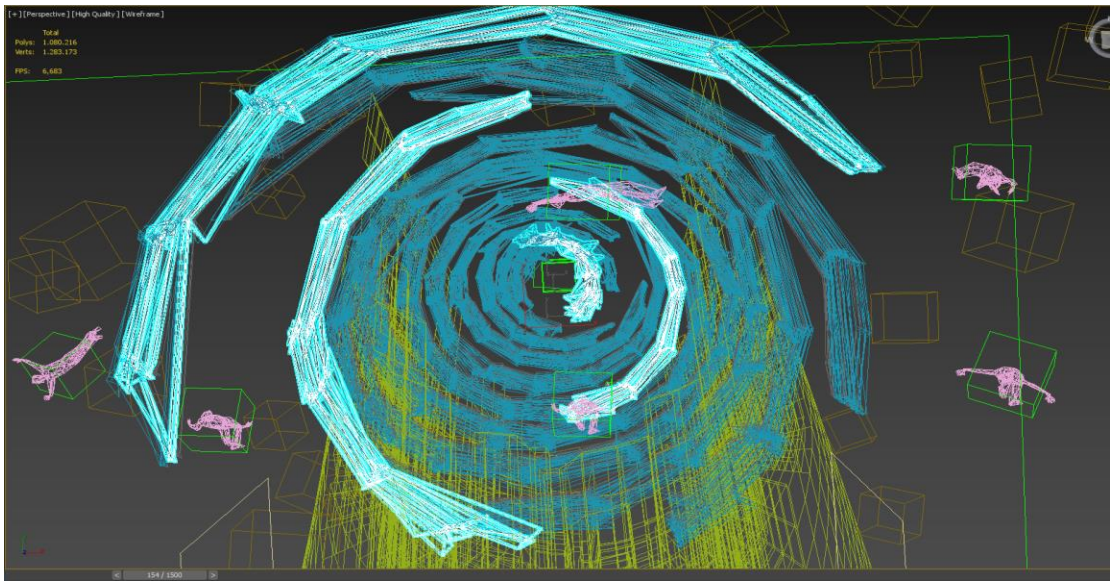


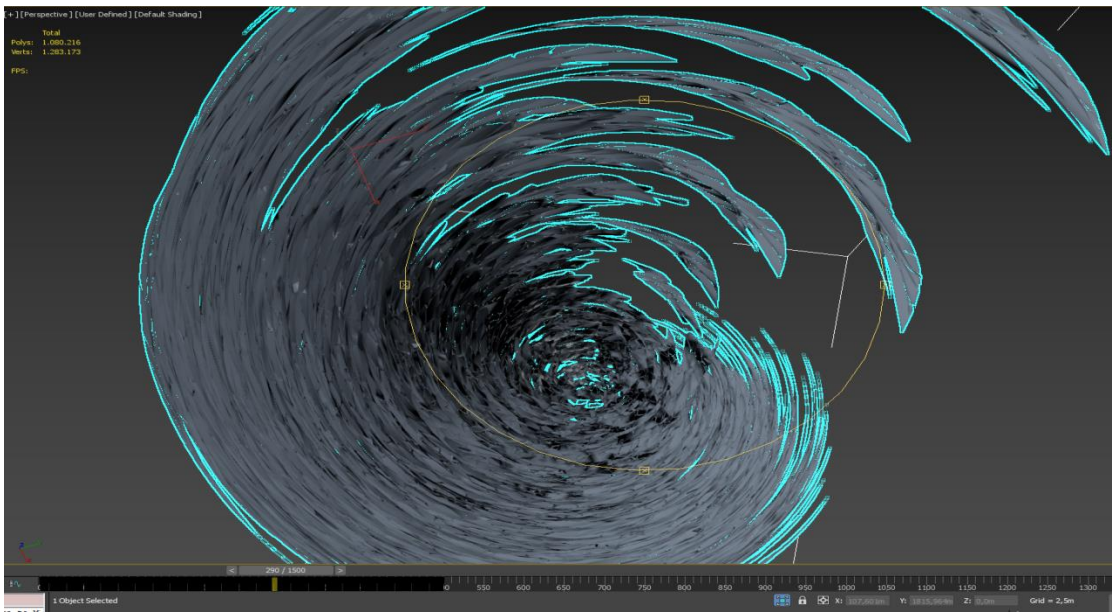




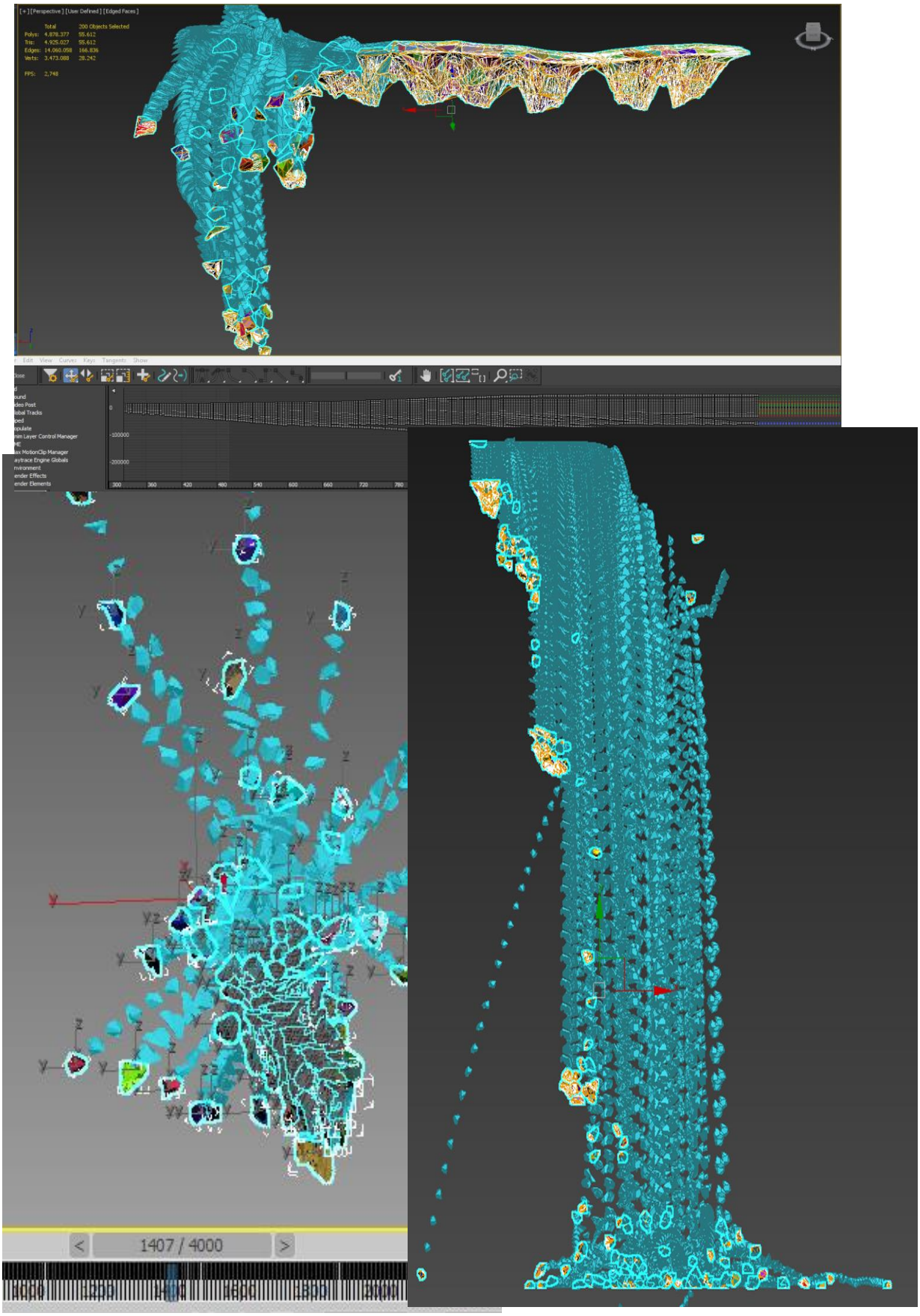
Figures 57 Stylized figures and their motion in frames.



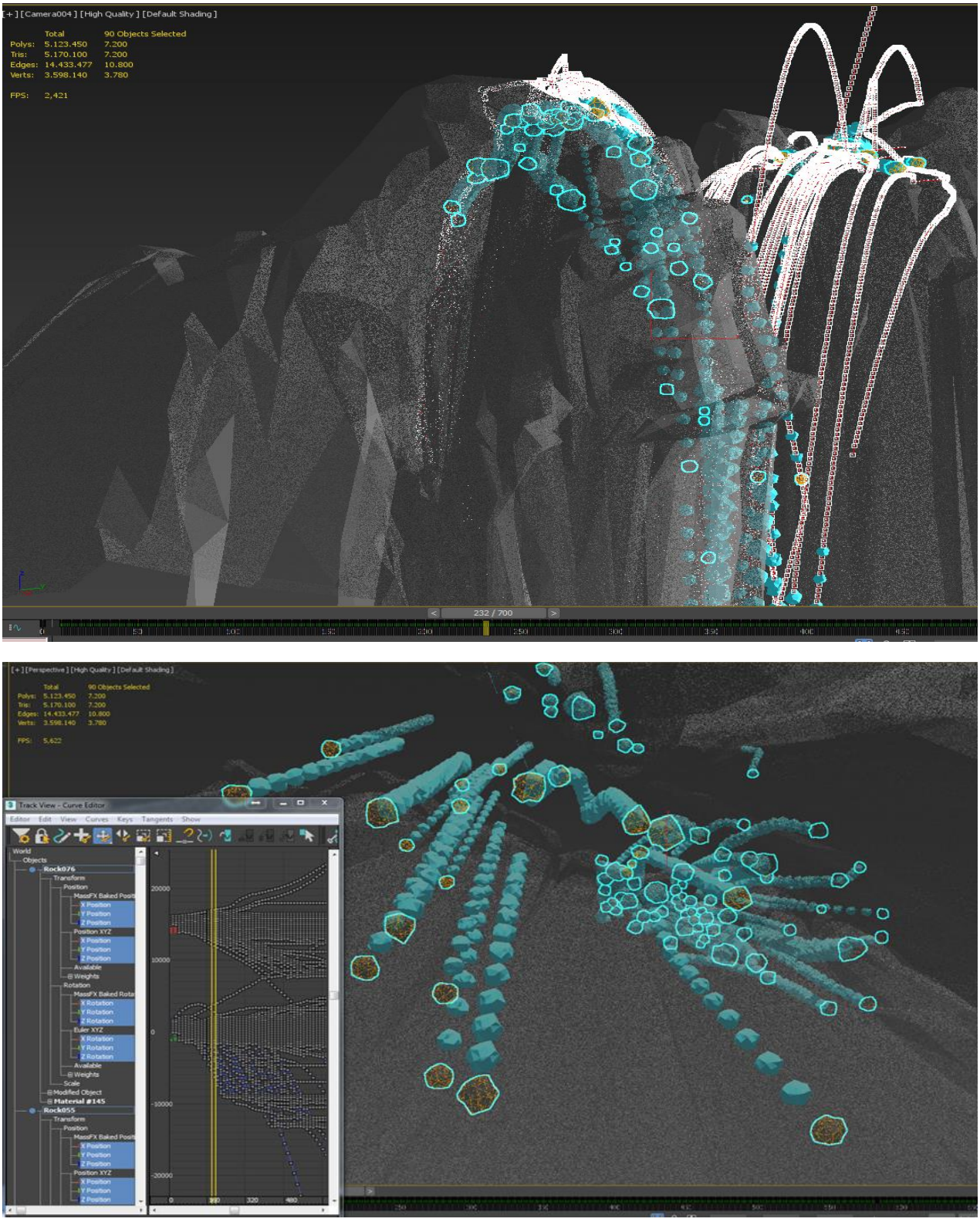




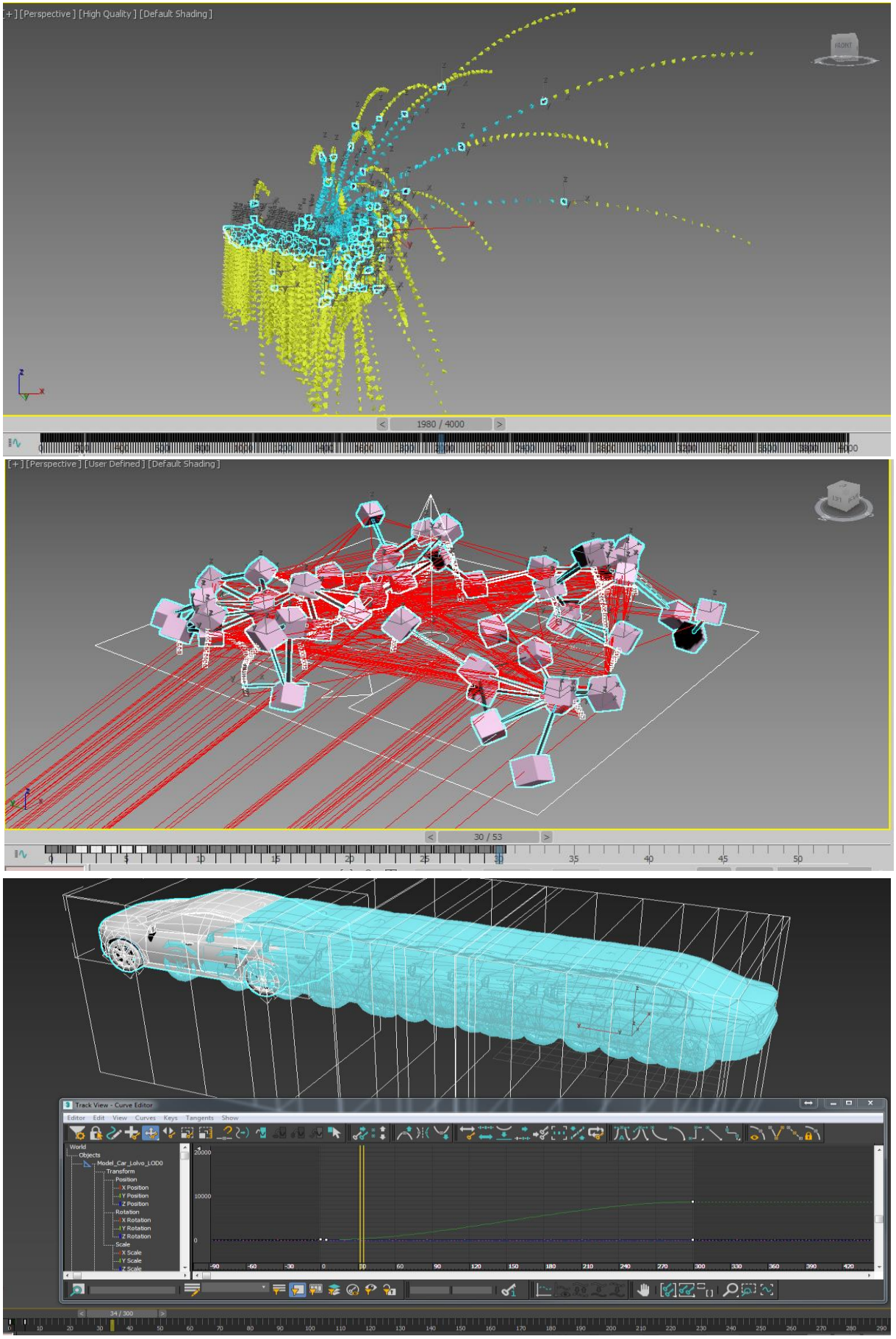
Figures 58 Cyclone geometry and motion tests.



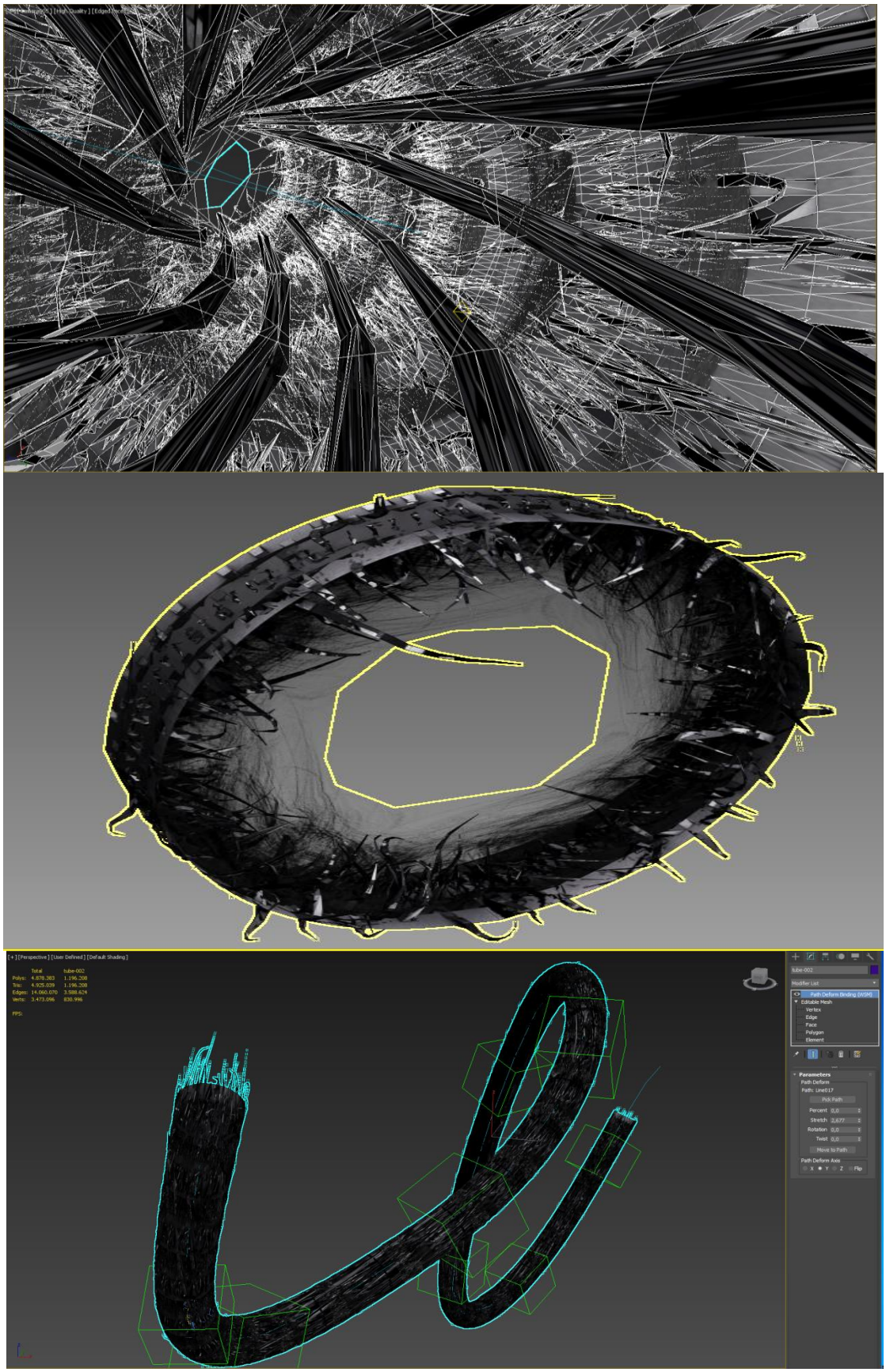
Figures 59 Exploding rock dynamic animation tests.



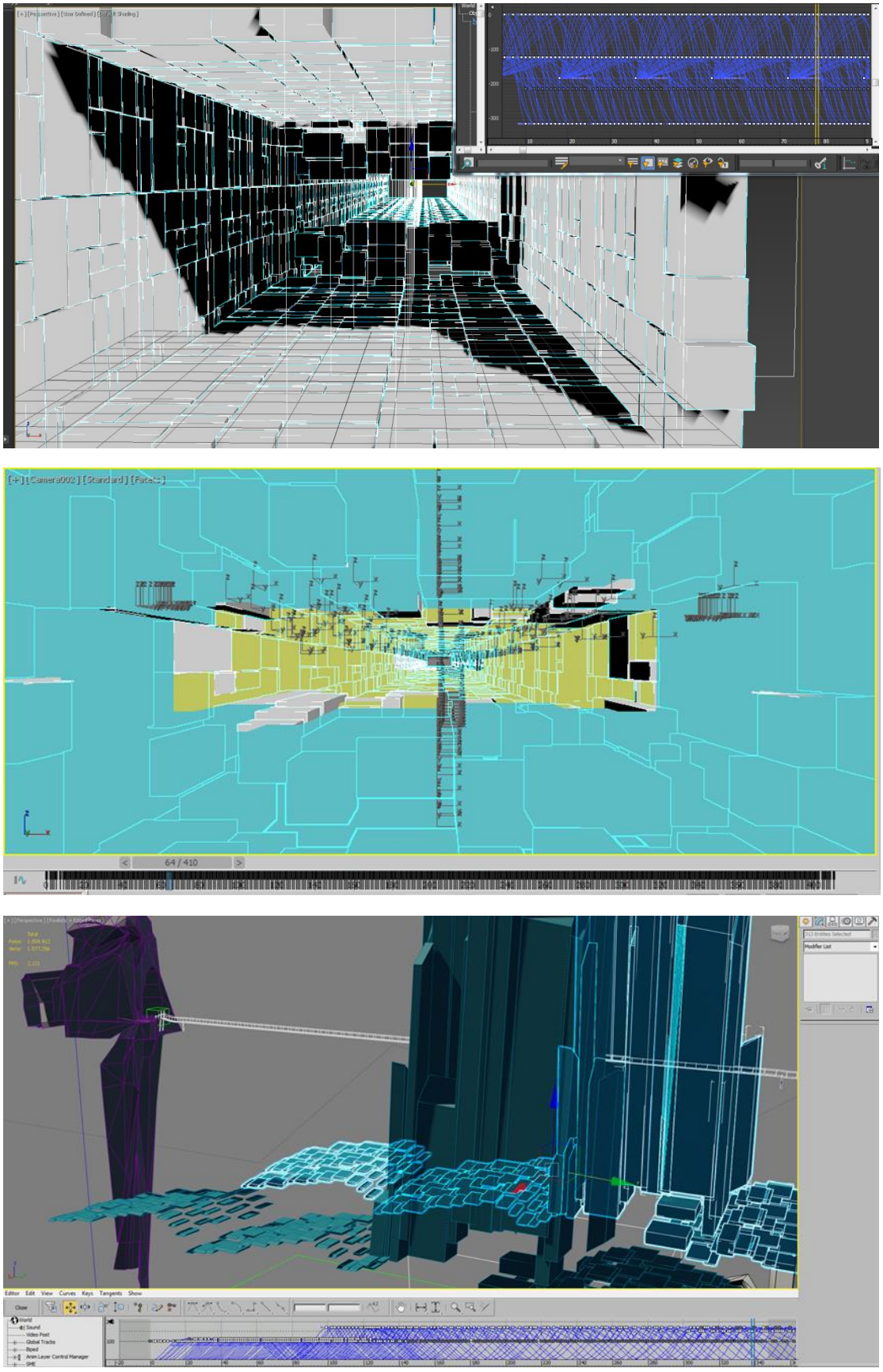
Figures 60 Landslide physics sequence for the mountain scene. Various experimentation in order to achieve the desired loopable result (displaying ghosting and trajectories).



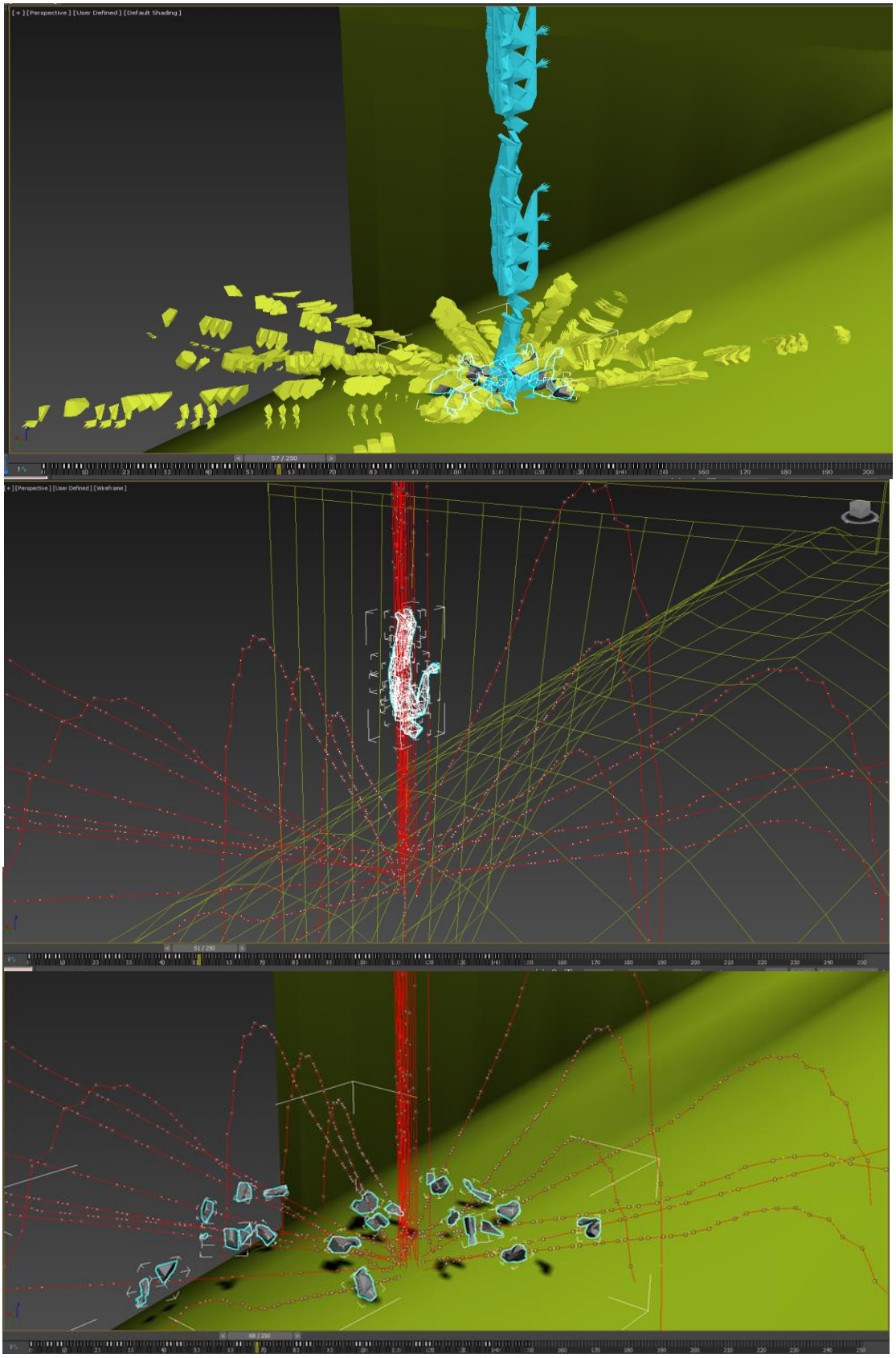
Figures 61 Experiments on procedural geometry creation, particles, physics and animation loops.



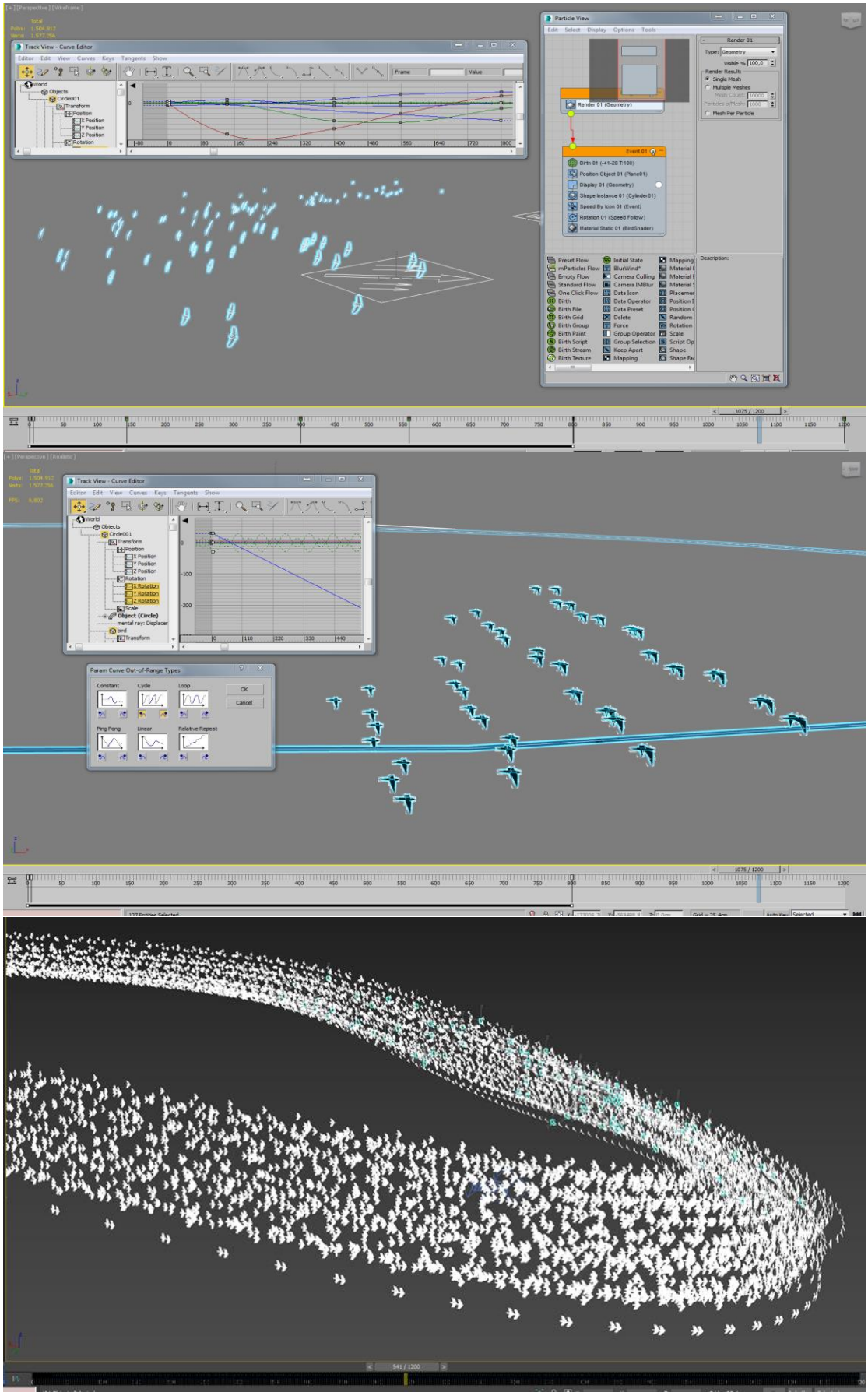
Figures 62 Experiments while modelling the wormhole and the initial loopable segment. The same line used for its creation navigates the camera. Dummies were placed to align the figures in Unity.



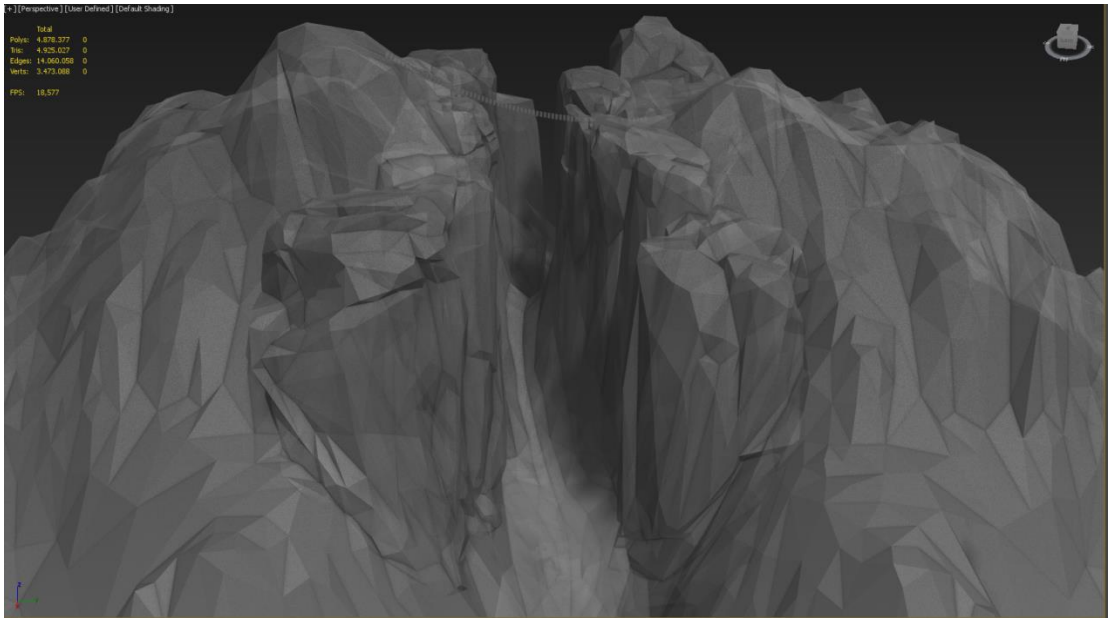
Figures 63 Procedural animation created in succession with multiple helpers offset to achieve this effect.



Figures 64 Animated physics with object shattering that was then baked in order to work in Unity.



Figures 65 Tests to create a flock of birds first using loopable animations constrained to a rotating object and later on by creating particle objects and baking the result for Unity.



Figures 62 Various experiments for generating landscapes.

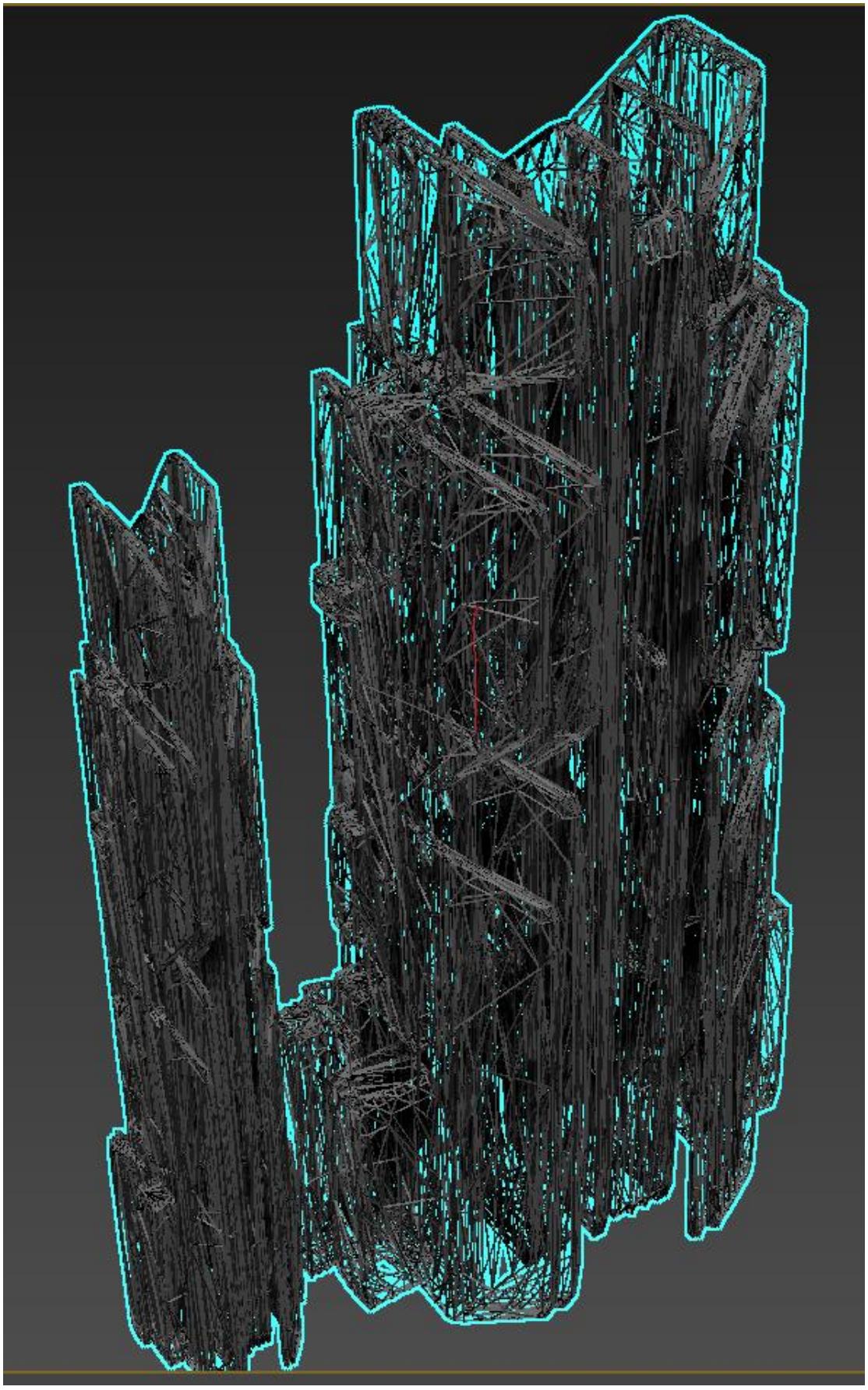


Figure 63 Visual research on geometry generation and depiction inside of 3DS Max.