The Aesthetic Response

A study of aesthetics in design of 3D-modelled game assets

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Abstract

This is a bachelor thesis on the subject of aesthetics in design in the realm of video game art. Our intention is to investigate if basic, geometrical shapes will highlight certain physical attributes or characteristics, triggered by the visual appearance of a designed product in what is essentially an aesthetic response. We test this subject in the realm of videogames, through our own design and production of 3D-models. A survey is then conducted with participants observing these models and answering questions relating to certain attributes that we intended for these models to display through their visual, aesthetic appearance. The survey shows that participant responses and general opinions regarding the design of these models were largely what we expected and set out to achieve. While we can not empirically verify these results as conclusive and the opinions and theories proposed in this thesis are largely dependent on context and personal experience, we believe an attention to aesthetics in design can effectively guide the aesthetic response an observer or user may experience with a product or artefact.

Keywords

Aesthetics, design, association study, modules, evolutionary aesthetics, cognitive mechanism, videogames, 3D.
Sammanfattning

Detta är en C-uppsats i design estetik inom videospel. Vi avser att undersöka hur personer kan uppfatta vissa attribut och egenskaper eller uppleva en estetisk respons utlöst av det visuella utseendet i en designad produkt. Vi har inriktat vårt forskningsområde till videospel. I denna studie ingår design och produktion av 3D-modeller av luftskepp till videospel. En enkät är sedan utförd med deltagare som observerar dessa modeller. Deltagarna svarar på frågor som relaterar till attribut och egenskaper som vi avser att dessa modeller ska framföra genom sitt visuella, estetiska utseende. Enkäten visar att trots att deltagarna hade sina egna uppfattningar och åsikter kring utseendet på dessa modeller så var de generella åsikterna och responserna överlag vad vi förväntade oss och strävade för att uppnå genom vår design. Vi kan inte empiriskt verifiera dessa resultat som slutgiltiga och åsikterna och teorierna som förs fram i denna uppsats är till stor del beroende på kontext och personal erfarenhet hos våra deltagare. Som forskare så anser vi att en uppmärksamhet och medvetenhet av estetik inom design kan hjälpa oss som designers och konstnärer att effektivt styra den estetiska responsen som en åskådare eller användare kan uppleva hos en produkt eller artifakt.

Nyckelord

Estetik, design, association studie, moduler, evolutionär estetik, kognitiva mekanismer, videospel, 3D.
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1 Introduction

When stumbling onto an artifact or an object, chances are that it may elicit some form of reaction or response in the mind of an observer, consciously or subconsciously. As an observer, you may associate the object you are observing with something threatening, or something comforting. You may find it attractive, or repulsive. Or you may even acknowledge the attributes the object may harness, such as speed or strength by simply visually identifying it. According to existing theories, this phenomenon has roots in cultural and social environment which condition the person’s perception of an object (Ulrich, 2006). It also stretches far back to human adaptation from prehistoric times, where the need for survival and procreation were instrumental in shaping certain perceptions we experience today (Hekkert, 2006). Theories have been developed in an attempt to understand and explain how people associate certain artifacts and their visual appearance with certain attributes. This paper will attempt to test some of these theories, in the context of video games. We will digitally create 3D-models of fictional airships for use in the future development our degree project, and solicit help from people willing to be participants in a survey to aid us in understanding how people may perceive the geometrical shapes and design of our 3D-models. We intend to investigate if the responses we hope to elicit with our design choices are indeed invoked in the participants’ aesthetic responses.

1.1 Background

This paper will attempt to highlight the aspects of aesthetics in design, and how the design of artifacts—through their visual appearance—can convey certain ambience, characteristics or attributes. Aesthetics, according to Paul Ford (2009), is the philosophical analysis and perception of beauty and art, defined by no particular definition of the latter and the former, and experienced in the moment by the observer. Aesthetics can also be used to reference design, as well as assuming the ability to judge on a sensory level and usher mutual agreement about beauty (Ford, 2009).

We define design as a practice of manifesting an abstract idea in your mind into the real world, whether it be a in drawing or in our case, 3D-models. Designed products have a creator and a purpose behind them, a purpose that is aided by the design of the object, whether it be the design of its visual appearance or its functionality. As artists, we believe an understanding of design and aesthetics is a necessary tool for artists in creating visual artifacts and imagery, and the further understanding of how aesthetics in design is relevant in establishing art style, the look and feel and the atmosphere of a video game.

When producing such a game, we believe a fundamental understanding of the aesthetics in design provides one with the ability to predict how a player or a user will perceive a game and its features. By knowing how humans respond to visual
features, such as material, shape and size, and how these responses are influenced by different processes such as the evolutionary processes in culture, social environment and education, one might predict how a designed product will be perceived by another person (Ulrich, 2006). As we touch upon the subject of evolutionary aesthetics, one might ask if this is relevant to a study of this size and scope. Evolutionary aesthetics is in our opinion an adequate beginning to understanding the most basic and fundamental origins of aesthetic interpretations and evaluation. Evolution and the essential motives and drives of humans influence all manner of human activities and phenomena, visual information and aesthetics included. According to Ulrich (2006), we can see evolution at the core of how we interpret our daily life and how that affects the tools and products we use and how the designs of these products are developed and implemented.

We believe that to this end, being aware of this theoretical aspect of evolutionary aesthetics and aesthetics in design when concepting and 3d-modelling assets, whether it be characters or non-living objects, attains a large degree of relevancy prior to and during a work-process in games or visual media.

1.2 Related Research

As we set out to begin our studies into this subject, we had no prior knowledge of a formal name for the phenomenon we were interested in, namely how one can design artifacts that convey certain characteristics or attributes that a viewer or user can perceive. One term that we came across during our initial research was aesthetics in design, also formulated by Ulrich (2006) as the aesthetics in design in ch. 5 of Design — Creation of artifacts in society, published in 2006. Ulrich (2006) further describes what he calls evolutionary aesthetics, how evolution has influenced aesthetics and formed a basis for much of our visual perception of the visual appearance and design in the world around us.

In our experience, finding research that relates specifically to the aesthetics in design in relation to video games has proven to be difficult. Some portions of research touch on our subject, most notably Solarski (2013) in his Gamasutra article The Aesthetics of Game Art and Game Design, where he describes the ways in which a player or observer of artifacts base their perception of artifacts on their sensual experience. He also highlighted the psychology behind the way we view certain attributes such as lines, shapes and volume (Solarski, 2013). Solarski asserts that we as humans base much of our perception of artifacts and objects on our personal experience of shapes, geometry and mass in the world around us in our upbringing. The way our sensory perception of the world evolves and the way we experience touch, learn to predict things such as weight and how we associate certain feelings or emotions with shapes translates into how we perceive design and artifacts (Solarski, 2013).

In the same vein, Hekkert (2006) wrote Design Aesthetics: Principles Of Pleasure In Design (2006), in which he further summarized the aesthetic experience, and emphasized the reasons as to why we experience certain things as gratifying to our senses. Like Ulrich (2006), he refers to the evolutionary psychology that may have influenced our aesthetic perception.
1.3 Goal and Research Questions

The primary goal of this study is to investigate the aesthetic responses of participants when they reflect on the visual appearance of 3D-modelled airships we have created. We then analyze if the responses correlate well with the responses we intend to elicit through the visual design and aesthetics in these 3D-models. It is our intent to compile results based on each individual's subjective perception, and identify if there are any underlying patterns in their responses, any recurring opinions that may be expressed, certain aspects of our design that are noted more often than others and if our group of participants share a general perception and overall opinion of the 3D-models and the design we have produced.

- Does the usage of certain geometrical shapes highlight certain attributes in 3D-assets? Are the 3D airships, designed and modelled to appear fast, agile, heavy etc., successfully perceived this way by participants in our study?

The purpose here is not, however, to assume any general conclusions nor answer any questions in regards to aesthetics in design in a broader sense. Neither is this paper intended to provide a thorough explanation of the subject of aesthetics in design beyond the realm of videogames, as this paper deals with digital graphics and a small number of 3D-models and participants. This essay does not touch on aesthetics in design as it may be observed in other forms of media or phenomena, such as traditional art, industrial design, commercial products etc. As the subject of aesthetics as a whole encompasses all the human sensory perceptions (sound, smell, touch, etc.), this paper narrows it's focus to visual information and how a person sees and interprets this information. The degree project connected to this study is one platform for which data collected within this paper will be applied upon, as we believe the research in this paper may aid us as artists in the development of art for this degree project, as well as future creative endeavours.

1.4 Essay structure

This paper is divided into key sections, Theory, Method, Results, Analysis and Conclusions. Within these, we have additional subheadlines that further explain certain topics that are of relevance and interest to both this paper and for our own purposes.

The following chapters of this paper will first cover the existing theory on aesthetics in design, primarily in the Theory section. This prior research will serve as a foundation and guideline for the design process of creating 3D-models, and formulating a questionnaire for a survey to be handed to participants. In the section Method, we will describe the process of designing and producing 3D-models of airships to be used in our survey, how that survey was set up and how the survey was conducted with participants from Södertörn University. Results of this survey will be gathered and presented under Results. In the chapter
Analysis, we discuss the survey results and apply our own, subjective interpretation of the answers and ideas expressed by the participants, and how their answers may be perceive through the lens of prior research and theories presented earlier. In addition, we discuss any unforeseen end-results we see emerging, deficiencies in our interpretation of theory or flaws in the execution of our survey that we can perceive.

After scrutinizing the results of the survey and how these results may influence our own views on the subject of aesthetics in design, and how it can be found in our survey and the context of this paper, the final chapter is Conclusions. These are our own conclusions regarding aesthetics in design and whether the purposes of this thesis are fulfilled and whether our expected outcome was indeed accurately predicted.
2 Theory

As we set out to perform this study, we were not familiar with any of the research done on aesthetics in design or theories behind how we as people perceive things we see in our surroundings. However, we were well aware of the general idea that one could design and produce visual products with a certain feeling or attribute in mind, this is something we believe all humans, whether consciously or not, all largely well-versed with. Certain visual phenomena we encounter in our life can be interpreted or perceived to have certain meanings, meanings that may be abstract or complex, depending on the personal association one makes when they observe something.

The theories and research we are about to present puts into words different processes and cognitive mechanisms that come into play when humans perceive the aesthetics in design. These theories are not intrinsically confined to videogames, the larger subject of aesthetics in design is extremely more complex than the scope and depth of this paper. We simply aspire to further understand and put into words the subject of aesthetics in design as it can be found in our specific study within the context of videogames and the 3D-modelled airships we have created for our future degree project. We believe the theories and prior research we have found, while a part of a greater subject than this paper, definitely are relevant to this paper and the phenomenon we wish to research.

2.1 Aesthetics in Design

Ulrich (2006) formulated his own theory on aesthetics in design, which he claimed did not elucidate thoroughly on the subject in its entirety, but it nevertheless we believe that it provides some valuable insights. The theory was that aesthetic response is a result of a variety of cognitive mechanisms, and that these cognitive mechanisms “operate on basic sensory inputs and on symbols derived from these inputs and memory” (Ulrich, 2006, p.6). The cognitive mechanisms, he further concludes, have “short time constants” and may be overridden by “more deliberate formation of reference based on analysis over longer time periods”. Evolutionarily, the process of detecting physical features was aesthetic responses that were “vestigial adaptations”, while other aesthetic responses are adaptations that “operate on symbols derived from learning, experience, and cultural context” (Ulrich, 2006, p.6-7). Essentially, he summarizes the processes involved upon viewing and interpreting an artifact.

In recent history, our understanding of basic shapes and the attributes and qualities we associate with them has increased greatly as the phenomena of art and aesthetics have evolved.
According to Solarski (2013), our perceptions of basic shapes in our surroundings and the objects we see and interact with have general connotations to them that are grounded in our development as humans. Spherical shapes are typically associated with a sense of roundness, perception of youth, femininity and energy. The shape of a cube signifies stability, maturity, balance, and persistence. Triangles typically convey a sense of aggression, power, and masculinity. These basic connotations of seemingly abstract and basic shapes in our surroundings are formed in our infancy, when children explore the world and environment around them. As a child learns by experience that certain objects in different shapes and size interact with the world in different ways, they learn to predict and assess it quickly in their visual sensory. This basic experience is fundamentally influential to a person’s perception of the world around them, and helps them navigate their surroundings in a more literal sense. But it also influences the experience of art and aesthetics, as these formative experiences resonate in all aspects of a person’s life (Solarski, 2013). While we deal more specifically with the realm of videogames, we believe this view of human perception can be useful for artists when creating products to be interacted with by other people.

An artist may use principles of lines, shapes, perspective and composition to guide a spectator’s attention, and to bring focus to certain details in favor of other more subtle or complementary features (Solarski, 2013). We believe this to be the case also in videogames, both in the realm of art and when creating game worlds and levels. A guided composition and focus on certain features is something we believe can be essential at times when one wishes to emphasize a certain aspect of an image or a product, 3D-models in our case.

While the aesthetics one wishes to convey through the design of a product may be complex, we believe these basic shapes and human associations to them can still be found, both in the smaller details or specifics and also in larger compositions, such as complex objects or images. A largely triangular vehicle such as the ones we intend to create may convey a sense of forward-motion, high speed and an aggressive demeanor. A more cubical or square shape would in our opinion be more likely to convey aesthetics that promote a sense of rigidity, stability, solidity and inherent durability. Spherical shapes have been found to give a person a greater sense of safe, childlike and playful atmosphere. In the realm of videogames, this is a fairly established notion when one creates casual games or games for children. These games use largely spherical shapes and bright colors to convey a sense of safety, playfulness and avoid any sense of immediate danger or a grim demeanor (Solarski, 2013).

The ability to judge the aesthetics of an artifact has its roots with the evolutionary
aspects of human cognitive mechanisms. All aesthetic judgements are cognitive, and these mechanisms include the ability to respond to properties such as status and prestige, as well as identify features which are considered to be attractive. Though context influences judgement, this trait is nevertheless universal amongst humans, regardless of cultural, educational or experiential background, and has it’s origins in evolutionary adaptations in our biological system. Human adaptation and the concept of evolutionary aesthetics reach back far back in human history and evolution, where features that were considered attractive and which could evoke positive responses has their roots in reproductive and survival instincts (Ulrich, 2006). This psychological mechanism is a result of the process of natural selection, in which human adaptation occurs to overcome obstacles in order to survive (and reproduce). This meant that humans would seek out patterns that were beneficial (i.e. that would evoke positive responses). The ability to assess attractiveness is a classic example of evolutionary aesthetics with the fact that symmetry is a feature that humans on average would respond positively to (in potential mates) (Ulrich, 2006). Alongside measuring attractive attributes, humans also harness the ability to equally react to repulsive aspects, which through evolution enabled the assessment of potential threats. Shapes and objects that resemble living animals such as dangerous predators or possibly harmful objects such as sharp, pointy branches or weapons may invoke a negative or dismissive reaction, one of fright or reluctance to approach in fear of harm (Ulrich, 2006). Contrary, we believe that objects that bear visual similarities with objects or phenomena that signify safety, nutrition or well-being in some shape or form may invoke a positive reaction. Through natural selection, psychological mechanisms have been adapted that aid humans to survive. Humans in general seek to serve these adaptive mechanisms as a mean to increase chance of survival, therefore we also encourage and enjoy visual and aesthetic patterns and characteristics that serve or reinforce these adaptive, mechanisms (Hekkert, 2006). In the case of the modular sets and ships that we created for this paper, we believe that these initial responses to the overall shapes and dimensions of our ships and modules may be interesting. Additionally, more deliberate, in-depth analysis and influence of earlier experience and knowledge of matters regarding these types of vehicles and videogames may produce interesting, personal reflections from our participants. An immediate reaction to the visual appearance may be grounded in a more evolutionary perspective, but when we reflect on what we are actually seeing in more detail and we consider things such as modern materials and technology that enables us to make designs and create products that we could not have done in the past, our overall perception and opinion on the “beauty” or “attraction” of a phenomenon may shift (Ulrich, 2006).

2.2 Context creates meaning

The concepts of value can be divided into two which influence interpretation: aesthetic response and what we deem as context. Context determines the “meaning” following the initial aesthetic responses, thus producing responses that may differ from individual to individual. Cognitive mechanisms operate on symbols in which values are emphasized (Ulrich, 2006). For instance, an artifact’s value may be influenced, or at times determined, by its symbolic status. This symbolism varies between cultural perspectives, which in turn influence...
social environment. As social environment fluctuates in how we perceive something, so does aesthetic preferences and judgement (Ulrich, 2006). Simply put, an individual’s cultural, educational and social environmental background heavily influences his or her perception of the world, artifacts and products.

In videogames, a player may register the difference between friend and foe, or what type of function an artifact may have, or even determine the power of an enemy character by visually identifying it. For instance, it might not be difficult to assess that Darth Vader (Lucas, 1977) or other similar-looking characters would be considered a threat against the protagonist. We believe entertainment culture have since popularized the notion that a black-suited, cloaked and robotic character wearing helmets with dehumanizing features are often interpreted by viewers as symbols of evil, acting as anomalies, alien or foreign entities. Whilst the context (game, genre, story, etc) would determine the player’s final perception of an artifact or character, the aesthetic response is the first response in which the player will identify the traits that suggest whether a foreign entity is a threat or not. To assess danger and threat is first instigated by visual identification.

The process of playing games encompasses the need to identify things within seconds. For instance, players need to quickly assess whether or not running and hiding behind a wooden crate in order to escape enemy fire, is a safe choice. Cognitive judgement at first would consider a wooden crate to be less safe and effective against incoming bullets, and one would perhaps seek cover behind something sturdier. However, context will influence player’s perception as to whether the wooden crate will provide protection or not; if the particular game dictates that wooden crates are unbreakable, then the player will be convinced that the wooden crate will provide safety and become a symbol for protection, and will become a commodity to be sought-after and identified visually. Without context, the meaning is lost and the ability to understand an artifact harkens the observer back to his/her initial aesthetic response.

Because games operate in an environment where physical laws are largely incompatible with reality, there is the need to suspend disbelief and accept the laws in which the game functions. Thus we believe much of human aesthetic judgement can have entirely different meanings in games as opposed to applying it in reality and everyday life.

2.3 Principles of Designing Aesthetic Products

Thus far, we have covered in the previous Sections on the aesthetic responses upon visually identifying an artifact. But is there a way to dictate the outcome of aesthetic responses in the creation of an artifact?

Bihn Pham (1999) lists nine basic principles for producing aesthetic products and artifacts, which relates to shape, composition and physical properties. He explains that these principles, when applied to products and artifacts, enable the possibility of exerting a variety of emotion responses (Pham, 1999).
The following are the nine principles developed by Pham (1999):

**Balance**: emphasizes the need to balance between symmetry and asymmetry, since both aspects can emphasize features that might not bode well with the design. As such, balance here achieves a sense of unity, where an artifact would have features that complement one another.

**Proportion**: linear (the dimensions between objects or features within one object), areal (area of the object) and volumetric (volume of the object) proportions that emphasize spatial balance; that a feature or object would require an acceptable amount of space in order to properly be identified. This would effectively separate objects or features by shape, color, texture and material.

**Dominance/Principality**: a feature can be dominant on an artifact in order to create a form of hierarchical unity in which that feature will dominate the rest. This would be the point in which the eye would be drawn to first.

**Alternation/Interchange/Contrast**: features and characteristics that are polar opposites of one another can create more impact on the visual aspects of the artifact.

**Solidity/Structural Coherence**: avoiding giving the impression of fragility and creating an artifact that exerts solidity, stability and strength through visual power can be achieved by adding features that signify “fullness or robust characteristics”, such as “round objects of heavy material and solid colors”, or combining elements into a single mass.

**Simplicity**: simplicity enables the artifact to maintain a sense of focus.

**Dynamics**: certain characteristics can give the impression of energy and movement, such as features displaying patterns pointing in a certain direction.

**Rhythm**: repetition of color, form, intensity or tone can evoke interesting reactions, though variations are important to avoid monotony.

By adhering to these principles, a graphic artist harnesses the basic guidelines to create artifacts that can elicit specific emotions.
3 Method

A survey was implemented to extract and collect data via participants who were tasked with observing 3D-models designed and created by us. Participants were provided with a survey questionnaire containing questions regarding certain pre-chosen attributes that we intended for these 3D-models to display through their visual appearance. Participants were asked to answer these questions with numerical responses that corresponded to their level of agreement regarding a certain attribute a 3D-model may or may not display. They were also encouraged to provide additional, optional comments in writing, if they wished to further detail their perception and opinion of the 3D-modeled airships.

3.1 Background Information on Survey

Prior to writing this paper, a pilot study titled *Qualitative Analysis of Design Aesthetics, A pilot study: How and why human perception interprets visual information with focus on fictional vehicular design (2013)*, was initiated in order for us to test whether a qualitative method would best provide us with the data we needed to attain. To this end, we implemented a survey in which participants were encouraged to write down their answers with little restriction based on first-impressions. Images of science-fiction vessels were selected from the online community for showcasing artwork, DeviantArt (2013), for the participants to scrutinize. An oral and a written survey were conducted, with different participants for each. The participants were instructed to either write their answers down on a form, or state their opinions orally in a recording device for documentation respectively.

The results of the pilot study proved insufficient for us to properly categorize the data, since the research subject was too vast and too complex, which resulted in answers that were not concrete enough to cater our needs. As a result, we felt the necessity to implement a setup that would provide numerical data for which we would be able to compile and compare. We proceeded to employ a simple method where participants were provided with multiple choice questionnaires, thus enabling us to maintain certain integrity on the research questions and still acquire adequate data.

Basing our study upon the errors of the pilot study, we attached brief background information on our game in order to create the proper context for which the participants would be able to understand and work with. In doing so, we relinquished the initial first-impression approach. In connection with our degree project, a Turn-Based Strategy game set in a Steampunk-inspired environment, we chose to create three versions of one airship, with each version harnessing different physical attributes. These physical attributes are determined by sets of modules, which are intended to be physical manifestations of specific attributes, the player is able to purchase during gameplay.
3.2 Subjectivity of Design

During the course of preparing to conduct the survey, the airship modules were designed to elicit specific aesthetic responses from each participant. With existing theory within our periphery, such as Solarski’s (2013) theory of sensual experience upon viewing certain attributes, such as lines, shapes and volume, and Bihn Pham’s (1999) nine principles of producing aesthetic products, we implemented our own understanding of form, shape and mass upon designing each ship module. As stated in the previous Section, each module was to be a physical manifestation of specific ship attributes, such as speed, durability and levels of power through visual identification. Because of the existence of subjectivity within this research subject, we consider that there are no definitive guidelines to employ when seeking to elicit aesthetic responses. Though there are common patterns present as a result of human biology, we consider them to be basic platforms for which specific design can have room to develop upon. Our own interpretation of aesthetic responses in the design of our modules was the starting point that we implemented when undertaking the modelling process. For instance, our own interpretation of “aggressive design” are forms that are sharp, triangular and jagged, as well as winged and forward-pointing—the latter coinciding with Bihn Pham’s principle of “Dynamics”. The term “alive”, meaning that the design indicates movement, liveliness and energy defined the basis for which we utilized in creating the modules. In contrast, the term “neutral” was duly emphasized in creating modules that were to indicate normality and balance, modules that were a neither passive or aggressive, but rather the variables in between.

For the most part, our own subjective point-of-view on what was the appropriate design resulted in the the forms that materialized for the modules. It should be indicated that the existing theories for which we have presented in this paper served as a backdrop for understanding the concept surrounding the research subject of aesthetics in design, but in conducting our research, our own interpretation was the focal point in the overall decision-making of the module designs.

To scrutinize the schematics of our design intent, we can summarize that the ship hull and the modules we had created is a blend of wood and metal, in what we deem to be part of traditional Steampunk architect. It was to be a mixture between the old and the new; a hull that strongly resembled a 17th century schooner, and replaceable metal parts reminiscent of Victorian-era steam-powered technology. The physical laws that apply in Steampunk were to be applied to our ship as well, as we deemed it important to apply the genre as a guideline for which we had to adhere to.

3.3 What is Steampunk

Though it is not the goal of this paper to provide in-depth information on the Steampunk genre, it is nevertheless appropriate to provide a brief elucidation on the genre as it is a defining guideline for our 3D-models and a future degree
project of ours. Steampunk is defined as a subgenre of science fiction and fantasy, where steam-powered, retro-futuristic technology is a prominent feature in an alternate history of the industrialized West, often with Victorian England or the Wild West serving as a backdrop. Airships are usually major components, ranging from the well-known steampunk zeppelins to re-interpretations of 17th century ships that transverse through the skies. In short, steampunk is a mostly a reimagining of history, playing with technology that were otherwise impossible to attain during the period in actual history. Like most fantasy fiction, steampunk tends to defy real-world logic, such as gravity, and function within its own meaning of logic (Anon, 2014b).

3.4 Creation of Models

In connection to this paper, we created 3D-models of fictional airships for our degree project. As this game is based on players controlling airships that fly and do combat with each other in hazardous storms above the surface of a planet.

In preparation for the survey, three versions of the same ship were duly modelled. They had the same basic hull and structure, but we also produced three different sets of exchangeable modules that can be obtained by the player in-game. These modules were created in three sets, with each set harnessing a certain archetype or characteristic in mind. One set of modules was made to make the ship appear lighter, faster and more agile than the others. The archetype we had in mind was to make the ship fast like a scout ship or an agile fighter. Another set of modules was made to make the ship look more solid, armored and durable as a whole. We consider it to be reminiscent of a tank on the battlefield, slower but more durable. A third set of modules was made to appear as a more neutral, medium specialized archetype. This version was made to give the ship the appearance of a more all-rounded ship, perhaps a transport ship or a medium-sized combat ship. With the survey, we set out to investigate if participants would somehow perceive these overall archetypes or characteristics that we had in mind when we designed and produced all three versions of the ship. We also kept an open mind to any additional interpretations that we could see emerging from the participants’ responses.
When modelling these ships, we based our workflow on the design of the game. For instance, the player will be able to control the same ship and obtain different modules such as propulsion, armor, power supply and so on. Due to time constraints, some modules were not textured to the same extent as others, and thus we made the decision to let all modules be displayed with a simple Blinn-material while the hull of the ship had a complete texture. This, we considered, was sufficient to create the contrast we sought to display—the combination of wood and metal; with metal being the the modules. Though textures for the modules were absent, the usage of Blinn-material created sufficient specular highlights, accompanied with the base color gray, in achieving the look and feel of metal—or at the very least, the impression of metal. While we believe it would have been optimal to perform the survey with all textures complete, we felt leaving all modules untextured in the 3D-scene gave a more coherent and comprehensive appearance at the time. We therefore chose to leave all modules untextured, while still retaining their geometrical shapes and overall appearance. While materials and textures do influence the perception of these models, we believe the participants were still able to form coherent perception of our 3D-models and their general design, geometry and appearance.
3.5 Survey Questionnaires

Upon developing our own understanding and basing our study on earlier research regarding aesthetics in design and human perception, we formulated 6 questions in the form of a multiple-choice questionnaire for our participants. These questions asked to what degree the participants felt a ship carried a certain attribute or characteristic, displayed through its visual appearance. We motivated the purpose and formulation of these questions based on our own, subjective perception and experience of visual appearance and aesthetics in design. These specific questions were implemented mainly because they covered the aspects of our design intent that we sought to investigate. Existing research provided us with general guidelines for our design process. These are the questions presented in the survey, along with the motivation behind each question:

- If you could decide, what type of function/role would this ship have? What influenced your answer?

This introductory, more open-ended question was intended for our participants to give a "first impression"-response. As they had at this point read and understood the context of the survey (backstory and genre of the game), we intended for them to utilize their knowledge and experience with videogames and gamedesign to imagine a purpose or role that these ships might have in the game. We intended to see if the perception of these ships in general corresponded well with the perception we had of them and the function and role we had in mind when designing and producing the 3D-models.

- From a scale of 1-5, how agile does this ship look to you (i.e can successfully dodge enemy fire)?

When creating the three different sets of modules and resulting versions of ships, we intended for them to display a difference in ability to maneuver in the air. The lightest version was created with less armor and mass, and with more aerodynamic shapes, such as sharp angles and wings with angled propellers on the side. We believe this would aid the ship in maneuvering, turning and flying at great speeds in the air. The medium ship was more reliant on stable, straight propellers, not being as proficient on sharp turns or aerodynamic changes, and more for a steady pace of flight and maneuvering. The heaviest ship modules utilized heavily armored modules, with propulsion and propellers without any aerodynamic proficiency and more geared towards mass and durability, with enough power to keep the ship moving, however slow or clumsy. We considered the principle of dynamics (Pham, 1999) as we sought to design modules and geometrical shapes that would signify a sense of movement and forward-facing direction, creating a sense of speed or movement forward.

- From a scale of 1-5, how durable does this ship seem to you (i.e can successfully absorb damage/not break easily)?

As the concept of our game relies heavily on air-to-air combat between these airships, the ability to sustain damage is very important, but must also be considered along with other attributes that may suffer from an extensive amount
of plating and lack of aerodynamic modules and so on. We intended for our heavy modular set to make the ship more of a slow, durable warship, as opposed to the other two versions. It has more armored plating and mass than any of the other two, while the others were made to sacrifice durability and sustainability in combat, but with more mobility and movement speed. We believe the principle of solidity (Pham, 1999) and structural coherence comes in when we attempted to design features that would display an appearance of a robust, stable and solid foundation and coherent profile of the ship, making it look structurally and integrally stable.

- From a scale of 1-5, how fast do you think this ship is (i.e can fly fast in a straight line)?

The ability to sustain damage in combat can also be countered by the ability to avoid damage all together, being a fast-moving target and a hard target to hit. We created the lightest version of our ships with a more aerodynamic profile and features, but also with two large engines at the back of the ship. We believe this ratio between the engines and the relative size of the rest of the ship and its modules would make the ship look like a very fast accelerating vehicle that would pack great propulsion and a light weight that could propel itself forward very quickly. The medium ship-modules were created with a single engine module, in our opinion making it look more slow-moving and stable. The heaviest set of modules was created with larger engines this design came about as an attempt to give the appearance of needing bigger engines to carry the heavier weight of the ship. Also, engines were integrated into large, square pieces of armor, we believe this would make the engines and propellers themselves less prominent and appear more protected from enemy fire in combat. As we designed the lighter ship modules, we sought to display a sense of speed both in the shapes and designs of the modular set as a whole, adhering to the principle of dynamics (Pham, 1999), but also through the principle of dominance and principality. The principle of dominance asserts that a feature can be made to look dominant and create a more hierarchical perception of the composition as a whole (Pham, 1999). By making the large engines appear dominant in relation to other modules, we believe this brings about a visual emphasis on the capacity and power for speed and acceleration in the ship as a vehicle, where the propulsion and engine is prioritized more highly than armaments or armor, for instance.

- From a scale of 1-5, how attractive does this ship look to you?

This question is more open-ended in nature, it can be interpreted as a pure inquiry into a participant’s immediate preference and whether he or she subjectively considers a ship and the modules to “look good” or well-designed. It can also prompt them to consider more aesthetic considerations, what they imagine when they judge something to be “attractive” and what it is about this product or artifact that influences their perception and aesthetic judgement.

What we hoped to gain by this question was a further understanding of any specific details or features that they would emphasis when perceiving a ship with a certain set of modules, it may be useful both to gain a small understanding of their preference or general opinion of the aesthetics of the models, but it may...
also allow them to emphasize certain features that we as researchers may not have considered or emphasized ourselves when formulating our questions.

### 3.6 Survey Procedure

We recruited 5 participants to conduct the survey. These participants were all 2nd-year students of game development at Södertörn University, and were in our own opinion perhaps well-versed with many of the conventions and trends of video games, thus enabling them to better grasp the context of the survey. They were asked to observe the 3D-modelled ships we had produced in Maya (Autodesk, 2014), a computer graphics software application.

The participants then answered our survey of 5 multiple-choice questions, as well as a more open-ended introductory question, pertaining to the visual appearance of these models, via a printed questionnaire. The participants were asked to assess their answer in the form of a number, ranging from 1-5. The answering options were categorized as follows: Poor (1), Average (2), Good (3), Very Good (4), Excellent (5). They were presented with a question regarding a certain attribute. They would then assess how much they perceived that attribute in the visual appearance of a ship and then give a corresponding, numerical answer. They also had the option to add written comments to clarify their assessments, with each participant giving additional information to certain extent. A more qualitative question was also presented in the introduction, where we asked the participants if they could formulate an assessment of a particular role they might imagine each ship to have, in the context of the introduction they had to our game design and concept of the game. In our previous pilot study, we performed a similar test with another set of participants where we hoped to elicit more spontaneous, first impressions and interpretations of what was presented. In this paper, we are less focused on spontaneous impressions and we were more concerned with eliciting more thorough, concrete answers. The questions we formulated for the survey were also a lot less open-ended, as we aimed for more direct answers pertaining to our 3D-models and their designs.

The questions regarding their visual appearance were the same for each ship, and the ships were displayed in the same 3D-scene in Maya, positioned in a row and referred to by their position in the viewport, such as ship Left, Middle and Right. As we refer to these ships in this paper, we will refer to them as Light ship, Medium ship and Heavy ship.

The ship furthest to the left, in what we deem as the Light ship, was to be the ship equipped with lighter, more aerodynamic modules. This ship was to appear aggressive, energetic and sharp. The triangular shapes, the forward-pointing angles and aerodynamic modules were to reinforce the notion that this ship can fly fast, initiate a hit-and-run attack and escape before the opponent can properly retaliate.
The ship on the right, which we call the *Heavy ship*, was designed with modules that would make it look more massive and robust, with the ability to survive the longest under duress. The square / rectangular geometry were to signify stability, safety and durability. It’s vital components, such as the engine, propellers and hull are thoroughly protected.

The ship in the middle, called the *Middle ship*, was equipped to appear more medium between the two more extreme versions. This ship was to act as the middleground, to be neither too aggressive nor too defensive. It has only the least amount of protective plates — especially compared to the *Heavy ship* — but it has more mass than the *Light ship*. Its single engine indicates that speed is not a priority, but can exceed speed faster than the *Heavy ship*, but not the *Light ship*.

These were the overall archetypes we kept in mind when we designed each modular asset and applied them to create these three “versions” of the same basic ship.

Though there was no time-limit implemented for the questionnaires, the circumstances did not permit prolonged participation, thus all participants were allocated to observe the models on one screen. We believe it is sub-optimal to have all participants watching the same screen at the same time, as this restricts each participant from navigating the software application and view each perspective of the 3D-models in their own pace. However, the angle of perception was changed several times and we believe each participant still gained a largely comprehensive, personal assessment of the models. We were aware of the fact that the participants may not be assessing the aesthetics of each ship as a separate phenomenon, but instead compare the ships to each other. While this may create a form of bias or influence their answers, we did not feel that this was a major flaw or a failing on the behalf of the study. We put no greater emphasis on first impressions or raw, fresh aesthetic responses. We as researchers also made an effort to not be involved with the survey, aside from helping with any questions regarding the procedure of the survey or the questionnaire itself.

### 3.7 Method Critique

Due to time constraints, no more than five participants were selected to partake in the survey. The most notable issue here is whether the amount of participants is enough to provide conclusive results. While we believe the results nevertheless largely confirmed our design intent, the outcome may have been different should the amount of participants have been larger. And the fact that all five participants had to observe the ships via a single monitor simultaneously could be considered far from optimal. The most optimal way would simply to have been to let each participant partake in the survey individually, and provide him/her with the ability to control the software camera in order to investigate the ships at his/her own leisure. We believe the participants were still able to form and express sufficient responses for our survey, but the format and procedure of the survey could have been better prepared and structured.
The overall survey and the quality of the questions, while having given relevant results, may still have room for improvement such as additional, more in-depth questions that may cover certain aspects that we may have neglected. The question regarding the attractiveness of the 3D-airships could perhaps have been specified to a greater degree, as in its present form it may not call on more than just a brief, subjective comment on the overall “beauty” of a 3D-model. While this is not irrelevant in itself, it might not be reliable to provoke any further comments on the details or designs of the visual appearance, the main focus of our purpose with this paper.

The implementation of our own design intent, reinforced by existing theories such as Solarski (2013) and Pham’s (1999) works, only covers aspects of the research which we aimed to obtain in this rather small-scale research. As such, this route would not be sufficient should one wish to address a broader spectrum of the research subject of aesthetics in design. The theories and prior research we have mentioned in this paper are not strictly specific to the context of videogames or 3D-graphics, certainly not graphics displaying 3D-modelled airships with a theme centered on Steampunk. We believe however, as our research still deals with the visual appearance and design of products to be seen and interacted with by people, that the same principles and aesthetics apply when it comes to interpreting these products. Whether it is videogames, or more traditional art such as a painting or furniture design etc., we believe the same visual sensory processes are present in the perceptions of the people interacting with the products and forming a judgement regarding its visual appearance.
4 Results

As stated in Survey Procedure, 5 volunteers were recruited to participate in the survey, and were asked different questions regarding several attributes and characteristics we had in mind when creating these models to see if they would also be observed by our participants. Their objectives were to provide mainly numerical answers on a scale from 1-5 in the form of multiple-choice questionnaires, with the option of motivating their answer with each question. The starting question enabled them to provide a general, open-ended answer. The collected data will be presented, with all questions and the averages of their corresponding, numerical responses from our participants in a chart. These averages were calculated by adding the total numerical sum of participants’ answers to a question and subtracting this sum by the number of answers per ship, namely 5. With these average scores, we have a simpler way of comparing participants’ perception of the ships, in relation to each other.

A transcript containing verbatim survey responses will be available in the Appendix, section.

Participant responses:

<table>
<thead>
<tr>
<th>Questions:</th>
<th>Light</th>
<th>Medium</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) From a scale of 1-5, how agile does this ship look to you (i.e. can successfully dodge enemy fire)?</td>
<td>3.6</td>
<td>2.8</td>
<td>1.0</td>
</tr>
<tr>
<td>3) From a scale of 1-5, how durable does this ship seem to you (i.e. can successfully absorb damage/not break easily)?</td>
<td>1.6</td>
<td>3.0</td>
<td>4.6</td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive does this ship look to you?</td>
<td>2.4</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>5) From a scale of 1-5, how fast do you think this ship is (i.e. can fly fast in a straight line)?</td>
<td>4.2</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td>6) From a scale from 1-5, how attractive does this ship look to you?</td>
<td>3.6</td>
<td>3.8</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Keywords:

There are keywords that were extracted from participant responses from the introductory question and from the additional comments they may have provided after each multiple-choice question. These keywords were primarily adjectives expressed in text by the participants. They were adjectives, words and phrases that we believe can efficiently summarize the participants' perceptions of the models they were presented with. These keywords coupled with averages of the numerical responses may present us with a greater understanding and help us determine if any patterns, trends or common responses can be found in the answers provided by our participants. With this, we ultimately intend to conclude with as much certainty as possible if the responses we predicted from our participants were the responses they gave, or if unexpected or contrary results emerge instead.

<table>
<thead>
<tr>
<th>Questions:</th>
<th>Light</th>
<th>Medium</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) If you could decide, what type of function / role would this ship have? What influenced your answer?</td>
<td>scout, arrow-like, improvised, economic, exposed, exploration, lighter, high-speed travel, fast troop transporter, artillery</td>
<td>support/command, light, military, escort/maneuver fighting, transportation</td>
<td>living quarters, supply, tank, combat, heavy, heavy transportation, robust, ram</td>
</tr>
<tr>
<td>2) From a scale of 1-5, how agile does this ship look to you(i.e can successfully dodge enemy fire)?</td>
<td>fast, less mass, less resilient, light structure, quick,</td>
<td>over encumbered, not very maneuverable</td>
<td>large, chunky, heavy metal, heavy and broad,</td>
</tr>
<tr>
<td>3) From a scale of 1-5, how durable does this ship seem to you (i.e can successfully absorb damage/not break easily)?</td>
<td>thin, low amounts of armor, exposed, light construction, not very durable, retreat</td>
<td>reasonably armored, weak points, unsound defense,</td>
<td>heavily plated, metal, lots of armor</td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive does this ship look to you?</td>
<td>fairly round, sharp, utility, civilized, not capable</td>
<td>less-aggressive angles, sharp, weighted for attack, no option to defend, not very</td>
<td>friendly circles, box shapes, stable, no aggressive sharp angles, defensive</td>
</tr>
<tr>
<td>5) From a scale of 1-5, how fast do</td>
<td>aerodynamic, less mass,</td>
<td>agile</td>
<td>boxy shapes, American muscle</td>
</tr>
<tr>
<td>you think this ship is (i.e can fly fast in a straight line)?</td>
<td></td>
<td>car, turns slowly, accelerates slowly, slow lumbering</td>
<td></td>
</tr>
<tr>
<td>---</td>
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<td></td>
</tr>
<tr>
<td><strong>6) From a scale from 1-5, how attractive does this ship look to you?</strong></td>
<td>simple, homely, civilized, quick, vulnerable</td>
<td>empire-like, submarine-inspired</td>
<td></td>
</tr>
<tr>
<td>box of metal, bottom-heavy, not ship-shaped, concrete design, feeling of purpose, heavy,</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 Analysis

When referring to the theories that Solarski (2013) proposed in his text *The Aesthetics of Game Art and Game Design*, shapes and forms provide the initial associations upon visual identification of an item or artifact. The aesthetic responses are the result of memory, context and personal associations (culture, social environment), but also due to evolutionary aesthetics of human adaptation which Ulrich (2006) and Hekkert (2006) explained in *Design: creation of artifacts in society* and *Design aesthetics: principles of pleasure in design* respectively.

Utilizing these existing theories as a staging point for our own designs of what we considered appropriate, we proceeded with creating models of modular sets that would best fit the physical attributes that they were to visually convey.

Upon reviewing the results of the survey, the numerical data provided a convincing overview of the patterns that emerged among the participants, which tended to resonate fittingly with our design intent. The responses indicated that the participants, for the most part, understood (or agreed with) the various design elements of the modular sets on each version of the airship. The optional question of why the participants selected their answers provided additional insight behind their reasoning, enabling us to compile keywords which were instrumental in forming a more cohesive pattern to accompany the numerical results.
When designing the *Light ship*—that is, the version of the ship with modules emphasizing speed, agility and aggressiveness at the cost of durability—we invested our design process in creating a version of the ship that would best comply with those specific properties. When asked about its speed and agility (questions 2, 5 respectively), it scored on average higher than the other ships. When asked about the durability (question 3), it attained the lowest score. To this end, our design could be considered fruitful. However, when it came to aggressiveness (question 4), it scored lower than the Heavy and “Medium” (both scoring 3.0) ship with a median score of 2.4, which indicated that our design was not credible enough to elicit the sense aggressiveness we aimed to achieve. Keywords such as “not capable”, “fairly round” and “utility” indicated that the “Light” ship was not as aggressive, with one participant claiming that “more metal” is needed to obtain a higher level of aggression within Steampunk.

Even though the *Light ship* was designed to look the most aggressive, the *Heavy ship* is, for example, surrounded by considerable mass which perhaps elicited a more threatening appearance. The participants responded with keywords such as “less mass”, “aerodynamic”, “arrow-like”, “high-speed travel”, “scout”, “exploration”, “vulnerable” and “economic”, which would not diverge too far from
describing the ship’s (intended) function in-game. The specific term “arrow-like” resonates exceedingly well with our interpretation of “aggressive design”, where we emphasized the term “sharp”. Solarski (2013) asserted that triangular shapes indicated aggression, force and masculinity (Solarski, 2013), a theoretical basis which we had in mind when designing the overall ship appearance with the appropriate modules; triangular, winged plates covering the side-propellers in a slightly tilted angle (accompanied by cylindrical engines and bent exhaust pipes to indicate streamline). In addition, the *Light ship* has features that indicate roundness, something we considered to be synonymous with smoothness, energy and aerodynamics. Solarski indeed claims that roundness represents energy, as well as youth, femininity, and innocence (Solarski, 2013). The latter term would perhaps clash with the initial design intent of displaying aggressiveness, but if we were to refer on our own interpretation upon this, it would be that that smallness, weakness and fragility and such similar traits, indicate insignificance and/or negligibility –something that would pose less of a danger (i.e. innocent). In-game, weaker ships might be easy targets, but would perhaps not have a high level of priority any larger extent. To this end, our own understanding of the shapes occupying the *Light ship* coincides with Solarski’s theory.

5.2 *Medium ship analysis*
The *Medium* ship was designed to have neutral stance in terms of appearance—the balance between light and heavy. In-game, it was to serve as a “middleship”, the “jack-of-all-trades but master of none” as we would call it. To achieve this, we maintained a moderate size for each module, with emphasis on creating modules that covered more surface of the hull compared to the *Light ship*, while maintaining more open spaces than the *Heavy ship*. The appearance is more angular with more defined edges—in essence, less refined than the *Light ship*. When it came to questions regarding agility, durability and speed (questions 2, 3, 5 respectively) the *Medium ship* fell comfortably within the middle ground—a trait that we have, as stated, aimed to achieve. When it came to aggressiveness (question 4), the *Medium ship* scored identically with the *Heavy ship* while scoring less than the *Light ship*. A possible reason would perhaps lie in the terms “military”, “no option to defend”, “unsound defense”, “imperial”, “weighted for attack”—keywords extracted from the participants. The underlying thought process here might indicate that the *Medium ship* is best suited for attack, due to the fact that its defence is inadequate—which one could refer to as ‘the best defence is to attack’ phrase. This might tip the balance somewhat, placing the aggressive level of the *Medium ship* with that of the *Heavy ship*. Though the design intent of the *Medium ship* was to be neither less-aggressive nor more-aggressive than the other ships, the reasoning behind these particular responses is understandable upon re-evaluation based on the survey results. When scrutinizing additional keywords such as “escort”, “support”, “royal”, “transportation” and “reasonably armored” alongside the above mentioned—it reinforces the notion of a “middleship”; a ship that, by our own definition, can provide several functions, both passive and aggressive. “Support” and “Command” was mentioned by two different participants, something we find interesting as this shows a degree of coherent agreement between several participants. The term “support” in the realm of videogames, based on our own experience as gamers and typical game conventions, is usually reserved for characters and/or vehicles that possess the ability and the sole purpose of adding an extra layer of aid, firepower or temporary upgrades to team members wherever it is needed. One of the participants remarked that the ship was not as aggressive, but at the same time not being as defensive either. We deem that particular description appropriate for the *Medium ship*. 
5.3 Heavy ship analysis

The Heavy ship was designed to emphasize durability and survivability in the face of sustained damage, while sacrificing movement speed and agility. To achieve this visually, we proceeded to place focus on armor and mass to create a set of modules that would comply with such traits. The base geometry was to be “blocky” and heavy, with large module pieces covering as much surface of the hull as possible to reinforce the notion of protection. The Heavy ship has its side-propellers protected behind steel cylinders, sporting one large exhaust pipe and equipped with rectangular-plated engines. Solarski (2013) indicated that forms resembling squares and cubes represented maturity, stability, stubbornness and balance. We believe the terms “stability” and “stubbornness” would be accurate in describing the Heavy ship in terms of its function in-game; it would be a ship that would be the first to take damage and the last to be destroyed. In game terminology, it would essentially be the “tank” — a role with the purpose to absorb damage in order to provide increased survivability to other team members (Anon, 2014a). When participants were asked about its agility and durability (questions 2,3 respectively), it scored the lowest — with a unanimous score of 1 across the board — and scored the highest respectively. "Heavily plated", "stable", "box of metal", "tank", "heavy and broad", "defensive", "turns slowly", "robust", "slow lumbering" are some of the keywords extracted from participant responses, which
would indicate the perception that the *Heavy ship* is indeed durable, but considerably less agile. As mentioned, the term “tank” was also a specific keyword that we employed throughout when designing the *Heavy ship*. In regards to the aggressive appearance (question 4), the *Heavy ship* lies evenly with both ships – even identical, as mentioned previously, with the *Medium ship*.

Our interpretation on this would simply be due to the mass surrounding the hull, with most of the surface being covered, and possibly eliciting a threatening appearance due to sheer size. If referring to our own notion of the *Heavy ship* being a “tank”, within the context of games, a “tank” is unable to reach a high damage output, thus posing little danger – a fact compensated by its stubbornness to outlive the opponent. An overall review of the compiled keywords would not indicate any sort of offensive aggression, but rather aggression in the form of weight and size – a passive offensive trait, in our perception. When it came to speed (question 5), the response was varied, resulting in an average range of 2.6. Those participants that gave speed a high score referred to the size of the engines – that large engines indicated more power and thus more speed (a fact that we considered when designing the *Light ship*). The design intent on the engines is that heavy mass requires considerable power to be moved, resulting in large engines, with the speed evening out due to the weight. When comparing responses to questions 2 and 3 (agility and durability respectively), we felt that the *Heavy ship* attained the highest form of consistency we aimed to achieve, when compared to the respective responses for both the *Light* and *Medium ship*.

### 5.4 Residual and Conclusive analysis

The intent here was to investigate the level of positive or negative association for each ship – that is, if the appearance would elicit responses connected to certain underlying, preconceived notion of “good” and “bad” (according the each participants’ own judgements). As such, it was to enable the participants to provide an answer that potentially covered additional aspects that were not possible in other questions. The numerical results notwithstanding, as stated above, the keywords for the *Heavy ship* did not indicate an overall consensus of hostile appearance, with one keyword being “friendly shapes”. We believe these “friendly shapes” may be a reference to the largely round propellers on the side of the ship, the lack of any truly sharp edges on different 3D meshes and the glossy material applied to the modules – glossiness being a trait that humans overall find attractive, possibly due to its association with water, which stretches back during the Pleistocene (Ulrich, 2006). One can assume that context – the notion that the *Heavy ship* is a “tank” – influenced the perception. In essence, we believe we can conclude that it elicited a positive emotion response. Ulrich (2006) asserts that artifacts which appear safe and stable are more attractive to humans, two terms that we consider can be observed in the visual appearance of the *Heavy ship*. While the term “attractive” can be difficult to categorize in a proper, systematic formula, the numerical results would indicate an overall positive association with each ship, and one fact can be attributed to it being essentially the same hull with different modules attached. A base reason as to why the responses were overall positive lies perhaps in the culture of associating such a ship with positive emotion – that is, adventure, swashbuckle, free spirit and roguish charm. These are all our own interpretations and speculations surrounding the responses given.
by our participants, and while we believe some of our speculations can be reinforced by previous research, these speculations and conclusions can not be empirically verified or determined.

While there were some specific keywords that contradicted one another when comparing the participants responses with one another, our impression was that the overall consensus among our participants indicated a uniform understanding of the design aesthetics of each version of the ship. Upon presenting the research to be within the context of videogames, we could assess that it was instrumental in providing the participants with the proper platform for which they could judge the artifacts in their correct environment. Simply put, by recruiting participants familiar and well-versed (varyingly) with videogames, we believe they were able to judge the airships based on their potential function within a videogame. The usage of terms such as “tank”, “escort”, “scout”, “support/command”, “cargo/unit-movement” and “fast troop transporter” – vocabulary that find extensive usage in videogames – demonstrated the participants' understanding of the attributes that we sought to find confirmation upon. While it may have been an interesting endeavour to forward the survey to those unfamiliar with videogames in order to attain responses outside the rim of videogames, we found it necessary to strictly work within the context of videogames, for better or for worse. The most important aspect in the selection of participants was the potential of them understanding the Steampunk genre to an extent greater than that of persons less-familiar with videogames. As we adhered to the physical laws and conventions of the Steampunk genre and the modular sets and ships were modelled with a future project in mind, it was equally important that the participants understood the context for which they were participating in.
6 Conclusions

The intention for this paper is to investigate the aesthetic responses upon visually identifying an artifact. To ensure relevancy to the study, we have done so within the context of videogames. The process for which data was collected for the investigation was via a survey that was distributed to 5 volunteers whom were more familiar with videogames and the genres that may typically be associated with them. The artifacts in question were created by us in the form of fictional airships, with the designs being based on our own perception of physical attributes the modelled assets were to represent with adherence to the appropriate genre. Existing theories and research by Chris Solarski (2013), Bihn Pham (1999), Karl T. Ulrich (2006) and Paul Hekkert (2006), added insight and valuable information to the conduction of our research, and were sources we believe could be referred to in order to lend weight to our own understanding. While hoping to provide a compilation of theories that may be of relevance to graphic artists when designing and/or creating assets to elicit a certain aesthetic response, and have it accompany our investigation in order to reinforce these existing theories, it is ultimately not the overall aim to provide answers to lingering, unanswered questions that may exist on the subject of aesthetics in design as a whole. The scope of depth of this paper is far too small-scale to provide any larger, general conclusions regarding aesthetics in design, but we believe it may still serve as an example of a smaller, practical application of the subject, in the context of a specific theme and setting.

When we initiated this study, we intended to investigate these questions:

- Does the usage of certain geometrical shapes highlight certain attributes in 3D-assets? Are the 3D airships, designed and modelled to appear fast, agile, heavy etc., successfully perceived this way by participants in our study?

The results of the survey we conducted with our participants indicated that there are some underlying factors that reinforce a person’s perception of an artifact, especially if the artifact in question is one that is of greater familiarity –more specifically, if the visual appearance and the symbolism the artifact may display is familiar to the person. As stated in 2.2, Contexts creates meaning, we assessed that cognitive mechanisms operate on symbols, which establishes value that varies depending on culture and social environment. In our study, Steampunk and the videogame context was the culture for which we based our designs upon, and grasping it plays a key role in determining the levels of value. The ship itself signifies the symbol for which value is placed upon within the context of Steampunk and videogames, and the results of the survey indicated that certain uniform interpretation of the ships materialized among the participants. The keywords provided us with the appropriate indication that the participants understood the context they were working within, as the keywords resonated accordingly with what we had within our design intent. In short, context created the appropriate meaning for which the survey was functioning within, and the responses verified to certain extent that the participants’ interpretation of each
ship lay in their personal association with the culture of Steampunk and videogames.

The numerical data from the survey provided an approximate overview and an indication that their understanding of the artifacts were uniform both within the context of the general theme and within our own design intentions. By comparing the average values between each ship, the results indicate that our design intent was largely successful. For instance, the value for the Heavy ship in regards to how fast it can fly (question 5), or how agile it looks (question 2) is the lowest of the three ships. The same could be observed in the case of the “Light” ship. This was indeed our design intent, and to this end, we consider that our design elicited the accurate aesthetic response. The Light ship, Medium ship and Heavy ship represented the different attributes that are present in videogames, and the responses showed that the participants’ interpretation of them can be considered conventional, in our personal opinion.

Researchers such as Solarski (2013) and Ulrich (2006), and their theory of aesthetic concepts of experience and evolutionary aesthetics respectively, added certain depth to our research in terms of understanding the human-nature side of the subject—that interpretation upon visual identification may have roots deeply ingrained in primal or instinctual levels of human psychology as a part of evolutionary adaptation. The results of the survey reinforced this notion—for instance, that symmetry is considered attractive (Ulrich, 2006). Symmetry was applied to all three versions of the ship, which might provide a speculative answer as to why the responses for question 6 regarding the attraction level was seemingly positive. Solarski’s (2013) theory on what shapes represent, as well as Pham’s (1999) principles of designing aesthetic products, were proven to be fruitful and accurate enough upon viewing the results from the survey. It could be stated that our own interpretation coincides well with these existing theories, and that our own aesthetic judgements fall in line with what can be considered conventional.

The subject of aesthetics in design is a vast and complex subject, perhaps too complex to carry out a study of without specific objectives. Our objective, as stated, was to test certain theories as well as our own understanding and interpretations regarding aesthetics in design and visual perception of the modules we have produced. This paper is based on the larger subject of aesthetics in design and the theories of Solarski (2013) and the principles of Pham (1999). However, it is also concentrated in the realm of videogames and production of 3D-art, therefore much of what we have covered in this paper is not enough to adequately provide any thorough, assertive and definite conclusion on the subject of aesthetics in design.

While our research was conducted using inanimate 3D objects, an interesting endeavour would be to further the study with moving images and sound. As aesthetics can be claimed to encompass the entire the human sensory perception—smell, sound, touch, etc.—this paper has not attempted to touch on these separate areas of perception on the basis of conducting the research.
strictly in the area of visual information. As such, the implementation of animation and sound, which would, would perhaps elevate the study to another level and provide more intricate research results that would cover the aspects of aesthetics in design that we did not for this paper.
7 References


8 Appendixes

8.1 Survey Questionnaire

The following is the multiple choice questionnaire provided by us to participants in our survey:

SURVEY QUESTIONS
In order for you to understand the context of this survey, we will provide you with brief background information regarding our game.

Our game is a Turn-Based Strategy game set in a Steampunk-inspired environment, where humanity is forced to reestablish their habitat above the clouds after a global catastrophe which unleashes massive storms and other weather-related forces of nature, making the surface utterly inhospitable. Resources on the surface are still valuable and increasingly scarce among the humans living above, causing rifts and friction among the various clans and guilds. Whenever the weather permits it, deadly airships—a result of human ingenuity and resourcefulness—will descend from the heavens to fight for what the various factions claim to be rightfully theirs.

Instructions:

You will be given 3 versions of the same ship to look at simultaneously. Simply scrutinize each ship at your own pace and answer each question below.

This is a multiple choice questionnaire, for which a scale of 1-5 will be used.

1 – Poor
2 – Average
3 – Good
4 – Very Good
5 – Excellent

Before you proceed, circle the name of the ship you picked for this paper.

LEFT
MIDDLE
RIGHT

1) Qualitative question: If you could decide, what type of function / role would this ship have? What influenced your answer?
2) From a scale of 1-5, how agile does this ship look to you? (i.e. successfully dodge enemy fire)? Reason? (Optional):
3) From a scale of 1-5, how durable does this ship seem to you? (i.e. successfully absorb damage/not break easily)? Reason? (Optional):
4) From a scale of 1-5, how aggressive does this ship look to you? Reason? (Optional):
5) From a scale of 1-5, how fast is this ship do you think? Reason? (Optional):
6) From a scale of 1-5, how attractive does this ship look to you? Reason? (Optional):
### 8.2 Chart of participants’ responses

<table>
<thead>
<tr>
<th>Questions:</th>
<th>Light</th>
<th>Medium</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) From a scale of 1-5, how agile does this ship look to you (i.e. can successfully dodge enemy fire)?</td>
<td>3, 3, 4, 4, 4</td>
<td>2, 2, 2, 4, 4</td>
<td>1, 1, 1, 1, 1</td>
</tr>
<tr>
<td>3) From a scale of 1-5, how durable does this ship seem to you (i.e. can successfully absorb damage/not break easily)?</td>
<td>1, 1, 2, 2</td>
<td>2, 3, 3, 3, 3-4</td>
<td>4, 4, 5, 5, 5</td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive does this ship look to you?</td>
<td>2, 2, 2, 3, 3</td>
<td>1, 3, 3, 4, 4</td>
<td>1, 3, 3, 4, 4</td>
</tr>
<tr>
<td>5) From a scale of 1-5, how fast do you think this ship is (i.e. can fly fast in a straight line)?</td>
<td>3-4, 4, 4, 4, 5</td>
<td>2, 2, 3, 3, 4</td>
<td>1, 2, 2, 3-4, 4-5</td>
</tr>
<tr>
<td>6) From a scale from 1-5, how attractive does this ship look to you:</td>
<td>3, 3, 3, 4, 5</td>
<td>3, 3, 4, 4, 5</td>
<td>3, 3, 4, 4, 4</td>
</tr>
</tbody>
</table>
### 8.2.1 Light ship Responses:

<table>
<thead>
<tr>
<th>Questions</th>
<th>1st participant</th>
<th>2nd participant</th>
<th>3rd participant</th>
<th>4th participant</th>
<th>5th participant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1)</strong> If you could decide, what type of function / role would this ship have? What influenced your answer?</td>
<td>Scout arrow like</td>
<td>cargo/unit-movement ships due to their studiness (sic) and their low amount of detail.</td>
<td>Improvised military vessel. Looks like a economic ship where someone’s (sic) tried to cover exposed parts.</td>
<td>Exploration. Lighter ship and it looks more fitting for high speed travel.</td>
<td>Artillery ship. It seems like there could be mortars or broadside cannons along the sires and a large forward deck gun on the deck. Could also be a fast troop transporter. The metal coverings on the side could be designed to protect troops from fire when preparing to board another ship.</td>
</tr>
<tr>
<td><strong>2)</strong> From a scale of 1-5, how agile does this ship look to you(i.e can successfully dodge enemy fire)?</td>
<td>fast arrow like (sic)</td>
<td>it's quite fast</td>
<td>Light structure =&gt; Less mass (but less resilient (aka can't take a hit))</td>
<td></td>
<td>Reasonably fast despite the mortars. Sort of a quick bomber type craft.</td>
</tr>
<tr>
<td><strong>3)</strong> From a scale of 1-5, how durable does this ship seem to you (i.e can successfully absorb damage/not</td>
<td>thin front not much armor</td>
<td>low armor, large surfaces</td>
<td>Exposed areas, light construction</td>
<td></td>
<td>Not very durable due to low amounts of armor plating.</td>
</tr>
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<td></td>
</tr>
<tr>
<td>break easily)?</td>
<td>fairly round but some sharp arrow like (sic) features</td>
<td>some nice military detail, but (sic) it seems to be made for utility</td>
<td>Does not look capable. It does look civilized, though.</td>
<td>Steampunk vessels don't often manage to look aggressive unless there is more metal.</td>
<td></td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive does this ship look to you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) From a scale of 1-5, how fast do you think this ship is (i.e. can fly fast in a straight line)?</td>
<td>looks aerodynamic</td>
<td>double engine? the double engines clash with its peacefulness (sic)</td>
<td>Less mass</td>
<td>Two engines, very little armor.</td>
<td></td>
</tr>
<tr>
<td>6) From a scale from 1-5, how attractive does this ship look to you:</td>
<td>Simple, homely</td>
<td>Civilized.</td>
<td>I like the thought of a quick vulnerable artillery boat.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 8.2.2 Medium ship responses:

<table>
<thead>
<tr>
<th>Questions</th>
<th>1st participant</th>
<th>2nd participant</th>
<th>3rd participant</th>
<th>4th participant</th>
<th>5th participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) If you could decide, what type of function / role would this ship have? What influenced your answer?</td>
<td>Support/command ship looks too fragile for an attack ship it looks a bit royal with the pipes on the back and chains for fans</td>
<td>Light, fast military</td>
<td>Escort/maneuver fighting</td>
<td>Transportation. Sturdier ship which suits for protection. Still adapted for fast travel</td>
<td>Support/command ship. The submarine-like structure on the deck could be a command bridge and the rings on the side could be docking rings.</td>
</tr>
<tr>
<td>2) From a scale of 1-5, how agile does this ship look to you (i.e. can successfully dodge enemy fire)?</td>
<td>Overencumbered Few/small maneuver (sic) surfaces (or - influencing...stuff)</td>
<td></td>
<td></td>
<td>Small but single engine so not very maneuverable (sic).</td>
<td></td>
</tr>
<tr>
<td>3) From a scale of 1-5, how durable does this ship seem to you (i.e. can successfully absorb damage/not break easily)?</td>
<td>reasonably armored but fragile bits</td>
<td>Weak points, unsound design in a defensive rate.</td>
<td></td>
<td>Mostly wood but protectet (sic) command bridge.</td>
<td></td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive</td>
<td>sharp face but not many aggressiv (sic) angles</td>
<td>Everything seems to have been weighted for attack. It doesn’t</td>
<td></td>
<td>Not very.</td>
<td></td>
</tr>
<tr>
<td>does this ship look to you?</td>
<td>look aggressive (sic) as much as it looks like it doesn't have the option to be defensive.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>--------------------------</td>
<td>----------------------------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>5) From a scale of 1-5, how fast do you think this ship is (i.e can fly fast in a straight line)?</td>
<td>agile but not so much in a straight line</td>
<td>(would have given it 5 if I hadn't seen the engine)</td>
<td>Smaller engine to make room for other stuff.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) From a scale from 1-5, how attractive does this ship look to you:</td>
<td>Empire like</td>
<td>It's pretty! Not smart, but dashing.</td>
<td>Looks cool with the submarine-inspired design.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 8.2.3 Heavy ship responses:

<table>
<thead>
<tr>
<th>Questions</th>
<th>1st participant</th>
<th>2nd participant</th>
<th>3rd participant</th>
<th>4th participant</th>
<th>5th participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) If you could decide, what type of function / role would this ship have? What influenced your answer?</td>
<td>Living quarters, supply ship.</td>
<td>Tank</td>
<td>Combat. Looks heavy, not as much exposed area (sic).</td>
<td>Heavy transportation. The ship seems so robust that the objects being carried would likely to be important</td>
<td>Assault boat. Plenty of deck guns and metal to protect them. Front seems built to ram.</td>
</tr>
<tr>
<td>2) From a scale of 1-5, how agile does this ship look to you (i.e. can successfully dodge enemy fire)?</td>
<td>Large chunky bits maybe heavy metal</td>
<td>Heavy and broad</td>
<td>It looks like it can go forward, not turn.</td>
<td></td>
<td>Big hunk of metal.</td>
</tr>
<tr>
<td>3) From a scale of 1-5, how durable does this ship seem to you (i.e. can successfully absorb damage/not break easily)?</td>
<td>Looks heavily plated and has extra engine stuff in case some goes out</td>
<td></td>
<td>Doesn't look like a design inspired by warfare as much as by metal.</td>
<td></td>
<td>Lots of armor. Woo!</td>
</tr>
<tr>
<td>4) From a scale of 1-5, how aggressive does this ship look to you?</td>
<td>Stable box shapes and friendly circles, no aggressiv (sic) sharp angles</td>
<td></td>
<td>Looks defensive. Like someone is always going to hit it first before it can hit</td>
<td></td>
<td>The only thing that would be more aggressive would be a flying gun.</td>
</tr>
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</tr>
<tr>
<td><strong>5) From a scale of 1-5, how fast do you think this ship is (i.e. can fly fast in a straight line)?</strong></td>
<td>Looks like it has room for fuel and torque?/power but the boxy shapes does not convey aerodynamics (sic)</td>
<td>American muscle car. Turns slowly, accelerates slowly, but not slow when it gets there.</td>
<td>Slow lumbering.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6) From a scale from 1-5, how attractive does this ship look to you:</strong></td>
<td>from some angles it looks more like a box of metal than a ship. A bit too bottom heavy? No so ship shaped</td>
<td>Nice concrete design that gives a good feeling of its purpose in a fleet.</td>
<td>Cool!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>