KYMENLAAKSON AMMATTIKORKEAKOULU
University of Applied Sciences
Degree Programme in Design

Alexander Chernykh
Visual Identity, Stylization and Game Design. Case: Harald Hirmuinen.
Bachelor's Thesis 2013

ABSTRACT

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CHERNYKH, ALEXANDER	Visual Identity, Stylization and Game Design. Case: Harald Hirmuinen.
Bachelor's Thesis	45 pages + 3 pages of appendices
Supervisor	Brenda Jiménez, Lecturer
Commissioned by	Aptual Oy
March 09:59:49	
Keywords	visual identity, stylization, graphic design, game design, game development, cartoon

Given work covers the process of research, design and implementation of visual artwork and game design for a series of computer entertainment programs (arcade games) based on existing registered product—Hägär the Horrible (*Finnish* Harald Hirmuinen) comic series.

The project's main goal was to create a consistent digital entertainment product which fits the original comic theme. Among the aims set within the framework of this educational project the following ones can be highlighted: acquiring of real-world experience, developing teamwork and negotiation skills, time and budget planning.

Present work relied heavily on studying of the existing artwork, characters, storyline as well as the research of given time period and environment. The final product has been developed within Unity 3D game engine.

The outcomes of the project may be evaluated as the successful ones not only in terms of the final product quality but also judging from the perspective of gained skills and experience.

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1 INTRODUCTION

> *"A game designer is a particular kind of designer, much like a graphic designer, industrial designer, or architect. A game designer might work alone or as part of a larger team. A game designer might create card games, social games, video games, or any other kind of game. The focus of a game designer is designing gameplay, conceiving and designing rules and structures that result in an experience for players."* (Salen & Zimmerman, 2004, p. 1)

The project was initiated when *Päivälehden Museum* of Helsinki contacted *Aptual*, the case company, with the purpose of creating a set of digital entertainment products, which were aimed to power the arcade machines built for Harald Hirmuinen themed exhibition. The product had to satisfy all the customer requirements: be of high quality, fit the visual style of existing product, be innovative and entertaining all at once.

Harald Hirmuinen[1] is the title and main character of an American comic strip created by cartoonist Dik Browne (1917–1989), and continued by his son Chris Browne after Browne's retirement and subsequent death. The strip is a caricature and loose interpretation of medieval Scandinavian life. This stylization of the Viking life became one of the cornerstones for designing the whole project for the *Päivälehden Museum*.

The company that was in charge of the project, *Aptual Oy*, is a Finnish media and advertising company located in Kouvola. The company consists of three divisions: Aptual Advertising, Aptual Interactive and Aptual Creative. Aptual Creative does the company's most complicated projects, which require wide range of competence, starting from visual design and up to game design, programming and hardware design.

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[1] In the present text, when referring to Hägär the Horrible's character or name, the finnish name Harald Hirmuinen, will be used instead.

The division has several years of experience in creating world-class entertainment and media products: mobile computer games, television advertisements etc.

The project's main task was essentially to create a set of two arcade games which were to be deployed onto entertainment arcade machines during the exhibition. The first game was a quiz game in which player had to answer a number of comic strip-related questions in order to get so-called “Viking diploma”. The diploma contained a printout of a player's score with digitally embedded photograph of a player with Viking attributes drawn on top of it—for this purpose an interaction with web camera was implemented.

The scope of work on the second game was more extensive due to more sophisticated hardware design, higher amount of the graphic assets needed and more intricate game design. This piece of digital entertainment was aimed to accompany real-world replica of a Viking boat to simulate the rowing process in order to put the player into the place of past-time Viking rower. An accelerometer was built into the spring-powered paddle that was hinged onto 1-axis joint. Accelerometer data was used in order to calculate the speed, frequency and amplitude of player's movements, which then was passed to the game logic unit to drive the virtual boat. The interaction with player was conducted through a screen mounted as a boat's sail, onto which the game picture was projected.

The team of three people was assigned to this project. Creative director of the company was in charge of art direction and project supervision. Software engineer was assigned to implementation and deployment of the game concept within Unity 3D framework. My personal task was to design the game process, create consistent visual style for the set of games taking into account software, hardware and legal restrictions and, finally, supply all the needed graphic assets to the software engineer. Alongside with the tasks mentioned, some additional tasks were determined: providing a working virtual physical model of a paddling mechanism and building of a set of solutions for optimizing software development.

As it is outlined by Swink (2008, p. 10), the game feel is most commonly a superposition of aesthetic sensation of control, the pleasure of learning, practicing and

mastering a skill, extension of the senses, extension of identity and interaction with a unique physical reality inside of the game. The following text will be describing the process of creating a game product in order to meet the mentioned definition.

2 VISUAL EXPLORATION AND RESEARCH

One of the most important requirements for the project was its visual coherence with the original material and accordance to modern standards. Vast amount of original comic strip materials had to be examined, in order to get acquainted with the peculiarities of the world and the characters of Dik Browne's creation. More than 1100 strips were read and analyzed to get the best possible understanding of the visual style, characters and common plot storyline templates. Also, the company's previous game projects were thoroughly studied just to get the idea of what the company's artists and customers were used to.

2.1 Character History

The title of the strip originated long before the work was created, "Hagar the Terrible" used to be the family nickname given to Dik Browne. In order to comply with the alliteration requirements, the title was amended to Hägär the Horrible. Later, with the aim of honoring the memory of already gone Dik Browne the strip was renamed to “Dik Browne’s Hägär the Horrible”.

Harald is depicted as a brutal Viking with a red beard (figure 1), who is wearing a worn-out dirty tunic, helmet with horns, and who obviously suffers from excessive weight. Among his favorite destinations for his invasions are Western European countries, such as France and England. However, on certain occasions readers can find out that he is not as rough and tough as it seems.

Figure 1. Daily comic strip featuring Harald and his team (Comic Strips, 2003).

There were certain storylines which were reused from time to time in the comic strips, among them the following ones may be outlined:

- Harald and his team raid one of the Western European castles, but something always goes wrong, usually due to incompetence of Harald's team members, and the whole company flees from the superior enemy forces.
- Harald and his best friend, Lucky Eddie, are alone on the uninhabited island for an undisclosed reason.
- Harald with his crew has been caught in the middle of sea storm.
- Tax inspector pays a visit to Harald.
- Harald returns home from his unsuccessful raid, beaten and tired.

These plots were considered during the story planning stages in order to create consistent and believable game environment.

2.2 Research About the Time Period

2.2.1 Overview of the Viking Age

The Harald story is set in the time period of Viking Age. However, it uses clichéd representation of the given timeframe. Particular volume of research had to be conducted in order to better understand the time environment during which the action had to take place, to have a more detailed vision of what technologies were available at the time in order to achieve higher degree of authenticity. The following is the result of the research work.

First mentioning of the Vikings dates back to 789 AD, which was the year when the Vikings had their first raid. The Vikings were constituted by people of Denmark, Sweden and Norway. There were several ideas expressed on the reasons for the appearance of the Vikings, and the most realistic one is that during 7-8th centuries there was a period of overpopulation Northern countries, while in European countries an increase in trade was dramatic, those two factors led to an increase in piracy. (Heath, 1985, pp. 3-4).

2.2.2 Appearance of the Vikings

Concerning the clothing, the most valuable features for the Vikings were warmth, comfort and durability. Fashion was not important for those people. Clothes of rich people could be distinguished from the ones of ordinary citizens by the material it was made from. Clothes was usually loose and worn in layers, thus the warmth was achieved. Footwear of the Vikings was made from leather.

Clothes of men included the following items: long-sleeve mid-thigh to belong-the-knee-length tunic, undershirt, woolen trousers or leggings, and a leather belt with metal or bone buckle. Women's clothes were represented by ankle-length short-sleeved or sleeveless underdress, woolen over-dress, and the outer-outfit was fastened with the metal brooch. (Schofield, 2002, p. 32).

2.2.3 Viking Vessels

Assumptions about Viking ships were made based on the discoveries of two vessels in Norway (in Gokstad and Oseberg), which belonged to the second part of the 9th century. At that time Vikings' longships appeared as well as merchant vessels (knarrs), which were utilized for raids, during which the Vikings were colonizing lands. (Heath, 1985, p. 4).

At about 10th century the distinction between warships and merchant ships eventually evolved. Merchant ships were short and wide, and had high freeboards. Warship vessels, in turn, were longer and thinner, and they were equipped for more oarsmen, which increased the speed of the ship. (Heath, 1985, p. 5).

Characteristics of longships made them perfect for operation in the open ocean. The length of longships varied from 18 to 27 meters, while their width could amount to 2.7-5.2 meters. The number of oar ports equaled to 24-50, depending on the size of the vessel. One more peculiarity, which was common for longships, was that round shields of warriors were hanging along the sides. Among the materials implemented for the construction of longships, oak, ash, pine and beach could be found. The ships were clinker-built, which means that the planks utilized were overlapping. Wool and animal hair were meant for filling in the gaps between the planks, which further were covered with tar. (Schofield, 2002, pp. 14-15).

It is vital that longboats are not confused with the longboats of the later period. Those boats were used common to transfer crews and cargo from the ship to shore.

2.3 Viking Armor and Weapons

When reconstructing the picture of Vikings' ammunition, we base our research on archaeological findings and existing graphic remains. Folklore is also among one of the sources to back up our theories. Viking tradition required that all free Norse men own weapons, and it was also permitted to carry those weapons without any limits. One could figure out Viking's social status by observing his weaponry and armor: wealthy Vikings used to have full set of ammunition and a good sword. Aside swords, spears, and bows, axes were also in use. Axes were peculiar to Vikings—nobody in Europe used them that extensively. The King Cnut's and King Harold II's elite guards sported heavy two-handed axes able to split shields and metal helmets.

2.4 European Vessels Research

Nowadays, any large water vessel is called a ship. Ships are used for warfare, transportation, entertainment, and other activities. We distinguish ships from boats based on size and cargo or passenger capacity. Originally, not every big enough vessel was a "ship"—but only one with a specific sail-plan—a sailing vessel with at least three square-rigged masts and a full bowsprit. Other vessels were classified by their sail-plan, too: there were barques, brigantines, brigs etc.

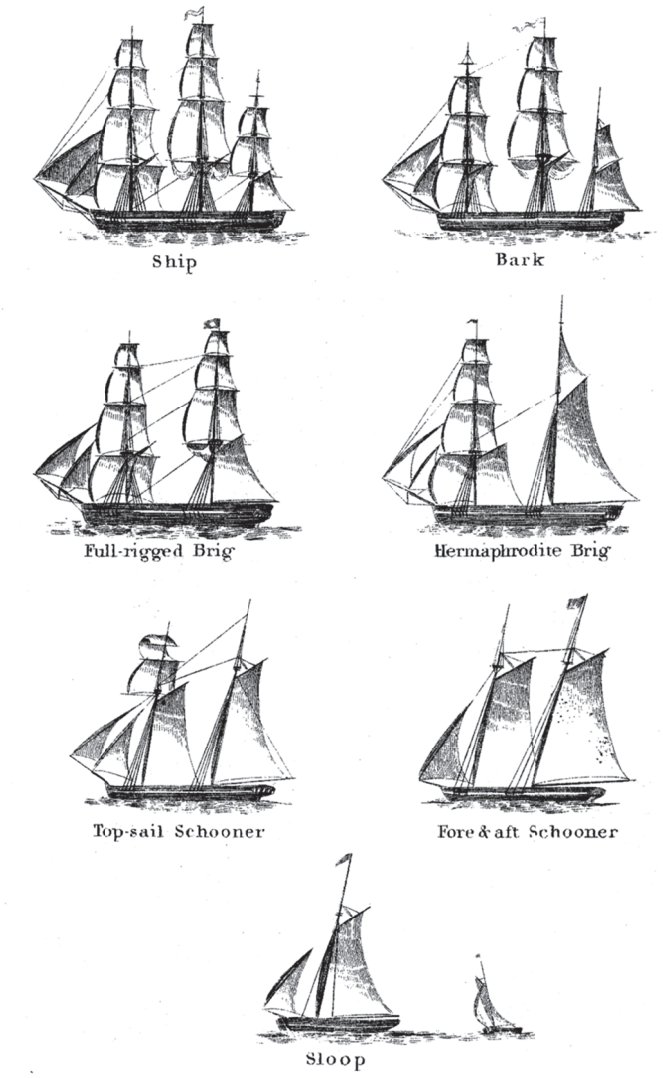

Figure 2. Sailplans of large vessel types (Types of Ships, 2009).

In order to create massive and menacing English ship for the game, bigger sailplans were considered (figure 2). The following is the list of most common types of European large vessels.

- Schooner: a fore-and-aft-rigged vessel, which has two or more masts where light square topsails are placed (usually at the fore).
- Topsail Schooner: a two-masted vessel having yards and square sails on its foremast and loose square foresail, and rigged after mast.
- Brig: a two-masted vessel, in which both masts are square-rigged.

- Brigantine: a two-masted vessel, which has a foremast that is square-rigged. Its mainmast has boom-sails and is fitted with the topmast with a gaff-topsail.
- Barkentine: a three-masted vessel, which has a foremast that s square-rigged. Its main and mizzen masts are equipped with topmasts carrying gaff-sails and gaff-topsails.
- Barque: a tree-masted vessel, in which two foremasts are square-rigged, while the mizzenmast equipped with the topmast having the gaff-sail and the gaff-topsail.
- Fully-rigged ship: a tree-masted vessel, in which all masts (foremast, mainmast and mizzenmast) have topmasts, top-gallant-masts and royalmasts, which are square-rigged.

(Desmond, 1996, pp. 123-125)

2.5 Research About Visual Style

Visual style can be described as rough, outlined cartoonish style with (if any) flat coloring and simplified forms (figure 3). Each character has well-developed drawing algorithm. Characters' faces are found to be depicted both en face and in profile.

Figure 3. Holiday issue of daily strip shows Harald and his family (Comic Strips, 2003).

The minimalistic and clear style of Hägar the Horrible can be explained by the past of the creator, Dik Browne, who not only used to work as a courtroom illustrator, but also he was engaged in creation of maps before the World War II. In addition, being a Stuff Sergeant and illustrator attached to a US Army Engineer unit had an impact on him as an artist. There Dik Browne drew technical diagrams, maps and other illustrations, which had to be clear and.

According to Catherine Sauvaget and Vincent Boyer, Browne's graphic style could be classified as straight stroke with flat color fill (Sauvaget & Boyer, 2008), although sometimes coarse stroke hatching is used to define volumes. Before conceiving Hägär, Browne was usually referenced as a co-creator of Hi and Lois comic strip, which already had the roots of Harald visual identity.

3 PRODUCTION

3.1 Game Design

The game design process will be covered in two main sub-chapters, with each one describing the process of game design for quiz game and the rowing game respectively. General design approach that was used is well described by Salen and Zimmerman in their book on game design called “Rules of Play”:

> *It's simple to play. The one-line instructions and intuitive knob interface makes Pong approachable and easy to understand. There are no hidden features to unlock or special moves to learn.* (Salen & Zimmerman, 2004, p. ix)

That said, both games were designed in the way that the exhibition visitors are able to start playing straight off the bat, without reading manuals or playing the “training levels”.

3.1.1 The Quiz Game Design

The quiz game design was rather straightforward. It was decided by the architect of the exhibition that the quiz arcade machine will be installed on a stylized bar counter with the screen being inside a wooden frame built on top of the counter surface. The input device type that was planned to be used was a touch-screen layered on top of the picture screen. Two stereo speakers were mounted inside of the picture counter.

One particular feature of the quiz arcade machine was the tiny camera, mounted atop the screen—it was planned that the image of player's face provided by the camera will be used to print out so-called "Viking Diploma" with congratulations regarding finishing the game, the score, and player's name and face on it (appendix 1). Color laser printing device, installed nearby would serve the actual printing purpose. Described hardware setup served us as a starting point when designing the game.

The set of question data provided by the client was divided into three groups: text questions, picture questions and guess-a-phrase questions. The questions of the latter

two groups were supplied with comic strips for each question. Each text question had 3 different answers to choose from with only one being correct. The picture questions were "yes or no" kind of questions, and guess-a-phrase ones had three phrases to choose from with only one of them being correct.

Game process was divided into four parts: title screen (idle mode), player introduction (entering the player's name), answering questions (actual gameplay), and diploma configurator/printout. To attract players to the machine, it was decided that the title screen will be animated, having a massive title with Harald logo on top of it with a prominent "Start" button under the game title (figure 4).

Figure 4. Quiz game title screen.

Pressing the "Start" button switches the mode to the introduction, during which the player meets Hamlet, Harald's son. Hamlet is a very smart person and is usually depicted in the comic holding a huge book or reading, which was the reason for picking him as a guiding character and the quiz host. After his introduction, Hamlet would ask a player to enter their own name. On-screen keyboard is used to serve the text input purposes, the keyboard layout was decided to be different from real PC keyboards: it has only letter keys, space and a backspace key. The arrangement is close to qwerty, but the keys are stacked in the two-dimensional matrix manner, without line shifting, which helped us to simplify the visual appearance and make the

keyboard usable even for children, who are not that familiar with typing on a computer. The shift key was removed from the layout and its function was replaced by the smart algorithm, which used pre-defined name patterns in order to capitalize certain letters.

After entering their name the player would press "OK" button and the actual game would start. The game story features Harald and his team being caught in the sea storm (figure 5). Hamlet tells the player that by answering his questions the player helps Harald to go through the storm, thus the connection and emotional bond is built between the player and the game characters—it's not just answering the questions anymore, but more of a life-and-death type of play. With each wrong answer, the huge lightning would strike the Harald's longship, with a loud thunder sound played from the speakers, heating the things up even more.

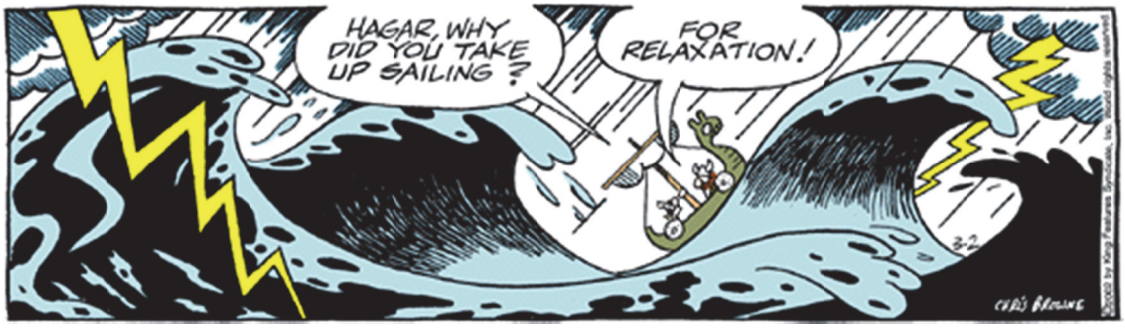

Figure 5. The recurring comic storyline where Harald gets caught in the sea storm.

However, the game purpose was not only asking questions and entertaining the player—as the game was developed exclusively for the Harald Hirmuinen exhibition, player should learn something new about Harald, comic characters, Vikings and authors themselves. After answering certain questions, the text bubble would appear giving interesting details on the question topic, thus making a game not only a piece of digital entertainment, but also an educational entity (appendix 2).

During the gameplay it is important to keep player informed about their progress, especially in the crowded space when the playing person is easily distracted and may lose the interest in playing the game. The solution consisted of two steps—first, it was decided to make the game sessions short, limiting the amount of questions asked

to 10; second, the player would always be aware of the number of questions answered, questions to go, correct answers, and wrong ones. After the answer is picked, the correct answer is shown, and if there are additional details on question topic, they appear as a text bubble next to the answers. The arrow-shaped "Next" button slides into the bottom-right corner, pulsating in size, thus attracting player's attention and suggesting pressing it and continuing to the next question. After the last question is answered, the text on the button changes from "Next" to "Finish", informing the player that the question part is over.

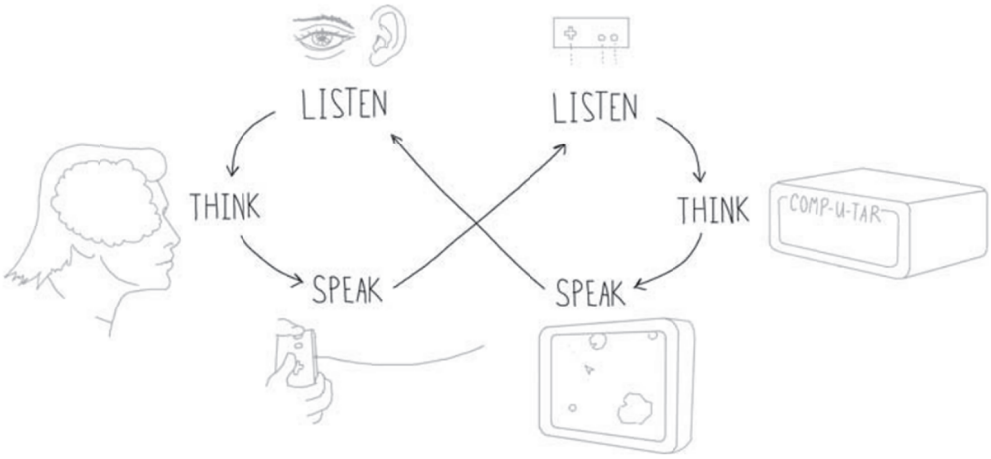

Figure 6. The conversation between the human and computer (Swink, 2008, p. 4).

On figure 6 is the illustration of the interaction process between the human and computer, which shows the idea behind the interface design approach that was used during the game UI development.

The next screen is the "Viking diploma" configuration screen (figure 7). The player is advised to take a picture, and if they appear to dislike it, the new photo may easily be taken. The player is able to see their image in real-time as if it was a mirror. The image input from the camera was then flipped horizontally to ensure that the on-screen image left-right orientation matches the player's. It was decided that a Viking helmet will be drawn on top of a player's head, which generated a problem of positioning the helmet to match the player's head. Instead of developing a complicated algorithm of head shape detection and following helmet image positioning, much simpler solution was used—the helmet would be statically drawn on top of the virtual

"mirror" and the player would be advised to position their head so that the helmet sits on their head as desired. To help the positioning, the 3-second shutter delay was introduced to give the player time to take the desirable position.

Figure 7. The Viking diploma configuration screen.

After the photographing process the player might review the data to be printed, and is given the ability to generate their own "Viking nickname", which is randomly picked from the nickname database every time the button "Generate new nickname" is pressed. However, this step is not compulsory—the first nickname is generated at the moment the diploma configuration screen is shown for the first time. Pressing the "Print" button would open the notification window with an animated progress bar showing the printing process. Even though the progress bar is not actually monitoring the printer state—it is just a timer set to animate the progress bar—it is important to communicate with the player in such way. This helps to direct the player towards looking for the working printer which is printing their "Viking diploma". Right at the moment the player gets the diploma from the printer output, the printing progress bar window changes into "Thank you!" screen. Happy player might then proceed to sharing his gaming impressions and his diploma with other visitors.

Even though it was not very necessary in this case (because it was perfectly fine to engage visitors in just one game session per visit), the replayability aspect of the game

was taken into consideration. To make the game interesting to play again, the questions order was randomized, and new questions would appear in the game all the time. In total, the database consisted of 30 questions, while only 10 were asked per one game session. To introduce the competition aspect, the number of correct answers was printed on the diploma in the form of "Viking medal", having different colors depending on the player's success. The standard bronze-silver-gold gradation model was used, which fit perfectly the "medal" theme (figure 8).

Figure 8. The medals' gradation.

One of the aspects that had to be considered was the fact that some players might abandon the game for some reason (it could be a distraction, necessity to leave the exhibition etc.) If the game is left unfinished, it is unlikely to be continued by another person, which means that the machine must be switched to the default idle state if the fact of abandoning is detected. The detection might be carried out in several different ways, among which are face detection, proximity detection, touch sensor activity detection and others. The solution picked was simple touch sensor activity detection— if nothing or no one touches the screen for more than 1 minute, the dialogue screen appears, asking if the player is still there. Pressing "Keep playing" would resume the game session, while pressing "Start over" resets the game. If nothing is pressed on the dialogue screen for 15 seconds, the game resets itself automatically.

3.1.2 The Rowing Game Design

The game design of the rowing game posed quite a challenge. The hardware configuration consisted of a real-world full-size Viking longship boat with a seat for the player, wooden spring-loaded paddle handle and a rectangular sail acting as a projection screen. The player was supposed to sit inside the boat as a Viking rower,

experiencing what Viking sailors of the past would do. The problem was that there were no input controls other than the paddle handle, which could only be rotated around single vertical axis. Another problem was that hardware engineers did not provide any solution of detecting the paddle position, angle or motion.

Intensive research, prototyping and brainstorming helped working team to carry out viable solutions to the problems mentioned, with the help of well-thought game design and the knowledge of physics and mathematics. The paddle motion detection mechanism was implemented as a combination of accelerometer, mounted inside of the handle and the software driver, obtaining the data from the accelerometer via USB and then passing it to the Unity 3D engine. The cable, connecting the accelerometer and the processing block has been hidden inside the hollow body of the handle.

Considering the game design itself, it had to be thought through practically from the scratch. The limiting factors were the distance to the screen (around 2-3 meters), relatively low contrast of the screen, the one-axis input device (the paddle handle) as the only way for the player to communicate with the game, and desirably short game sessions. Competition aspect and replayability were added as benefiting part for this physical exercise-engaging affair and also to make it attractive to spectators to add some social flavor to it.

The game process was split into 4 different stages, quite like the quiz game, as essential parts are basically the same: title screen, briefing, gameplay itself, round summary. Setting the theme for the game was a no-brainer: as the player is taking Viking rower's role, then let it be a sea-sailing game. To lessen the amount of work, thus cutting the production budget and to meet short deadlines, it was decided to use rather flat third person perspective, showing the boat from the side.

To attract the players to the game, the title screen (figure 9) features Harald hanging a paddle behind his back as if it were a rifle, and pointing with his sword forward. The background is essentially a late day sea scenery with animated waves and clouds. Under the image of Harald there is a huge "Harald: Rowing Game" title, below which "Begin rowing to start the game" text is written. The title screen also has "High score" panel to engage players into the competition.

Figure 9. Rowing game title screen.

Because the only input device was the paddle handle, the only way to detect the presence of the player was actually detecting paddle motion. The problem is that during the peak hours the exhibition will be quite crowded, and passing by people will be moving the paddle either accidentally, or just out of curiosity. To prevent false start, the "Begin rowing to start the game" text was transformed into progress-bar panel, which is filled the more, the more actively the paddle is being set in motion. The progress bar starts filling instantly right after the first movement of the paddle is made, making the progress bar visually connected with the paddle—even if the player is not able to read or see the text, bright contrast progress bar reacting to the paddle movements will suggest the player to row more actively in order to start the game.

The intuitiveness is an essential part of any game input system. It helps to reduce the amount of suffering player has to go through figuring out how to control the game, and make them actually start having fun. The illustration (figure 10) shows the feedback loop between human and computer.

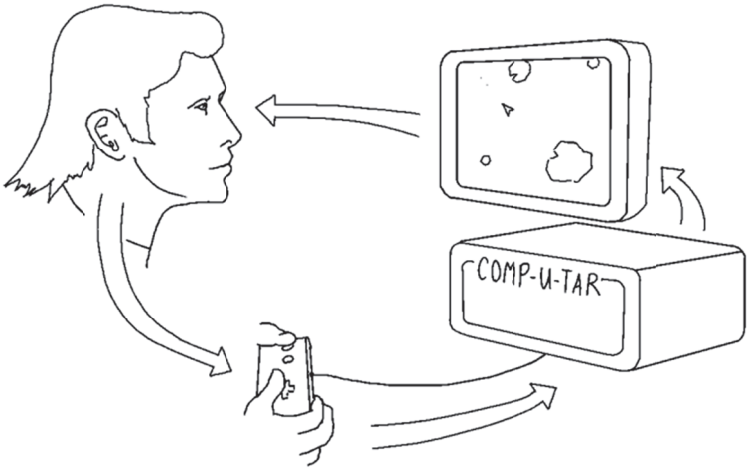

Figure 10. The interaction loop between human and computer (Swink, 2008, p. 2).

When the progress bar is fully filled by the active rowing, the game machine switches into the second phase. During this phase, Harald is shown inside the Viking boat, brandishing his sword and screaming, while instructing the player about the rules and aims of the game, thus creating "boot camp" feeling to the player through clichéd "boot camp instructor" behavior. The rules of the game and the story behind it (the plot is based around recurring comic storyline where Harald raids and pillages the Western European countries, in particular England and France), according to Harald's instructions, are following.

The Harald and his crew successfully looted in England, loading their longship full of treasures (which they packed in three big chests). However, unfortunately, English King sent a battleship to chase them and retrieve the stolen goods. In order to get away from the pursuers and to keep the loot, player is instructed to maintain the proper speed—in case the player moves too fast, the boat will become uncontrollable and consequently hit an iceberg; in case of moving too slow, the chasing English ship will ram into the Harald's boat. No matter which of the two unwanted situations happens, the crew will lose one of the chests. To make the game more interesting and intense, the target speed changes throughout the game, demanding high concentration and certain reaction speed from the player.

What makes the game easy to understand, but quite tricky to play is the fact that the longship speed is not controlled directly by the frequency of player’s rowing

movements. The rowing frequency and amplitude control the acceleration, and the resulting boat speed is roughly a product of integration of it, which takes some practice to understand and figure out the patterns in which to speed up and slow down the longship.

One of the problems which needed the involvement of advanced calculations was that the position of the paddle controller was not known to the computer—current transverse acceleration of the handle was the only input to the system. The mathematical model of the controller and the in-game boat was constructed in order to provide feasible solution to the problem.

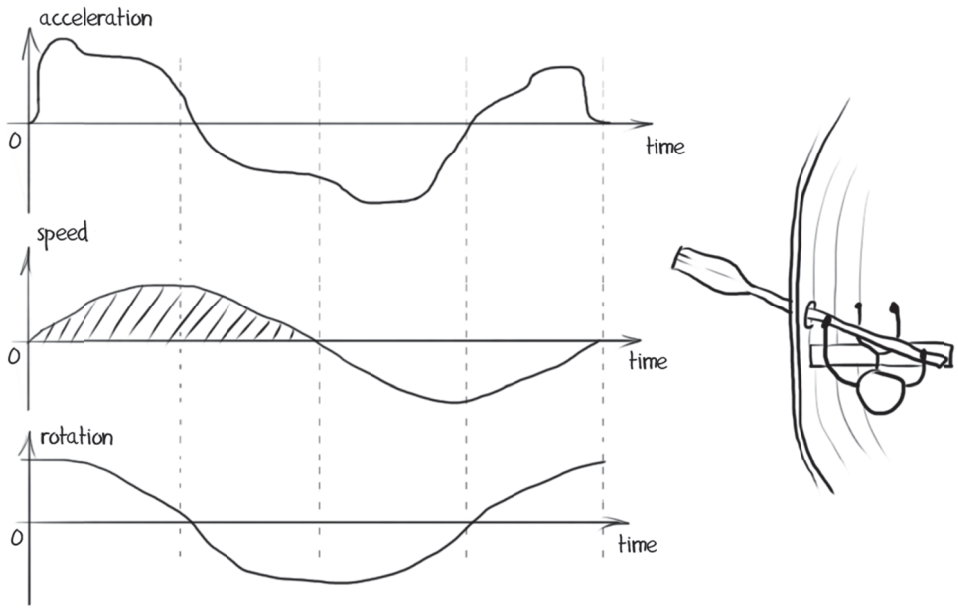

Figure 11. Common input readings and derived data.

First, the input from the accelerometer was filtered to cut out the noise and random vibrations from the measuring device. Endpoints of the rowing movements were calculated based on sudden change of the acceleration from positive to zero and then to positive again (and the same with the negative acceleration). As in the real world rowing affects the speed of the boat only when the rower is pulling the paddle (otherwise the paddle is out of the water), thus only these parts of movement were taken into account (figure 11, note the hatched part).

The paddle velocity relative to the boat was calculated as definite time integral from the endpoint to the current moment based on the measured acceleration (as the actual paddle tip velocity is proportional to its length, we don't care about the multiplier by that time—multiplier will be defined by trial and error, to make the game playable). The formula on figure 12 shows the relation between boat-to-water velocity and the measured paddle acceleration.

$$v_{pb} = k_P \int_{t_0}^{t} a(t)dt$$

Figure 12. Calculation of paddle-to-boat velocity.

When the paddle velocity relative to the boat is known, the paddle velocity relative to the water can be calculated, based on the boat speed (which is given by the Unity 3D as the boat is the physical object). That paddle-water velocity actually determines the force applied to the boat by rowing and, calculated, that force was in real-time applied to the boat within simulated space in Unity 3D engine (figure 13).

$$F_{pb} = s_d k_w (v_{pb} - v_b)^n$$

Figure 13. Calculation of force applied to boat by paddling.

The first two multipliers determine, respectively, the direction of force (depends on the sign of the paddle-to-water velocity) and viscosity of the water. The power, to which the velocity difference in exponentiated, determines the character of viscosity and is tweaked in the range between 1 and 3.

It was investigated before, that the minimum amount of time it takes for a player to perceive the changes in the game process, think about what to do and react on that

impulse is around 240 milliseconds. The figure of 240 ms is a composite of three different time intervals: perceiving, thinking, and acting (figure 14).

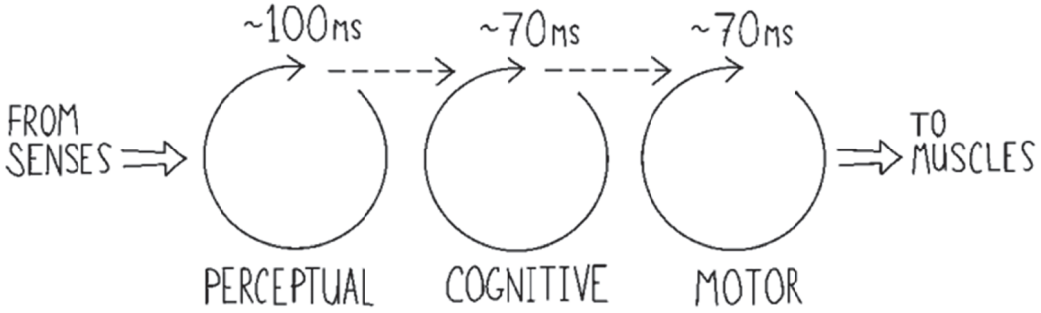

Figure 14. Human processing delay (Swink, 2008, p. 37).

That delay has to be considered when creating a fast paced gameplay. For example, no one would be able to react to the changes instantly, and some delay is needed in order to make the game more playable. In the rowing game that fact was taken into account in the form delay between the change of the recommended speed on the speed gauge, the appearance of Harald giving out the commands, and the actual change of the game situation on the screen, giving the player enough room to react to these events.

That said, the gameplay is rather simple and transparent, which allows players to start experiencing the game process without long introductions. However, even if it looks like a simple task, it is quite hard to get the highest score without playing a couple of rounds to "feel" the controls, which makes it a good game! Here's what is written in "Rules of Play" about Pong, classic and highly acclaimed arcade game:

> *"Every game is unique. Because the ball can travel anywhere on the screen, Pong is an open-ended game with endless possibilities. Pong rewards dedicated play: it's easy to learn, but difficult to master."* (Salen & Zimmerman, 2004, p. ix)

After finishing the game, the longship is shown arriving to the docks in Norway with Harald's house in the background. Then, the process of the score calculation is shown to the player, making in transparent to them, thus allowing the player to replay the

game with the ideas of how to improve the score in mind (figure 15). Stage-by-stage animation helps to make the process easier to read and understand; usage of graphic icons instead of words also helps to reduce the amount of visual noise from the picture. When the resulting score is given, in case it is the highest score, the golden "high-score" panel is slapped on top, thus rewarding the successful player.

Figure 15. Score calculation screen

Gabe Zichermann and Christopher Cunningham write in their "Gamification by Design", that the game scores present on the "high scores" screen should not be very high numbers, because it creates terrible disincentive to play, making the players believe that it's almost impossible to beat the highest score (Zichermann & Cunningham, 2011). With that in mind, the game scores were limited to tens of thousands, making them quite distinguishable from each other while still being relatively small. The game score is calculated based on the amount of chests saved and the accuracy in maintaining the recommended speed: time integration of the absolute value of speed difference was used in order to calculate the overall deviation of the speed.

The self-resetting mechanism was done in similar fashion to that of the quiz game. If the machine is not in the title screen state and the player is not present, it has to reset

itself. The absence of the player is assumed when the paddle is not being moved (random small movements do not count and are filtered), and after 10 seconds of that state, the warning screen is shown, asking the player to row a bit to show his presence and intention to continue the game. If the paddle is not moved for 15 more seconds, the game returns to the title screen.

3.2 Visual Style and Graphics

3.2.3 Key Concepts in Creating the Visual Style

The games did not require sophisticated graphic design, and even more to say—they could not afford it not just because of a very tight production schedule, but also due to the fact that the visitors will have roughly 5—15 minutes to experience the product and they need to get accustomed to it as quickly as possible.

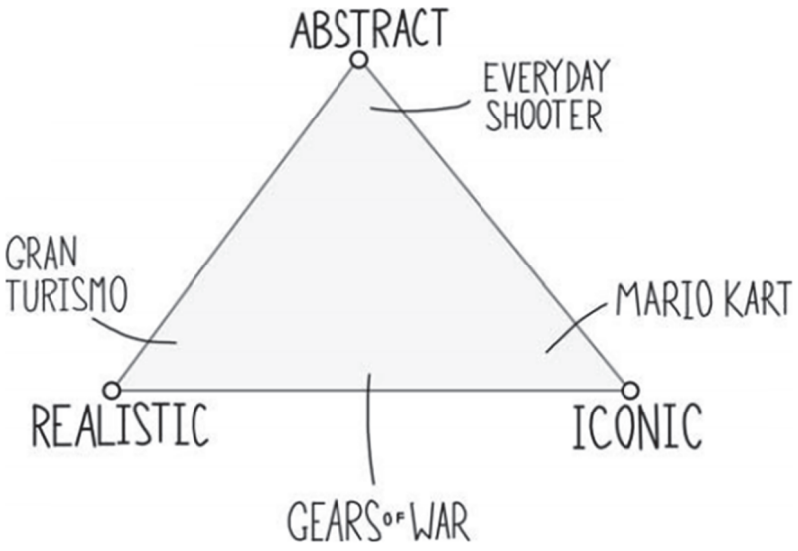

Figure 16. Scheme of possible approaches to game visuals (Swink, 2008, p. 176).

Swink (2008, p. 177) writes that the correct visual metaphor sets up proper expectations to the player about how things should look, move, sound, behave and interact. The metaphor is actually affecting the game feel, and it is a win for the designer and the player when every aspect of the game is in harmony with others. According to Swink, the game visual style can be placed as a point on the triangle

with iconic, realistic, and abstract styles assigned to its vertices (figure 16). For the Harald games, iconic style was chosen in order to keep it somewhat resembling the original comic and because people are accustomed to that visual style being used in casual games.

The main goal when designing the visuals for Harald games was to maintain the original character art as much as possible to avoid any licensing issues, and at the same time to make the game look appealing to present days gamers. Popular games nowadays rarely feature oversimplified graphic style, the one which original Harald comic has.

Depending on tools that were used for strokes and colors, the following styles might be identified:

- straight stroke, which is the most common cartoon style without relief or black flats;
- stroke with black flats: the character is emphasized and the dramatization is achieved by flat areas of the picture without half tints;
- realistic cartoon: straight strokes may be combined with multiple black flats in order to produce relief giving a realistic atmosphere and contrasted lighting;
- wash: half-tones for black and white applied by touch with different intensities by scale. It is used to create a cold atmosphere.

Aside just mentioned, other styles exist like modeling by stroke or gray-tone stroke. (Sauvaget & Boyer, 2008).

During the ideation process, and according to art director's advice, the following solution has been distilled. All the original characters, including Harald, Hamlet and The Boat will keep the exactly same shape, color scheme and strokes as in the original, but to add additional volume and depth to them, color gradients and cel shading techniques will be utilized. The surrounding objects will in turn be represented with heavy use of gradients and half-tones with touches of cel shading technique in order to give visuals needed depth and atmosphere while maintain cartoonish appearance.

3.2.4 Color Scheme Solution

It has been studied before that colors can be used to set certain mood to the viewer. Different hues and tones have corresponding effect on human emotions and thus on their overall impressions about the product. (Sauvaget & Boyer, 2008). This allows the designer to manipulate players' mood, helping to achieve needed degree of immersion.

The color scheme solutions used for the games were different from each other. In the quiz game, the idea of Harald going through storm set thinking in the direction of creating a feeling of danger, dramatic effect; the game genre also suggested some mysterious tones to the colors. Finally, dark blue and green-blue colors were used for the sky and sea—the most prominent surfaces on the screen. The perfectly neutral grey is rarely used in art, and in case of the clouds for the quiz game it was no different—slightly purplish shade of grey helped to complement base colors and develop rich color scheme. The bright orange-yellow has substantial contrast to dark blue, so it was used for the game title in order to attract visitors and for the text highlighting to catch players' attention.

Color scheme developed for the rowing game was totally different, as the mood of the game is different, too. In this game Harald is going home with all the loot sacked from English. The English battleship is chasing Harald's longboat, from the left side of screen while Norway, where the Vikings' home is, is on the right side. Thus, violet-colored menacing clouds were drawn on the left side of sky, as a metaphor for the chaser ship. The setting sun is putting its warming golden rays from the right side, symbolizing the home, so desired final destination.

3.2.5 Graphic Design Details: Quiz Game

Several solutions were made during the later development of graphics for the quiz game. The solutions were meant to solve certain problems, which arose during the process of implementing visual appearance of the game when considering different aspects of game design, usability and so on. One of the problems was the requirement

of showing the progress during the game session: players had to know how many questions were left, how many of them were already answered and how successfully

.

Figure 17. “Harald Quiz Game” game process.

In order to achieve that, the Harald’s longship was used as a “progress bar” with shields attached to its board (figure 17). Initially, it was thought that the colored marks (green ticks and red crosses) would indicate the correctness of answered questions. The outlined approach has proven to be erroneous—introducing new bright colors not only distracted the viewer from looking at questions, but also created dissonance with the existing color scheme (figure 18). The solution to that problem was in removing the color indication from the shields and changing the appearance of the shields instead—shiny shields represented the correct answer, while broken ones resembled the wrong ones. The active question was first designed to be indicated as a question mark, but this approach was rather distracting and it was impossible to make the question mark contrast enough without introducing high frequency noise to the picture. Showing only shields was more consistent solution, but the “current” shield was quite hard to be made standing out. The animation helped to solve that issue: adding a slow pulsation to the shield made the shield visually separable from the surrounding and

suggested the active state of that question. The following questions were logically represented with just semi-transparent outlines of shields.

Figure 18. Process of refinement of the progress indicator.

The Harald franchise logo needed to be presented on the title screen to indicate that the game is related to it—the bigger game title was intentionally left without references to Harald to reduce the amount of words in order to be able to make the texting bigger and in one line, allowing it to be more prominent and attracting. The colored logo took its place on top of the title on the title screen, but in-game logo could not be left colored—it was too distracting. It was decided to make logo semi-transparent white with moving it to the top right corner of the screen, where it was nothing to interfere with.

Animated waves and clouds were already helping to separate on-screen text from the background, but the contrast had to be ensured, because the readability of the questions was one of the key parts in the gameplay. To help the text contrast even more with the background, two solutions were made: first, the text was made pure white, which helped to make it stand out without introducing changes to the color scheme and highlighted text color was picked as a complementary to the background (bright intense orange as opposed to dark green-blue color of the background sea); second, black opaque hard shadow was added under the text to ensure the separation from the colored background.

The next problem was Hamlet. To be more precise, it was the task to keep the visual resemblance of the original character, but making him fitting the chosen graphic style. In order to keep Hamlet's looks as precise as possible, the original art was taken as a starting point. The outlines were carefully vectorized shape by shape, colored flats were chosen to be somewhat a compromise between chosen palette and the original

color. To give Hamlet the needed volume, gradients and flat shading was applied to the flats. Few versions were tested in order to create the best looking character, which fits both the original style and the surrounding environment (figure 19).

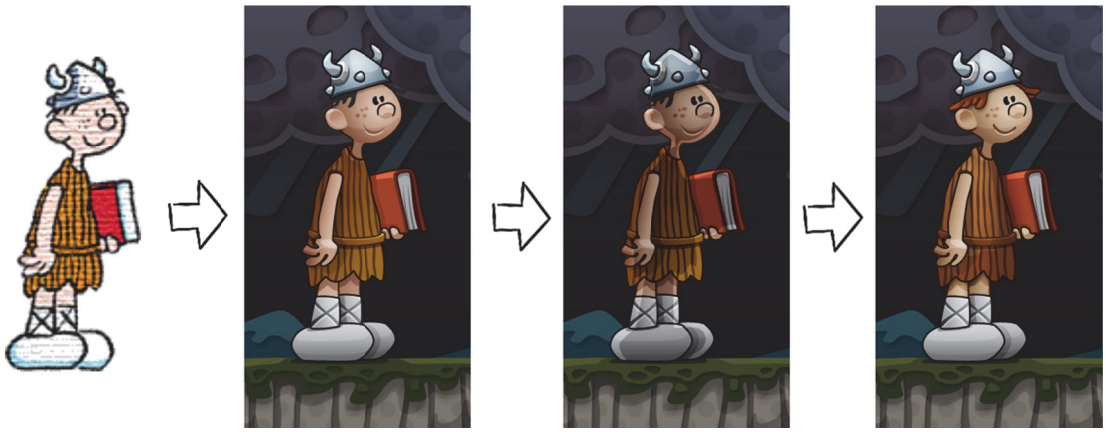

Figure 19. Progression of Hamlet's appearance from the original art to the final version.

As Hamlet was effectively more a narrator than a gameplay character, and needed some kind of separation from the in-game scenery. Putting him on a magic floating rock helped to define him as invulnerable to the stormy weather, thus pushing him closer to the player, introducing a connection between storyteller and the listener.

It was designed that after the player answers certain questions, the related historical information would appear, thus helping the visitors to learn something new about Harald and Vikings. The solution to this requirement was in making the text appear as a comic text bubble, coming from the longship, making him a character himself. The Harald's longship actually was a character in the original comic: it had eyes, mouth and was able to express different human-like emotions depending on the situation.

Figure 20. The solution to scalability of the text bubble.

At first, the text bubble was made to have round shape, resembling most common comic text bubbles. The problem that shape implied was that it wasn't easily adaptable to incorporate different amounts of text: it was impossible to make it smaller or bigger without rescaling or redrawing it. The solution was in making the text box rectangular, having pre-drawn top and bottom parts with easily scalable middle part, with all the parts designed so that they can seamlessly form a text bubble (figure 20).

On the Viking diploma configuration, Harald holds an exquisite French mirror in his hands, which "reflects" the player as a Viking. As it will be outlined in the next chapter, the frame design is taken from Renaissance era, but was simplified and stylized in order to match the visual style of the quiz game.

The other problem with the Viking diploma configuration screen was the fact that it featured Harald in the position, which was hard to find in the comics. So the Harald on that screen has been drawn from scratch, based on the existing pictures of Harald's face and other images. It appeared that despite the roughness of the Browne's drawing style, even the minor deviation from the original style and proportions would render Harald unrecognizable (figure 21).

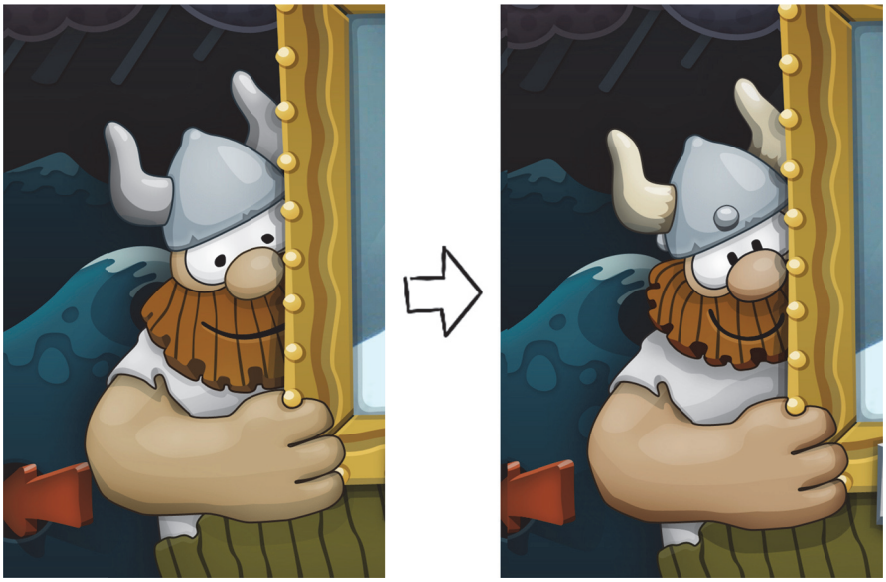

Figure 21. Even the minor changes in proportions affect the character's appearance.

One of the most common tricks used in the designing the visuals for the game was in usage of color gradients in order to give more contrast to the edges. The idea behind that was that when detailing single object, it is better not to bring highly contrasting colors into the details, but to use local contrast instead: to separate low contrasting colors, local gradient was introduced to the one side of the edge if the form of glow or shadow (for example, the waves' details). That technique not only helped in bringing out the details, but also gave the volume to the picture. The same approach helped to increase the difference between already contrasting colors.

3.2.6 Graphic Design Details: Rowing Game.

Rowing game used most of the tricks and techniques developed when designing the quiz game. However, some changes were made to certain approaches and new ideas were generated in order to solve the emerging problems during the development of the graphics for the rowing game.

To separate the main action from the background, aerial perspective was used—distant objects were rendered slightly desaturated, lighter and with a bluish tint to them. The bigger distance from the viewer, the stronger was the effect. Distant clouds were also given overall orange tint because of the setting sun present in the environment.

As the previous, the rowing game needed the progress indicator, too. The progress bar was put in the top left corner, with the simplified icon of the Viking longboat moving along the bar from left to right end. On the right end of the progress bar, the checker flag was drawn as a widely recognizable symbol of finish line. To visually separate the icon and the bar from the changing background, black semi-transparent shadow was added under (figure 22).

Figure 22. Rowing game screen showing the interface and the game graphics.

The speedometer was combined with the optimal speed indicator in order to simplify the matching process, and to reduce the space eaten by HUD elements. It was stylized to resemble the throttle gauge of the real-world ship, with the combined frame-handle perfectly suitable as an indicator of the optimal speed. The red arrow indicating the current longship speed was added to the gauge dial.

It was also necessary to indicate the loss of chest when one happened, with displaying the amount of chest left, although the chests were drawn in the boat on the screen and their loss was animated—these chests were quite small and the more prominent way of indication was needed. The solution was showing the bigger image of chest with the amount of chests left in the left bottom corner of the screen, which was sliding in when the chest was falling out of the longship due to collision, and sliding off screen

after couple of seconds in order to save the screen space. To imply the fact of the loss, the number next to the sliding chest image is shown equal to previous number of chests, and after one second it decreases by 1, showing the current amount of chest left (figure 23).

The same sliding in—sliding out approach was used for the Harald giving his orders to the player. The picture of Harald appears in the left corner of the screen, with the text bubble next to in, occupying the rest of the bottom of the screen (appendix 3). This sliding animation helped to reduce the distraction to the player, with the ability to adjust the level of attention by changing the animation speed.

Figure 23. The English ship is about to ram into the Harald's longship.

Animations on the whole played a significant role in creating seamless and effective communication with the player. Swink (2008, p. 5) emphasizes the importance of polished and intuitive animations, underlining their ability to "sell the game". To emphasize, for example, effect of heavy collision happening between English ship and Harald's longship during the ram attack, a "camera shake" animation was played. One more example: when moving at high speeds, the vessels were slightly rocking on the waves, creating dramatic effect of speed and visually helping to sell the ships as massive objects.

3.2.7 Typography

Paying attention to typography is vital to ensure proper and strong communication with the player. The games have sufficient amount of text information that needs to be delivered quickly, while keeping consistency at the same time with minimal conflict with the game visual style and atmosphere. The additional aspect to consider was the fact that the language of text is Finnish, which restricted the typeface choices to the ones having Scandinavian characters within them; the price of the fonts wasn't a big problem, but free fonts are always more hassle-free.

Ruder (cited in Ambrose & Aano-Billson, 2010, p. 19) points out that typography should be clean and unobtrusive, and in order to achieve clear communication of the content, sans-serif fonts have to be used. The same approach was taken when designing the typography for the Harald games.

Two different typography schemes were developed to meet the purposes. Gilles' Handwriting[2] font was used to underline the curiosity of the quiz game, while Comic Book[3] font was used when stronger feel was needed (figure 24). Comic Book is also capable of maintaining pleasant look and legibility when subjected to various effects, such as indentation.

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[2] Gilles' Handwriting font was created by Gilles Sage.

[3] Author: Neale Davidson

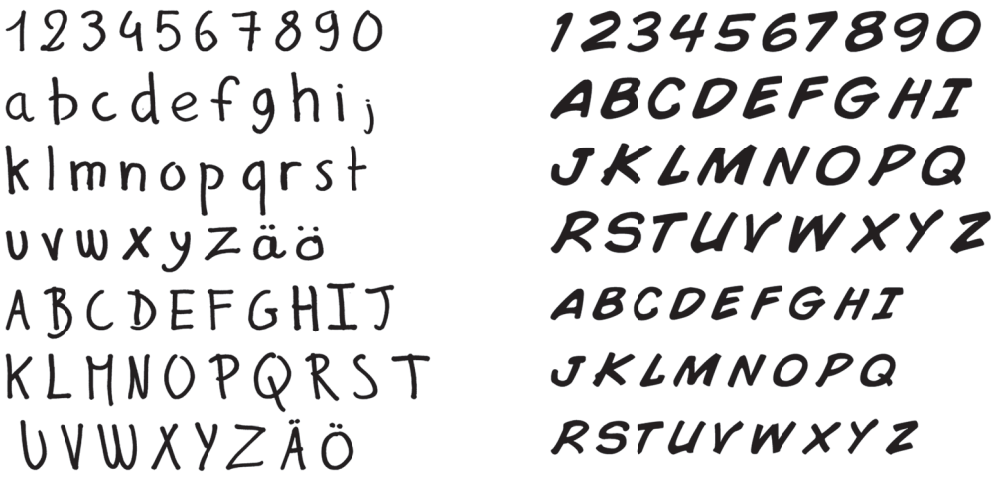

Figure 24. Gilles' Handwriting and Comic Book fonts

As the rowing game is more fast-paced and needs to ensure the instant perception of instructions given by Harald during the game round, Arnold 2.1[4] font was used for the body text. To complement it, Comic Book fits just right (figure 25). The described font sets were used to satisfy almost every type-setting need during the project. However, the game titles and largest headlines were custom drawn based on purposes and Harald original logotype.

[4] Author: Aaron Smith

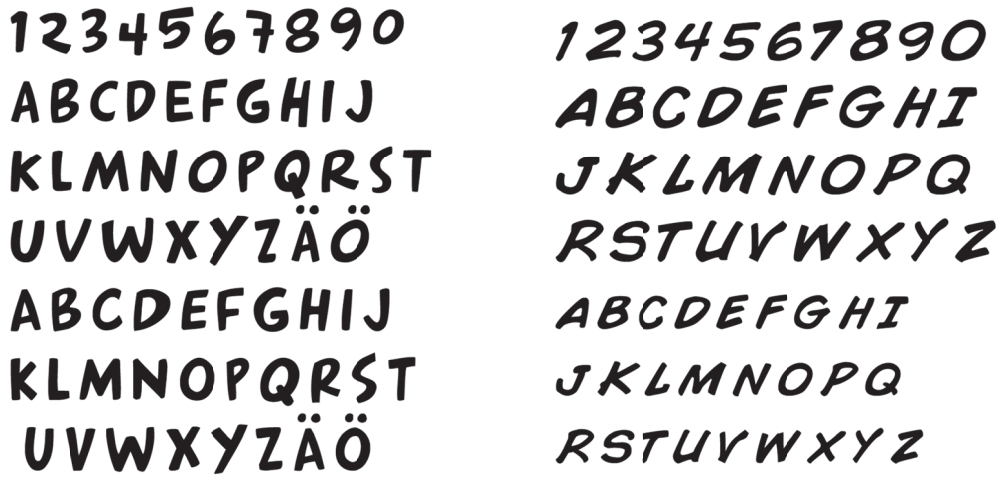

Figure 25. The font set picked for the rowing game

This decision ensured the less robotic feel to the project and also helped to add some more depth to the designs. For the Viking Diploma fine print text, PT Sans was chosen as neutral body copy sans-serif font.

3.2.8 Time Period-Specific Objects and Their Design

Several in-game objects to be designed and visualized were not available in the original comic, which required them to be created from scratch, but also taking into account visual, cultural and authenticity-related constraints. The most complicated design process was related to the English ship visualization for the rowing game. It might look like it would be the best solution to just find the most famous Viking Age English ships' design and recreate it using the developed drawing approach.

However, during the Viking Age time period English ships didn't look like most people would imagine themselves a medieval English ship. As good example of Viking Age English ship, Ship Thomas (XIII-XIV c.) might be picked. Unfortunately, this visual style did not have enough contrast to Harald's longship, which was the reason doe choosing later English Navy time period as a visual reference.

Numerous examples of the outlined time period's ships were checked for suitability to be used as a reference. The ship such as Great Harry suited its purpose as a prototype

for an in-game English ship much better. Not English, but Portuguese merchant ship Sao Miguel (figure 26) has even more distinct and recognizable Western European appearance, and on top of that, its color scheme resembles that of authentic Great Harry ship.

Figure 26. Sao Miguel ship which was used as reference to the English ship (Tall Ships, 2012)

The latest mentioned vessels were taken as a visual reference and a general type for the in-game English ship which was designed to chase Harald's longship on the way to Norway.

For the picture/mirror frame, which Harald holds during the "Viking diploma" configuration screen, early Renaissance frame designs were used as a reference (figure 27). This solution has been made due to the fact that this time period is quite close to the Viking Age and most people are familiar to this style and it is strongly associated with exquisite and expensive European monarchs' decorations.

Figure 27. An example of exquisite French picture frames (Picture Frame, 2006).

During the years from 1610 to 1643, under the reign of Louis XIII in France, frame designs were heavily influenced by court and undergone substantial refinement. The profiles became thinner than their Italian predecessors, and new continuous design patterns appeard. Among those patterns, egg-and-dart, ribbon and flow of leaves might be mentioned. This gave the birth for Baroque design in picture framing, and "Spanish, Flemish, and Italian influences were all at work to produce a curious intermingling and exchange of ideas. “(ArtQuid 2012) (The Renaissance and Louis XIII style, 2012)

3.3 Unity 3D Game Development

Although the games look like having 2D graphics, it is not actually the case. As both games were developed under Unity 3D environment, it's easiest to keep all objects in three-dimensional space, less like in the applique technique when all the pieces reside on one flat plane, and more like in volumetric stop-motion if it makes a good comparison at all. The fact that all the objects are in three dimensions makes the process of development very intuitive and logical.

The technical approach in visualization was taken as follows. Each in-game object is represented as a flat rectangular plane, or quad, which consists of two triangular polygons[5]. Objects were then assigned an individual material with "Unlit" shader in order to maintain the input 2D art untouched. Each material has its own color map texture to "paint" the objects. To give the objects shapes different from rectangular, all texture maps were converted to 24-bit .png files and supplied with alpha channel[6]. Thus, the transparent areas of alpha channel were translated onto object's surface making them transparent as well.

To simulate the distant depth of the sea, it was originally decided to split the sea into 4 flat layers of "waves", and the layers then were arranged in the 3D space accordingly. The movement of the waves was accomplished by animating the x-axis texture coordinate shift and by moving each wave layer along y-axis in near-sinusoidal pattern. As texture shift is defined in relative numbers, different shifting speeds were used in order to simulate the parallax effect on the waves.

The rowing game had quite a lot of depth to the imagery and it needed to maintain the feeling by having numerous background objects moving according to three-dimensional perspective, such as clouds, waves etc. For the clouds and white caps a rather elegant solution was used, which helped in meeting the deadlines and offered us a flexible and easy to use tool. Unity 3D has built-in particle system generator, for which a parallelepiped-shaped generator with billboard-type [7]particles can be used. Unfortunately, the aspect ratio of the particle billboards in Unity is fixed and equals to

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[5] In computer graphics a polygon is a closed shape consisting of straight lines (edges).

[6] Alpha channel is an additional level of data within 2D image, which contains information about transparency of the image in each pixel.

[7] A 3D computer graphics method in which a sprite is rendered orthogonal to the camera

1, thus each particle's texture map[8] had to be converted to square-shaped bitmap. The diversity of particles was achieved by using particle animation sheets. Instead of animating the particle textures over the time, random texture was picked by the generator from the particle sheet. In total, 3 particle systems were created, with each of them having its own particle material with a texture sheet bitmap: big close clouds, small distant clouds and water white caps.

Because there was no real horizontal sea surface, nothing would obscure the boat and paddles, resulting in "floating" vessel. In order to simulate the water surface, two additional flat objects were created, with the first one obscuring the boat itself from the camera, and the second one obscuring the lower parts of the paddles. Both of these additional objects were assigned with a material of the same color as underlying water layer and with wave-shaped alpha mask. On later stages, the copies of these objects were used to simulate the submersion of the English ship and the iceberg.

[8] Texture mapping is a method for assigning two-dimensional bitmap to surface of polygons in order to render surface details.

4 CONCLUSIONS

During the development of the Harald game set, various concepts and workflows were learned and exercised. Creative limitations and advantages of working with a registered character were explored; during this project I tried to understand the allowed degree of freedom in changing/modifying the original designs intuitively.

The concepts of shape, color, and motion were studied and applied to the real product. Different drawing styles and techniques were also investigated, which helped to understand the landscape of graphic arts and expand the knowledge of the given field.

The excessive teamworking and the concept interaction between team members was learned and helped to meet the deadlines while keeping high quality product. The Unity 3D game production pipeline was studied and practiced, which is becoming a valuable skill nowadays as the Unity 3D engine gets more and more popular in game industry.

Overall, the project might be considered to be successful, as both the developing company and the client were highly satisfied with the outcome. It can also be considered a good educational project, as it helped me to develop myself as a professional graphic designer and game artist.

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APPENDICES

VIKING DIPLOMA Appendix 1.


HARALD
HIRMUINEN
Valitse viimeiseen tekstikuplaan sanat
OLETKO YKSI-SARVINEN?
Kyllä. Miesten pitkät poissaolot kotoa tarkoittivat sitä, että naisilla oli oltava oikeus omaisuuden hallinnoimiseen ja sopimuksiin miehensä nimissä. Tasa-arvoinen viikinkiyhteiskunta ei ollut, mutta aikaansa nähden naisten asema oli vahva.
Jatka

HARALD IS GIVING HIS ORDERS TO THE PLAYER Appendix 3.