

Emmi Rukkila

REDESIGNING SUPER MARIO

Creating realistic versions of some characters
and animations featured in Super Mario franchise

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Abstract <p>Super Mario is one of the most well-known and iconic characters in the video game world. This study examined how the nature of the Super Mario game franchise would change, if the character design and visual style of the colorful and family friendly game would be realistic instead and set in the 80s New York.</p> <p>The thesis researched the history of Super Mario franchise and its successful start and how the character design affected the popularity of the game. Historical research was carried out of Italian Americans as well as the appearance of citizens of New York in the 80s to produce historically accurate redesigned characters. An animating technique, rotoscoping, was to be used in the animation process of the redesigned Mario. The said technique and its history were examined, likewise the games in which the technique had been used before.</p> <p>Based on the research, realistic redesigns were created for the three main characters of the Super Mario franchise: Mario, Princess Peach and Bowser. In addition, three prototype animations were created for Mario with the rotoscoping technique. The planning and design processes were covered clearly and in detail.</p> <p>Due to time restrictions for the thesis creation, the redesigns are not as polished as intended, but they serve as good examples of how the realistic Super Mario game could look, whether the new appearances and animations would work for the franchise and what challenges one might face if using the rotoscoping technique.</p>		
Keywords Super Mario Bros., platformer, character design, realism, animation, rotoscoping, comparative research		

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1 INTRODUCTION

Recreating the concept of *Super Mario Bros.* game is a project carried out by two students, the author of this thesis and Eda Brasileño-Hatanpää, and the concept itself is divided into two different theses. The aim of this project is to create graphically and mechanically realistic concept which would expectedly differ greatly from the original *Super Mario Bros.* concept. The main focus of this thesis is in the character design and animating processes as well as the subject related background research whereas Brasileño-Hatanpää's thesis (*Realistic Super Mario*, 2017) focuses on the project's environmental design.

The thesis starts with a video game industry related historical research considering the 80s video game industry and Nintendo game company. In addition, the research part examines the evolution of character design in Super Mario games and how this has influenced the popularity of the franchise.

A new backstory was created for the redesigned concept, thus background research considering the history of Italian Americans and American Mafia was needed. In addition, some game animations were designed anew, so that the game would be as close to reality as possible. The animation part of the thesis was created by using the rotoscoping technique which needed to be studied properly to get genuine outcome. Afterwards the game physics from both versions were taken under comparative analysis.

The following parts of the thesis include the more detailed explanation of the planning and creation processes of the redesign. Each state is explained thoroughly step by step and analyzed simultaneously. Afterwards, the final version of the redesign is examined and compared to the original *Super Mario Bros.* concept.

In the conclusion, the strengths and faults of the qualitative research and the redesign process are considered.

2 RESEARCH

2.1 80s video game industry

At the beginning of the 80s two major markets dominated the video game industry: the home market and the arcade market. The home market consisted of video game consoles that could be connected to a television and were sold to people for personal use whereas arcade market consisted of coin-operated arcade machines that were often placed in public businesses such as bars and shopping malls. (Chikhani 2015.)

The success of *Space Invaders* (1978) encouraged many new companies to emerge and try their luck on the video game industry. The result was an oversaturated video game market in which most of the released products were low-quality. Consumers lost their confidence in the market and the events ultimately culminated in the 1983 video game crash. As a result, many of the companies went bankrupt or folded. (History.com 2017.)

A Japanese company, Nintendo, had a strict quality control on softwares to prevent the low-quality products getting to the markets. Their video game console, *Nintendo Entertainment System* (1985), helped the industry to recover from the crash. The company ended up succeeding with the third party developers' franchises as well as their own. At the late 80s other video game developers still failed to compete against Nintendo's quality products. (History.com 2017.)

2.2 Nintendo

Nintendo Company – originally known as Nintendo Koppai – was founded in 1889 by Fusajiro Yamauchi. At that time the small business, located in Kioto, sold handmade versions of *Hanafuda* – card game that used illustrations instead of numbers – which later on became so popular that the company had to start to mass-produce them. (Cohen 2017.)

Nintendo was the first successful manufacturer of mass-produced plastic playing cards in Japan. In 1949 Fusajiro's grandson, only 22-year-old Hiroshi Yamauchi, took over as the third president of Nintendo. After realizing the company's current business had a limited potential, Yamauchi renamed the company from Nintendo Playing Card Co. to Nintendo Co. Between 1966 and 1973, the company tried to succeed in the Japanese toy industry, to no avail. The company had to change their business' direction once again, and that is when they ended up focusing on family entertainment. A simulation called *Laser Clay Shooting System* was Nintendo's first video game project. Although the game was barely successful, the company gained enough profit to continue focusing on family entertainment and game industry. (Schkolnick 2016.) A couple of years later in 1972 the first home video game console *Magnavox Odyssey* became available in America. Nintendo saw an opportunity in electronic games and thus bought the distribution rights for Odyssey's Japan release. After the positive reception the electronic games got, Nintendo began to develop their own games and consoles, starting with *Color TV Game Systems 6* and *15*. (Cohen 2016a.)

In 1977 Shigeru Miyamoto – art student and father of the many Nintendo's future franchises – joined Nintendo's ranks as a staff-artist. His start in the company was not easy: one of Nintendo's huge investments, *Radar Scope*, an arcade game which was momentarily popular in Japan, flopped terrifically in United States' market. Miyamoto was asked to develop a game that would use the *Radar Scope* engine so the unwanted machines would get a new life and thereby save the company from considerable losses. As a result, Miyamoto created the very first *Donkey Kong*, which was a major success. (Cohen 2016a.)

As Miyamoto and *Donkey Kong* helped Nintendo flourish in arcade markets, in 1980 another Nintendo employee, Gunpei Yokoi, designed a handheld video game known as *Nintendo Game & Watch*. There were various types of *Game & Watch* games, and they all featured a single game to be played on the screen. In addition, *Game & Watch* was a progenitor for multiple future handheld consoles. (Cohen 2016a.)

In 1983 Nintendo developed their first multi-cartridge gaming system with 8-bit graphics: Family computer, also known as *Famicom*. Despite the slow start of the sales, Miyamoto's new successful game and the second in Mario franchise, *Super Mario Bros.*, made the console successful and popular. Due to the Atari shock, also known as the 1983 video game crash, the industrial leadership moved from United States to Japan, which Nintendo saw as an opportunity.(Ernkvist 2006.) In 1985 the renamed and redesigned *Famicom*, now known as *Nintendo Entertainment System (NES)* (Figure1), was published in United States. (Cohen 2016a).



Figure 1. *Nintendo Entertainment System*. (Amos, 2018)

In late 80s Sega challenged Nintendo in console market with their newest console, *Sega Genesis*. Nintendo ended up winning the console war with their fewer, more polished and more quality franchises, as Sega tried to produce as many games as possible, while failing most of them. (Schkolnick 2016.)

In 1989, Nintendo released their first handheld game system with interchangeable game cartridges. The system known as the *Game Boy* was bundled with a famous puzzle game, *Tetris*. In 1990, right after the *Game Boy*, Nintendo released a 16-bit game system, *Super Famicom*, in Europe and America known as *Super Nintendo Entertainment System (SNES)*. Many remakes of *NES* releases and sequels of Nintendo's famous game franchises were released on *SNES* with highly improved graphics. Six years later in 1996

Nintendo launched the *Nintendo 64*, the world's first 64-bit game system and in 2001 Nintendo released yet another console, the first to use optical discs, *Nintendo GameCube*. (Schkolnick 2016.)

In 2002, 52 years after starting as the third president of Nintendo, Hiroshi Yamauchi announced his retirement. Satoru Iwata was named his successor and the fourth president of Nintendo. Under the leadership of Iwata, Nintendo released couple of new portable consoles – *Nintendo DS* (2005) being the most popular of them. *Nintendo DS'* greatest qualities were wireless multiplayer as well as two screens of which the lower was a touch screen. Another great success, a home console known as *Wii*, was released in 2006. Most of the games released for *Wii* required the player to actively move the controller in order to play. The release of these active games, especially the sport-based ones, encouraged even those who usually find no entertainment in gaming in general. (Schkolnick 2016.) In 2015, Nintendo formed a partnership with company called DeNA, to extend to mobile game market. During the same year, Nintendo's president Satoru Iwata passed away due to complications resulting from a tumor in his bile duct. Tatsumi Kimishima was named his successor only two months later. (Skipper 2015.)

From 2015 to this day, Nintendo has continued to develop their family friendly game franchises and released a couple new handheld consoles as well as successfully extended to mobile game market. (Nintendo 2017.)

2.3 Super Mario franchise

This thesis concentrates on the evolution of three important characters in Super Mario franchise: Mario (the protagonist), Bowser (the antagonist) and Princess Peach/Toadstool (the damsel in distress). Other characters of the franchise may be mentioned, but are otherwise dealt in superficial fashion.

Furthermore, the thesis examines the main factors that eventually made the Super Mario franchise popular.

2.3.1 The evolution of character design

Mario was first introduced in *Donkey Kong*, an arcade platformer created by Shigeru Miyamoto in 1981. At the time Mario was known as Jumpman, a carpenter struggling his way through a construction site and trying to save damsel Pauline from an ape-like character, Donkey Kong. (Sather et al. 1991, 16.) Compared to Mario's modern look, where his shirt is red and overalls blue, the colors are swapped. In the game's flyer art (Figure 2a), Mario lacks the rounded, soft features that are nowadays known as part of his style. Before *Donkey Kong* existed, Nintendo tried to get the rights to make a Popeye game, basing the story around a love triangle. The deal fell through and Nintendo decided to replace the characters: Popeye became Jumpman and Bluto, Popeye's arch-rival, became the Kong. (McLaughlin 2010.) The features of Popeye were however still visible in some of the *Donkey Kong*'s artwork (Figure 2a&2b).



Figure 2a. Mario's style in the arcade flyer of *Donkey Kong* (1981) resembles Popeye (the image has been cropped to only show Mario). (Nintendo, 1981)

Figure 2b. Popeye. (King Features Syndicate Inc. and TM Hearst Holdings Inc., 2017)

According to Miyamoto, Mario's looks were designed to match with the setting of *Donkey Kong* game, thus he was presented as a construction worker. In addition, Miyamoto admits that due to the limits of technology at the time, the amount of pixels he could use to draw Mario's face was drastically limited. (Porges 2009.) Figure 3 illustrates Mario's in-game design. He has a hat, because at the time realistic looking hair was difficult to represent, moustache was added to highlight

the nose and overalls to emphasize the arm movements (Stuart 2010). Miyamoto later revealed in a Japanese interview in 2005, that Mario was designed to be around 24 to 25 years old (Griffin 2016).



Figure 3. The pixel amount was highly limited when the in-game look of Jumpman/Mario was designed. (Nintendo, 1981)

Mario's next appearance was in arcade game *Donkey Kong Jr.* in 1982 (Muldoon 2012). The character got a new name, Mario, from Mario Segale, the landlord who stormed into a room during the Nintendo's board meeting, demanding the unpaid rent (McLaughlin 2010). *Donkey Kong Jr.* is the only game in Mario's history in which he appears as the antagonist. Mario has captured Donkey Kong and ape's son acts as the protagonist, trying to save his father. (Stuart 2010.) In flyer art, Mario has lost his Popeye-look and resembles his future self with a more portly physique (Figure 4).

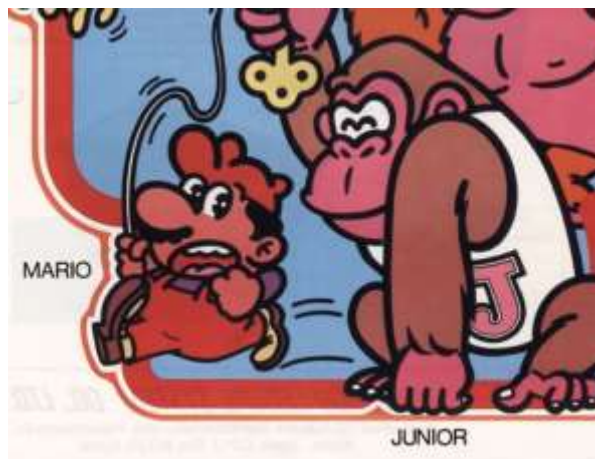


Figure 4. In flyer art of *Donkey Kong Jr.*, Mario has his iconic portly physique (the image has been cropped to only show certain characters). (Nintendo, 1982)

Nintendo's first home console, *Nintendo Entertainment System (NES)*, was released in 1983 and along it a game known as *Mario Bros.* For the first time Mario acted as the star (Muldoon 2012). According to Miyamoto, developers had a vision that the enemies could pop out of pipes, and that setting reminded them of New York's sewer system. That led to the idea of Mario being a plumber instead of a carpenter. (Porges 2009.) In addition, this was the first Mario-related game presenting his brother Luigi. (Sather et al. 1991, 17). First version of Luigi only differed from Mario by the color of his clothes. Both brothers wore blue overalls, but Mario's clothes were otherwise red and Luigi's green as depicted in Figure 5. The bright colors were easy to spot against the dark background of the sewer (Porges 2009).



Figure 5. In *Mario Bros.* (1983), Mario and Luigi differed only by the color of their clothes (the image has been cropped to only show the characters). (Nintendo, 1983)

Super Mario Bros., released for *NES* in 1985, was the first title of the Super Mario franchise to have horizontal scroll, where camera follows the character's horizontal movement, instead of non-scrolling single screen. (Sather et al. 1991, 18-19.) In addition, the game was the first of the franchise to be set in the iconic Mushroom World. The environment gave designers liberty to add multiple mechanics which utilized the game's fantasy setting. (Stuart 2010.) Mario would start as small Mario and only grow larger if the player picked up a mushroom. The very same mushroom worked as an extra life. Should the player pick up a fire flower, Mario would transform into a fireball shooting version of himself. (Muldoon 2012.)

In some early concepts *Super Mario Bros.* was planned to have more of a shooter based mechanics, as seen in Figure 6. Button A was for shooting bullets,

B to dash and up on the control pad to jump. At first the bullets were replaced with fireballs and eventually the idea of shooting-based game was dropped entirely, for the developers wanted to concentrate more on the jumping action. Shooting mechanic was replaced with throwing maximum of two fireballs – which would bounce from the ground instead of going straightforward – when starting a run sequence with B button as fire Mario. The jumping action was set to button A as it was considered the most used mechanic of the game. (Totilo 2010.)

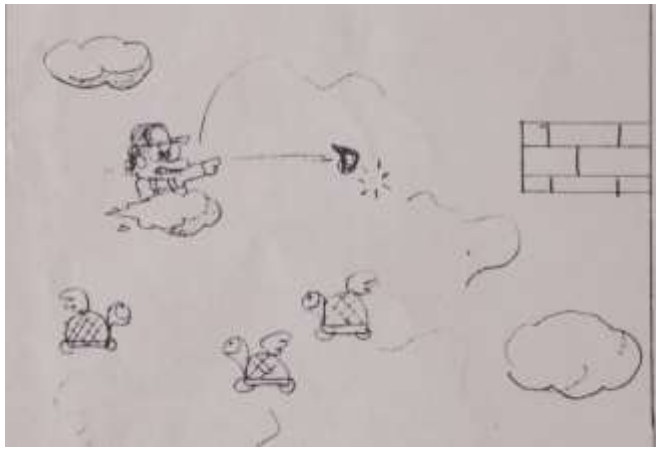


Figure 6. Sketch of Mario throwing fireball in the game's shooter-based concept. (Nintendo)

Super Mario Bros. was the debut appearance for the franchise's evil antagonist, King Koopa – later named to Bowser – and the damsel in distress, Princess Toadstool – later known as Princess Peach. In the lore of *Super Mario Bros.* the Koopa King has kidnapped the princess and taken over the Mushroom Kingdom. Mario's task is to save them. The design of Bowser is based on kappas, turtle-like demons from Japanese folklore. (McLaughlin 2010.) Bowser is a turtle with an ox-like head, a design that was highly inspired by the Ox King in *Alakazam the Great* by Toei Animation (Nintendo 2017). Most characters in Mario franchise are formed from circular shapes associated with cuteness, but Bowser has spikes in his back, sharp fangs in his mouth and pair of horns in his head. (Sloan 2015, 187-188.) Similar color palette and appearance exist in both the Bowser's original design and the present one (Figure 7).



Figure 7. Evolution of Bowser (the image has been cropped to remove the unnecessary space). (Nintendo)

Peach was designed to be stubborn but charming Princess with a cat-like eyes (Nintendo 2017). Pink dress and blond curls are her trademarks, and she has quite soft features, typical to good characters in Super Mario franchise (Sloan 2015). Peach is usually presented as the franchise's damsel, but in couple titles, she fights on her own (McLaughlin 2010). Present-day Peach is more detailed and her build is more realistic compared to the original design (Figure 8).

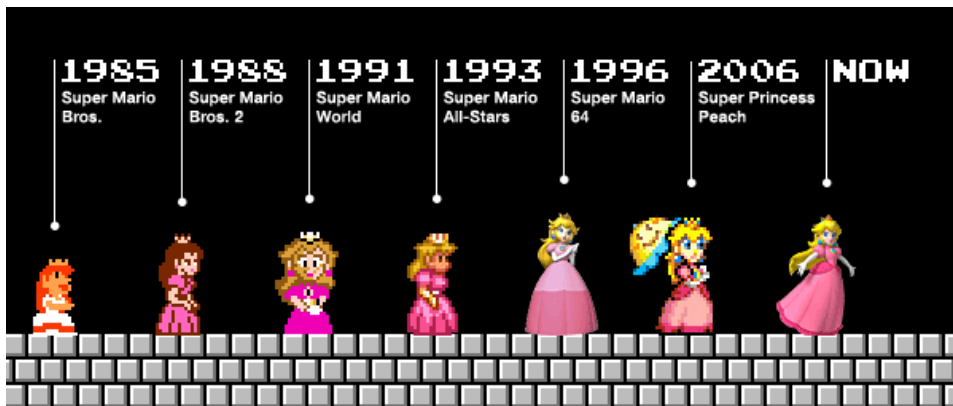


Figure 8. Evolution of Princess Peach. (Nintendo)

After *Super Mario Bros.*, Mario played supporting roles in several games while making his way to the leading roles, such as *Golf* and *Wrecking Crew*, released during 80s (Muldoon 2012). The original version of *Super Mario Bros. 2* never appeared in US or Europe, for it was considered too tough for players outside Japan (Stuart 2010). Instead the Western release of *Super Mario Bros. 2* was a Japanese game called *Doki Doki Panic*, re-branded as *Super Mario*. Original *Doki Doki Panic* featured a totally different main character with turban and baggy pants. (Sather et al. 1991, 20-21.) Likewise, *Super Mario Bros. 2* had a Middle-Eastern design and atmosphere (Figure 9).

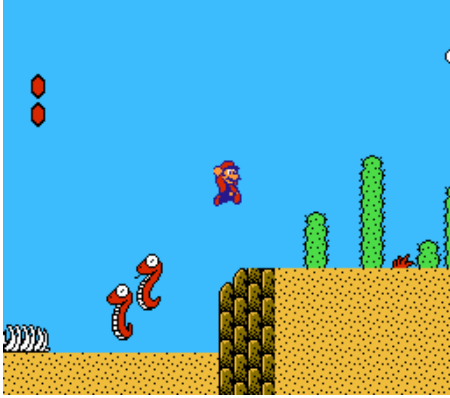


Figure 9. Desert level from Super Mario Bros. 2. (Nintendo, 1988)

Super Mario Bros. 2 had a lot new mechanics and features compared to previous Mario games. Player could for example pick up and throw objects and use bombs and potions. They could choose the character they wanted to play as from Mario, Luigi, Peach and an NPC from previous titles, Toad – a citizen of Mushroom Kingdom and Princess' attendant. All the characters had their own unique abilities. (Sather et al. 1991, 20-21.) Luigi was designed on top of *Doki Doki Panic's* tall playable character, so for the first time his build differed from his brother's. In addition, the game's lore was different from other super Mario games: the boss was a giant frog called Wart instead of Bowser – who did not even exist in the game –, there was no damsel in distress to save and the whole game ended up being Mario's dream. (McLaughlin 2010.) The original Japanese version of *Super Mario Bros. 2* was later released in Europe and US as part of the *Super Mario All-Stars collection* (1993). The release is known as *Super Mario Bros: the Lost Levels*. (Stuart 2010.)

Super Mario Bros. 3, depicted in Figure 10 and released in 1988, is regarded the most popular game ever made for *NES*. In addition to previous games, developers introduced even more mechanics which Mario would master by wearing different kinds of suits. As an example, by wearing a raccoon suit Mario could fly, with Frog suit he becomes a master swimmer and Hammer Brother suit would give him the ability to toss hammers. (Sather et al. 1991, 22-23.) Mario is send away by Princess Toadstool to save seven kings of Mushroom World from Bowser's seven unruly minions, Koopalings. During the Mario's gallant mission,

Toadstool ends up being kidnapped by Bowser and so in the end Mario must travel to Bowser's castle and save the damsel. (McLaughlin 2010.)



Figure 10. Mario, Bowser and Koopalings presented in the art of *Super Mario Bros. 3*. (Nintendo, 1988)

Nintendo's second home console, *Super Nintendo Entertainment System*, was released in 1990 and along it the newest Mario game *Super Mario World*, depicted in Figure 11. With the aid of magical cape and newly introduced character – a rideable dinosaur Yoshi – Mario covers the world filled again with Bowser's Koopalings. *Super Mario World* is much more detailed and colorful compared to previous Mario titles released on *NES*. In addition, it had enhanced controls as well as advanced sound effects. (Sather et al. 1991, 8.)



Figure 11. Mario riding Yoshi in *Super Mario World*. (Nintendo, 1990)

In 1992 released racing game, *Mario Kart*, player competes against AI-controlled characters from Mario franchise. *Mario Kart* was the first game of a larger series of Mario-themed racing games released for upcoming Nintendo consoles.

(McLaughlin 2010.) *Super Mario All-Stars collection*, released on 1993, includes all the big Mario titles released for so far. The games were visually remastered to SNES' 16 bit graphics, but in any other way were identical to the original versions. (Muldoon 2012.)

Nintendo's 64-bit console known as *Nintendo 64 (N64)* debuted in 1996. *Super Mario 64* was released the same year and it was a pioneer in the field of 3D games. Mario was a lot more controllable than in previous 2D games: he could now walk casually, double and triple jump, crawl, climb and the list goes on. (Muldoon 2012.) With the lead of Shigeru Miyamoto, the development team came up with an in-game camera the player could manipulate. The new design replaced the old fixed camera and gave players more freedom to explore the open world. Furthermore, Mario got his first voice lines in *Super Mario 64* after Charles Martinet was assigned to his voice actor. (McLaughlin 2010.)

Six years after Mario was transferred to 3D world, the developers came up with a successor game, *Super Mario Sunshine*, which was in 3D and released for the Nintendo's next home console *Nintendo GameCube*. Although the game was graphically faithful to the usual style of the franchise, the gameplay had been changed drastically. Instead of Mario's usual repertoire, he now possessed a pressure washer he had to use to clean up the colorful Isle Delfino – not located in Mushroom Kingdom –, which an imposter had smeared with paint. Overall the reception of the game was positive, but some fans of Mario franchise were not satisfied with the huge changes in mechanics and the lack of familiar aspects. (McLaughlin 2010.)

Super Mario Galaxy, released for Nintendo's next home console *Wii*, was released in 2007. Bowser kidnaps Princess and her entire castle, and carries them through the galaxy which leaves Mario no choice but to follow. Although the game added new mechanics and environments, it was faithful to the very first

games of the franchise and the popular *Super Mario 64*. Mario's appearance and skills change with different suits and power-ups and he can play with gravity while jumping from planet to another. Overall *Super Mario Galaxy* was considered an entertaining package for both Mario fans and people who were new to the franchise. (McLaughlin 2010.)

Many Mario games were released on *Wii* after the success of *Super Mario Galaxy*. He kated in *Mario Kart Wii*, played tennis and even competed in Olympic games. Mario's past adventures were seen again in a form of *New Super Mario Bros. Wii* and *Super Mario Galaxy* got a successful sequel. (McLaughlin 2010.)



Figure 12. Evolution of Mario's appearance from 1985 to 2007. (Nintendo)

After the release *Super Mario 64* (1996) and the transition to 3D, the general appearance of Mario franchise's main characters has changed just remotely (Figures 7, 8 & 12). The graphics in video games have had huge improvements over the years but besides having more polygons and some changes in mechanics, Mario has remained the same. (Muldoon 2012.)

2.3.2 Popularity

The popularity of Super Mario franchise bases on good level and character design, as well as market niche that needed to be filled. The 1983 video game crash transferred the industrial leadership to Japan, and Nintendo decided to make the most out of it, releasing *Nintendo Entertainment System* and *Super Mario Bros.* in United States in 1985. Eventually almost every household in U.S had *NES* as well as *Super Mario Bros.* that was usually bundled with the console. (Cohen 2016a).

Nintendo has always invested in the advertising of their games, which is one of the many reasons Mario is so popular even today. Besides being a star of Super Mario games, Mario has had multiple supporting roles in Nintendo's other games, such as *Golf* (1984) and *Wrecking Crew* (1985). Over the years and after multiple titles, Mario has become Nintendo's mascot and people associate the two together. (Stezano 2017.)

In terms of appearance, Mario has always been a pleasant and relatable looking family friendly character and his generic appearance is highly appealing. Mushroom World, in which the Mario's most adventures are set, is filled with colorful landscapes and creatures. Early Mario did not need voice lines or deep personality to be likeable. Everyone knew his task to save the poor damsel Peach was indeed heroic and altruistic, as he tirelessly traveled through the worlds fighting against Koopa King's minions to fulfill his task. (Sloan 2015, 187-188.) To this day, Mario's appearance has remained the same after he was successfully transferred to 3D world in *Super Mario 64* (1996), a game that set the standard for 3D camera and character control in video games (McLaughlin 2010).

Mario games are easy to learn for the controls have always been fairly simple and responsive. There are no proper tutorial texts in the gameplay to guide the player; instead the level flow successfully teaches the necessary controls and mechanics with certain obstacles that the player has to overcome. This offers a good start even for casual players. (Iyer 2017.) The games, however, can give a high level of challenge for those who seek it with hidden collectibles and secrets as well as alternative routes.

Even after 30 years of Super Mario's first release, the game gives nostalgia trips to adult gamers. New Mario titles are constantly released for Nintendo's consoles as well as smart phones. Both children and adults want to buy these new products; adults especially to rekindle their childhood memories. (Stezano 2017.)

2.4 Recreating the backstory of Super Mario

Mario Bros. (released in 1983) was Mario's debut as a plumber. Developers had come up with the idea that the enemies in the company's new single-screen game would pop out of pipes, but Mario's previous role as a carpenter did not work with the setting. Developers then, highly inspired by New York's sewer system, decided to make Mario a plumber. (Porges 2009.)

In this thesis, the 80s New York and the Italian American citizens are used as a reference. However, the content of this thesis emphasizes the redesign process of characters and animations. The history examination is carried out solely to create and support historically accurate character designs.

2.4.1 Historical research: Italian Americans and Mafia

From 1900 to 1914 nearly two million Italians immigrated to American cities – New York being the most popular of them – and by 1930 over a million Italians had settled to New York City alone. Most immigrants came from extremely poor circumstances, wanting to earn a living for themselves and their families. Being uneducated but industrious, most of these men worked as laborers whereas most women worked in the garment industry. (Dobbins 2013.) Italian Americans are known to respect authority inside a family, but on the contrary they are highly suspect of external, broad authorities such as politicians who are not part of their community (Cannato 2015). Cultural differences between Americans and the immigrants led to Italian Americans creating ethnic enclaves (Dobbins 2013). The enclaves were formed in Northern cities as well as in Pennsylvania and Ohio, which were small industrial towns at the time (Cannato 2015). Majority of these immigrants were law-abiding, but some belonged in gangs, mostly being a nuisance for other Italian Americans (History.com 2009).

During World War I, Italy was in an alliance with United States and many of the Italian American immigrants serviced in the United States military. While as a result, Americans were a bit more welcoming towards the Italian Americans, the war pressured nationalism among the immigrants. Italian immigration was eventually halted in 1924 by immigration restrictions. (Pozzetta 2017.)

Italian America underwent great changes during the interwar years due to national prohibition. The prohibition enabled illegal but profitable markets, which some of the Italian Americans, such as Al Capone, utilized. The popular culture even strengthened the gangster image of Italian Americans during 1920s. (Pozzetta 2017.) At the same time Sicilian Mafia in Italy was attacked by Fascist regime. This led to some Sicilian Mafiosi fleeing to United States and later joining to the American Mafia. In the late 1920s New York had become the capital of America's organized crime and was divided into five Mafia families. (History.com 2009.)

Each crime family in American Mafia was usually led by a boss, with undisputed authority and right to get a monetary share of every activity carried out by a family member. Next in the line of authority was the underboss and below him the consigliere, who acted as the advisor and ombudsman. Underboss led the captains, and each captain controlled a group of approximately 10 soldiers. Besides the family members there were associates, who worked for the family or did business with them, but were not part of them. (History.com 2009.)

The prohibition was abolished in 1933 and American Mafia proceeded from bootlegging operations to extensive underworld operations such as usurping and unlawful gambling. In addition, they infiltrated in legal businesses and labor unions as well as managed to bribe broad authorities such as business leaders and public officials. (History.com 2009.)

1950s, 60s and 70s were the golden era of American Mafia. Over time, there were however fewer associates for Mafia and fewer people taking bribes. (Ferranti 2015.) In 1970 Racketeer Influenced and Corrupt Organizations Act (RICO) was passed by the Congress. It allowed prosecutors to go after the crime families and their members as well as their sources of profit – no matter if lawful or unlawful. Due to RICO laws, multiple prestigious crime family members were convicted during 1980s and 1990s. Witness-protection program encouraged some members to even testify against each other. (History.com 2009.) From the beginning of the 1980s, the undercover agents played the roles of muggers and thugs, infiltrating the Mafia and gaining information of their daily life (McFadden 1987).

At the beginning of the 21st century, the American Mafia was still surviving but had lost its former glory (History.com 2009). Italian Americans are still suffering from the stereotypes where they are associated with organized crime and Mafia, although researches have proven that crime rate is no higher for Italian Americans than for other parts of society (Pozzetta 2017).

2.4.2 Historical research for character appearances

Research for the appearance of plumbers, crime family members and the fashion in the 80s was carried out to support the characters' redesign processes.



Figure 13. A vintage poster designed to promote safe and sanitary plumbing. (American Standard, 2018)

The plumber's clothing depends on the working conditions. Safety glasses are useful if there are remains of chemicals in the drain. If a plumber works on a construction project, a hard hat is recommended. Slip and impact resistant boots protect them from slippery floor as well as dropped heavy tools. Gloves protect the plumber from chemicals and – if they solder as well – from hot metal. In

addition, they need enough coverage for body to avoid abrasions and cuts. (Dellenbach 2017.) Figure 13 depicts a plumber from the 20th century.



Figure 14. Boss of the Gambino crime family, John Gotti, with his son John Jr. (Pedin / New York Daily News, 2017)

Crime families are still often associated with expensive clothing. Uniforms are seen as the sign of wealth and success, and mobsters wanted to express that they are above the common citizen. They considered themselves businessmen and wanted to impress their rivals, to the point where they even carried out operations while wearing suits. (Luecke 2014.) Figure 14 illustrates the crime family members' everyday look.



Figure 15. Madonna in 80s New York. (Rock Paper Scissors, 2018)

The female clothing in 1980s was colorful and pretentious. Hip-hop and punk were prevalent as well as workout fashion, inspired by aerobics videos. Celebrities, such as Madonna (Figure 15), led the fashion with an influential grip. Hair and makeup were intentionally exaggerated: hair was often extremely curled and the make-up, especially eye shadow, blush and lipstick, looked bold. (Brewer 2018.)

2.4.3 New backstory compared to the original

Adventuring through Mushroom Kingdom and saving Princess Peach while defeating evil Bowser has most of the time been Mario' chivalrous task. At the beginning of the production, Mario franchise went through multiple changes but ended up being a success and that is because of the simple yet fascinating backstory.

Although the author aims to keep as much as possible from the original backstory, the redesign would probably feel a totally different game. The original Mario's target group that nowadays mostly consists of children and nostalgia-hungry adults would not necessary appreciate the newly designed lore for Mario. However, the new design could attract gamers that enjoy more of a dark and adult approach.

2.5 Motion and physics

Physics in Super Mario games have always been highly exaggerated compared to real life. The subject was examined for better understanding of the movement in the Super Mario games and to figure out whether it was possible to be faithful to the original franchise while replacing the animations with realistic ones. The animations for the final design would be created with a time consuming rotoscoping technique which led to a decision of only creating animations that concern Mario's basic movement

Rotoscope animations and platformer games that use the same technique were examined to better know where to aim for with the redesign.

2.5.1 Super Mario games

The following measurements for Mario's physical performances are taken from the original *Super Mario Bros.* (1985). Mechanics between Super Mario games vary, but are nevertheless exaggerated compared to real life.

Mario has always been able to jump many times his own height (Figure 16). When investigating Nintendo's official Mario statue, one may notice life size Mario would be approximately 1.55m tall. With this information one can calculate Mario's able to jump as high as 7.75m, when the current world record for 'Highest Standing Jump' is only 1.67m. To perform such jump in real life, one would need enormous muscles to produce the necessary amount of energy. Besides that, no matter how high Mario falls from, he always lands the same way, legs straight. That is considered extremely harmful for bones and joints. (Benson 2017.)



Figure 16. Mario jumping. (Nintendo, 1985)

Mario's run speed is 18km per hour, which is not inhumane, but still fast considering that the average speed in current marathon record is approximately 20km per hour. Mario can keep running at a steady pace without getting tired and only have to stop when dying, hitting a brick wall or finishing the level. (Benson 2017.)

Mario can punch through four layers of bricks with single hit. In real life a pile of four bricks can stand as much as 16,681 newtons of force. Martial artists who practice breaking bricks use approximately 3,000 newtons to break a single block which means Mario would need to use more than five times that amount. Besides that, he builds that amount of force while jumping which could only be possible in real life if he had an enormous body mass. (Benson 2017.)

In *Super Mario Bros.*, a player without a power up can defeat the enemies by jumping on them or – if they stand on a platform – by hitting the platform from below. With the mushroom power up Mario grows to a larger Mario, so he can take one hit and only lose his power up, not his life. When Mario already has a mushroom power up, he can collect fire flower which allows him to throw fireballs. Throwing stuff at enemies can be considered more realistic than jumping on them, although fireballs are usually seen in fantasy oriented content. Star power up makes Mario temporarily immortal, he can run towards enemies and defeat them with bare touch. This skill cannot be replicated in a real life.

2.5.2 History of rotoscoping technique

Rotoscoping was originally a hand-drawn technique of tracing live action footage frame by frame onto a paper. Animators either copied the footage into their work or used it as a motion reference. (Fleischer Studios 2017b.)

Rotoscoping was invented in 1915 by American cartoonist, Max Fleischer, depicted in Figure 17. Two years later Fleischer's patent application, under the title *Method of Producing Moving Picture Cartoons*, was approved by United States Patent and Trademark Office. (Fleischer Studios 2017b.)



Figure 17. Max Fleischer with Fleischer Studios' star performer, Betty Boop. (Fleischer Studios, 2017)

In his younger years in early 1910s, Max Fleischer was but a young artist working at Popular Science Monthly. He had anticipation for both photography and mechanics and eventually his boss suggested Max could use his skills to improve the illusion of movement in animations. Max decided to accept the task given for he was fascinated by the potential of the science of film. (Fleischer Studios 2017b.)

First Fleischer had to invent a device that would let animator project the film frame by frame, and this way the animator could use the images as guidelines for their drawings. Fleischer planned the device to have a small glass panel and the film would be projected onto the back of it. Animator would place a sheet of paper on the top side of the panel and trace the necessary movement from the frames, one by one, all for different sheets. The finished product would have a rate of 16 frames per second, same rate as the films at the time, and give an illusion of smooth, lifelike motion. (Fleischer Studios 2017b.)

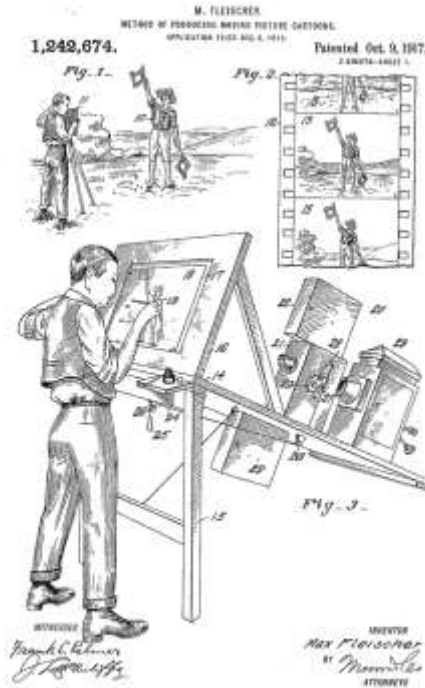


Figure 18. Patent drawing for Max Fleischer's invention, the 'Rotoscope'. (Fleischer Studios, 2017)

Creating the device was anything but easy. Most of the needed help Max got from his film editor brother, Dave, who was excited about the idea. Despite the rough start, the brothers were able to create a working device, illustrated in Figure 18, and test the idea of tracing over footage. The first rotoscoped animation took a year to finish and it only lasted for a minute. Brothers improved the process further to produce animations faster, and soon the technique was not only possible but also practical. Due to WWI breaking out, Max' plans for rotoscope animations delayed to 1918. In 1919 Max began working on his *Out of the Inkwell* series and created the first rotoscope animations for large audience. (Fleischer Studios 2017b.)

Fleischer Studios produced many popular animations and animation series that used rotoscoping technique, such as *Koko the Clown*, *Betty Boop*, *Popeye*, *Gulliver's Travels* and *Superman*. (Fleischer Studios 2017a.) Rotoscoping was used by other animation studios as well. Disney partly used rotoscoping technique in some of its titles, *Snow White* (1937) for instance, to create a realistic human motion. However, few studios actually admitted using the

technique, for it was considered cheating and disgrace. (Menache 2000, 2.) In the course of time – besides animations – rotoscoping has been used in music videos, commercials, live action films and video games (Fleischer Studios 2017b).

Nowadays rotoscoping technique is mostly harnessed in the field of Visual Effects (VFX) to create fictional elements for live-action movies and television series. Softwares such as *After Effects* use the matte and masking techniques that base on isolating an image out of background and manipulating it afterwards. (Pluralsight 2014.)

2.5.3 Realistic physics in hand-drawn 2D platformer video games

One of the first realistic looking platformer games were created by Jordan Mechner. He loved creating animations, but was not good enough to draw actual cartoons. While other game companies went with simplified characters or space ships, Mechner wanted to create realistic movement with a realistic human character. His first project, a fighting game *Karateka* (1984) depicted in Figure 19, gained over half a million in sales. The real-life resembling animations and physics were a welcomed change to the dominant unrealism in video games. Furthermore, the game included an early version of regenerative health system, adding more realistic feeling to the game. (McLaughlin et al. 2010.)



Figure 19. Creators of *Karateka* (1989) wanted to make realistic animations for their 2D platformer. (Brøderbund, 1989)

After the success of *Karateka*, Mechner and his Brøderbund team wanted to create another game, this time using the rotoscoping technique to get even more realistic result in animations. Jordan Mechner's brother David volunteered to act the role of the main character while Jordan did the filming and later traced and scanned the frames into the computer to create a rotoscope animation. The result of the effort was *Prince of Persia*, released in 1989. On account of the rotoscoping technique, the animations were smooth and incredibly realistic. However, the cost of realistic and seamless animation was slowly responsive controls: one animation had to end for the next to begin. Player had to predict the jumps and other actions or the character would inevitably die. For the sake of realism, developers added fall damage to the game; the greater the fall, the more likely prince would end up dead. (McLaughlin et al. 2010.)

Not many game companies have used the rotoscoped animations since because the technique is considered expensive and time consuming. The games that used the technique were mostly either point-and-click games or platformers and released in 90's after the successful release of *Prince of Persia* (1989). *Flashback*, illustrated in Figure 20, is a futuristic platformer developed by Delphine Software International and released in 1992. The game had huge variation of rotoscoped animations from jumping to forward rolling to shooting. (Pyron 1992, 60-62.)



Figure 20. Main character of *Flashback* readies to shoot. (Delphine Software International, 1992)

Realistic hand-drawn animations have been mainly replaced with faster and more efficient techniques that utilize the present day's technology. In motion capture technique the actor wears a body suit with traceable markers, and the cameras capture the target's movement in 3D environment and with incredible accuracy. (Linna 2017.) The rotoscoped animations are nowadays still seen in point-and-click and tactical games, but rarely among 2D platformers.

2.5.4 Super Mario versus realism

Unrealistic yet well-constructed physics and animations are one of the major reasons Mario franchise grew up to be as popular as it is nowadays. The physics were constantly improved for the following titles, yet developers – faithful for the franchise – decided to keep them unrealistic.

Mario games have always relied on Mario's jumping skills as well as hovering platforms and dangerous ledges. The author of this thesis wished to stay as faithful for the franchise as possible and decided to make the controllable character more agile than an everyday person without making the animations unrealistic.

3 PLANNING THE REDESIGN

A basic storyline that would support the redesign of the three characters: Mario, Princess Peach and Bowser; was created for the project. The events of Super Mario redesign are set in 1980s New York while the American Mafia and crime families were still active but chased by prosecutors under the RICO (Racketeer Influenced and Corrupt Organizations) laws. (History.com 2009).

After figuring out the story, the basic idea of each character was created, the final design was outlined, the steps for creating the animations were considered and the tools and techniques to be used while creating the redesign were listed.

3.1 Story

Boss of the Koopa crime family orders a kidnap on a rich family's daughter, Peach, and the operation is successfully executed by the loyal soldiers of the crime family. Undercover cop, Mario, who knows the girl from his childhood, happens to witness the kidnap. He decides to go after the crime family and save the girl. During his journey, Mario has to face the Koopa family's soldiers and captains as well as other dangers that await him.

3.2 Characters

Historical research for character appearances was carried out in the thesis' research phase to support the redesign process of the characters. In addition, pictures of the citizens of 80s New York and the characters in Super Mario franchise were examined to create redesigns that would be faithful for both sides.

In the redesigned version, Mario is an Italian American undercover agent, who poses as a plumber. According to McFadden, undercover agents usually played the roles of muggers and thugs to infiltrate the Mafia, but in the redesign, Mario is dressed like a plumber for the sole reason of distracting the crooks. He is an agile and capable man in his late 20s, and in the final design he will likely have a moustache and wear a hat and overalls – faithfully to his original design.

Peach is the redesign's damsel in distress, a young American woman in her early 20's. Peach has a playful temper but discreet behavior as well as cute appearance. The character is planned to be attired in a dress or skirt with a petticoat underneath it and potentially have the upper body covered with a short jacket or a bolero.

Bowser, the antagonist of Super Mario franchise, is presented as the dangerous boss of the Koopa crime family. He is no longer a turtle, as in the Super Mario franchise, but a human. Bowser is planned to be attired in a high quality suit as a sign of wealth.

3.3 Setup for animation

This thesis does not include the creation of final animations, but the designing process of ideas and prototypes that could be used as guidelines for the final game. The animations are only created for the redesign's main character, Mario.

Rotoscoping technique was decided to be used to create as realistic movement for animations as possible. Each frame created with the technique would be used as a sprite, a single image that is a part of a sprite sheet. Sprite sheet contains the animation frames (sprites) of the character. By putting the sprites in order, one can create a continuous movement, known as a cycle. Game development-wise the usage of sprite sheets saves the memory and processing power from the game engine as well as time and effort from the animator. (Lambert 2013.)

Figure 21 illustrates a basic walk cycle.

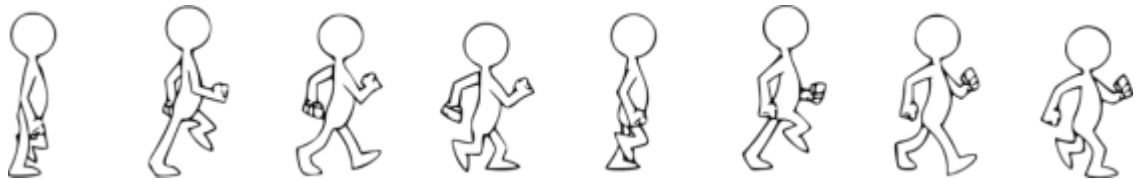


Figure 21. Sprite sheet of a walking man. (Guerreiro, 2011)

Multiple movements that would be performed by the actor were listed and afterwards it would be decided which movements to further develop. Mario's abilities in the redesign prototype's animations are limited to basic movement instead of action skills such as shooting or combat that could be potentially included in the final version. The list of movements that actor should perform for the prototype consisted of: idle, beginning of the movement, walk, run, jump, crouch and forward roll.

Turnaround sheet of Mario would be created to support the animation process. In turnaround sheet, character can be seen from multiple angles to give the viewer a precise image of the character's appearance (Figure 22). Turnaround sheets are often less detailed color-wise than the final designs.



Figure 22. Tracer from Overwatch (the image has been cropped to remove the unnecessary space). (Blizzard Entertainment, 2016)

The actor for the rotoscoped animations needed to be agile, so only person the author knew to fit for the role would be their brother, Santeri Rukkila. Santeri had the necessary agility to replicate Mario's airy movements. Both author and Santeri have a martial arts background and belong to a sports club, Kouvolan Taido. The room, in which the movements would be filmed, had to be spacious enough so the author could capture full cycles of movement and afterwards easily animate on top of the footage. The space, in which the filming was planned to be carried out, was in Haanojan Haali sport center in Kouvola. Haanojan Haali has a special training room for martial arts and is floored with tatami, a flooring material originated in Japan (Hoffman 2012). Kouvolan Taido has a reservation for the Haanojan Haali's training room twice a week. The filming was decided to be carried out during one of these reservations with the filming feature of a smart phone.

3.4 Tools and techniques

Adobe Photoshop CS6 was planned to be used for both creating the character designs as well as the animations. Drawings would be done with Wacom Intuos Pen & Touch drawing tablet. One highly detailed picture of each character was to be produced. In the final designs, each character would pose in a way that fits to

their personality. Besides the basic coloring, each character's final version would have at least simple shadowing. The turnaround sheet of Mario would only have basic coloring, since it is not planned to be as detailed as the final design pictures.

Video material for animations would be captured with smartphone's filming feature. The material would be then transferred to a pc and the actor's movement would be traced from the live footage. The animation cycles would be developed to stage where they have at least black-and-white outline and, if possible, details and colors.

4 CREATION PROCESS OF THE REDESIGN

4.1 Concept art

After the historical examination of character appearances had been done, a good vision of where to go with the designs had been formed. The first step was creating black and white sketches of redesigns of Peach, Mario and Bowser (Figure 23).



Figure 23. Sketches of Peach, Mario and Bowser. (Rukkila, 2017)

In the first sketches, Peach is wearing a dress with an unnoticeable petticoat underneath it and a short jacket. She has a curly dark hair. Mario wears an overalls with suspenders and underneath it a long-sleeved shirt. He has a dark short hair and a moustache. In addition, he wears a cap. Bowser wears a high-quality suit, a shirt and a tie. He is clean-shaven and has a short dark hair. (Figure 20.)

With the guidance of the sketches, experiments were done with different clothing combinations for each character, coming up with the sketches which to use as examples for the final designs (Figure 24).

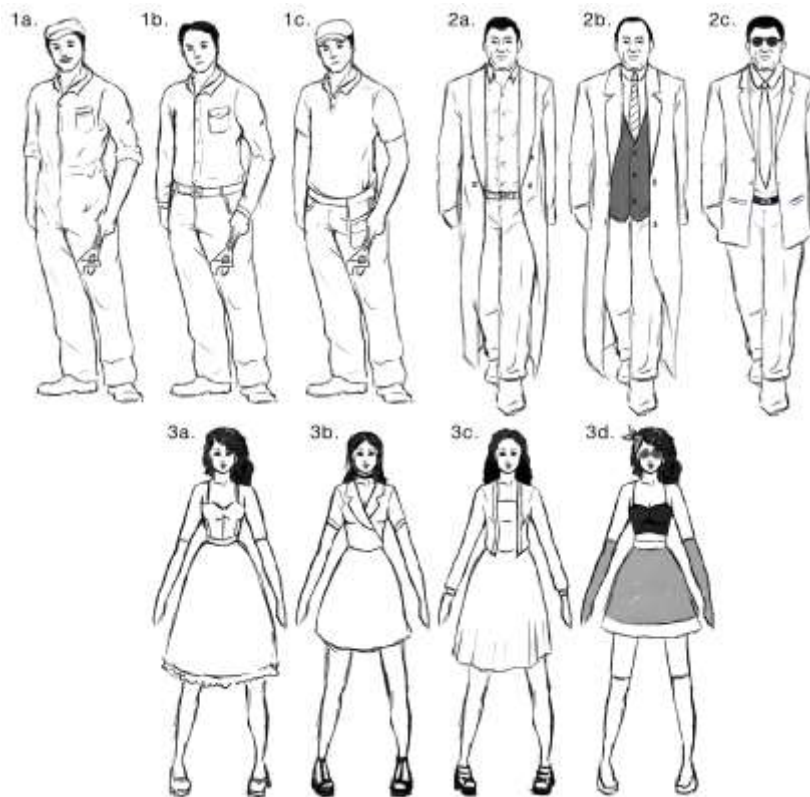


Figure 24. The author experimented with different clothing and hairstyle combinations for each character. (Rukkila, 2018)

Concerning Mario's redesign, the final design was decided to be based in the 1a. The overalls Mario wears in the design resemble the original design and make him easy to animate, in case more detailed versions of the Mario's animations are to be produced. (Figure 24.)

For Bowser's redesign, it was decided to proceed with the clothing seen in 2b. and combine it with the hairstyle seen in 2a. and 2c. The design has interesting details to it and makes Bowser look stylish and wealthy, suitable for the boss of the crime family. (Figure 24.)

For Peach's design, multiple clothing choices were experimented with. It was decided to proceed with the design seen in 1a. as it resembles the Peach's original princess-look the most. The hem of the dress, however, might be modified in the final design to direct more attention to the petticoat. (Figure 24.)

4.2 Color palettes

A preliminary color palette was designed for each character before the creation of the final character designs. The color palettes resemble the color design of original Super Mario franchise, but they deliver the gloomy atmosphere of the 80s New York as well. The color palettes might have minor changes during the final design creation process, depending on how the results look. (Figure 25.)



Figure 25. Color palettes for all three characters of the redesign. From left to right: Mario, Peach and Bowser. (Rukkila, 2018)

Redesigned Mario was planned to have blue overalls and brown shoes as in the original design. In addition, he would have dark brown hair, blue eyes and a medium skin color which resembles the original design. Redesigned Peach would have a rosy skin and blue eyes and wear a pink dress and light blue shoes. Her bright yellow hair color from the original design would be changed to brown.

Redesigned Bowser would have brown eyes and dark hair with some grey tone to it. He would have a medium skin, a bit darker than Mario's. Bowser's suit would have a yellow tone to it, his sweater would be dark green and his tie and shoes dark blue.

4.3 Final designs

After it was decided which outfits and colors to continue with, the final designs for the Mario, Bowser and Peach were created (Appendix 1). In addition, a turnaround sheet of Mario was drawn to potentially help in the creation of the details in animations (Appendix 2).



Figure 26. Example of final design's creation process. (Rukkila, 2018)

In the creation process of the final designs, the sketches for the characters were created first, then the linearts. Lastly the basic colors and the shadows were added. (Figure 23.) The basic colors from the preliminary color palette were used as such, but some of the colors meant for the shadowing had to be modified. The end result was not as realistic as intended, due the linearts being visible and the

shadowing simple. However, each of the final designs ended up having realistic body measurements and color palettes.

4.4 Animation

In the creation process of the redesigned animations, the necessary footage was shot first. Then the movement seen in the footage was traced digitally and thus the frames for the rotoscoped animation created. Finished frames were then arranged into a sprite sheet and an animation, which held all the traced material, was published online.

4.4.1 Filming

The filming was carried out in March 2017 in Haanojan Haali sport center. The exact date was not planned beforehand but on one day the author and their brother, the actor, happened to be the only ones using the Kouvolan Taido sports club's reservation. The author had the smartphone with the filming feature with them, so the footage could be captured that day.



Figure 27. Smartphone's filming feature could not capture the small details in actor's movement. (Rukkila, 2018)

The movements the actor was expected to perform were explained to him and after few a tries he knew what to do. The list of movements consisted of: idle, beginning of the movement, walk, run, jump, crouch and forward roll. The

cameraman stood still, without moving along with the actor. After the filming, the most successfully performed and captured movements ended up being crouch, forward roll, jump, running and the beginning of movement. Later the footage was examined more closely to pick the three best of them for further development. At that point it was noticed that the actor's movement looked somewhat blurry in the footage (Figure 27). A stand for the smartphone had not been used while filming, which led to some of the footage being tilted.

4.4.2 Rotoscoping

It was decided the animations would be created of run, jump and forward roll footages. The footage used for the rotoscope animations was published online to elucidate the beginning of the animating process and the quality of the video material (Rukkila, 2018a).

The application to be used for rotoscoping was Adobe Photoshop CS6. To create an animation, the video file was imported to Photoshop using the software's video frames to layers feature. The footage would be limited to every two frames to save some time and effort. (Figure 28.)

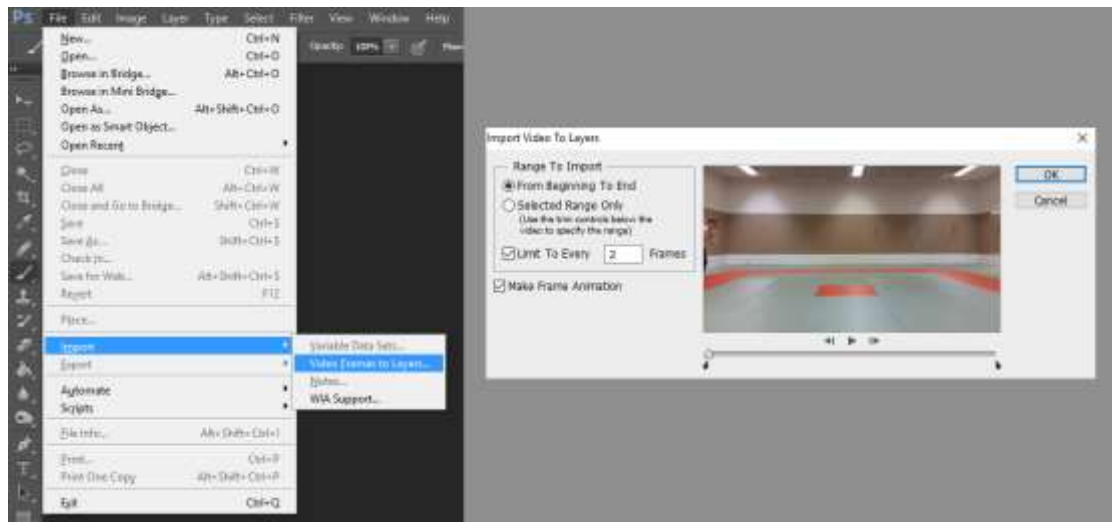


Figure 28. Importing a video file to Adobe Photoshop. (Adobe Systems, 2018)

After the successful import of the first video file, the center point was marked to the picture and multiple guidelines were created inside which the movement should be kept. After this, the actor was moved in every frame to place them

vertically in the middle. (Figure 29.) This enabled the creation of a movement cycle which could be seamlessly repeated whenever necessary. The creation process of a single frame is illustrated in Appendix 3.



Figure 29. Creating the rotoscoped jump animation. (Rukkila, 2018)

Because of the movement being blurry in the footage and actor wearing loose clothes during the filming, some of the smaller details had to be guessed while tracing. While creating the last outlines of the run animation, it was noticed that the animation cycles were difficult to seal due to the actor's movement at least slightly changing when comparing the beginning and ending of the film material. Ultimately, free-hand drawing was used to seal the cycles. After the tracing was completed, the details in the movement of the rotoscoped animations were patched without the original footage being visible (Figure 30).



Figure 30. Outline of the forward roll animation without the original footage visible. (Rukkila, 2018)

While finishing each animation separately, an attempt was made to merge them together, so they would connect seamlessly when needed. The basic movement was to be the running and the jumping and forward rolling could be repeated whenever necessary.

Due to schedule constraints, it was decided to only create simple black and white versions of the animations and not detailed ones. After the animation frames from running, jumping and forward rolling were successfully merged together, a sprite sheet, which included the frames for all three animations, was created (Appendix 4). With Adobe Photoshop's Save for Web feature, a GIF animation was formed. The file was then opened in a program called VirtualDub (Phaeron 2018), and saved as AVI file to be published online. The animation has 166 frames in total of which 115 are unique. (Rukkila 2018b.)

4.5 Redesign compared to the original design

The redesigned Mario and Peach have color palettes and details in their appearances that resemble the original designs. Mario is more fit in his new design to meet the physical requirements and to make the high jumps and other agile movements. Bowser is turned into a human and does not have as wicked appearance as the original design. The old and new Bowser, however, have a similar color palettes. The atmosphere that the redesign conveys is more gloomy and serious compared to the original Super Mario franchise's family friendly tone.

As the original Super Mario franchise's animations and mechanics were unrealistic, the jump action could be used to defeat the enemies by jumping on them and to reach distant platforms. That mechanic, however, could not be used in the same way in the redesign as it's not physically possible. Redesigned Mario can still jump, but only to cross short distances or to jump over low obstacles. Provided that Mario is expected to defeat the enemies in the potential finalized product, it can only happen by combat or by other similar measure.

5 CONCLUSION

The production of the thesis was delayed from the original time frame, but was successfully carried out a year after. The research that supported the redesign process proved to be more challenging than expected, as there were only few reliable sources. In addition, some of the subtitles in the table of contents were adjusted multiple times during the production as the desired direction gradually clarified.

The research for the history of Nintendo and the Super Mario franchise was successful, as it extensively covered the stages that eventually led to the creation and popularity of Mario. The evolution of character design focused mostly on Mario as the reliable sources of information concerning the Princess Peach and Bowser were challenging to find.

The research and recreation process of the backstory ended up being fruitful, and although it was doubt if all the information gathered was necessary for the entirety, the research gives a good insight into the lives of 80s New Yorkers and Italian Americans. Likewise, a lot of trivia was found of the motion and physics in the original Super Mario games as well as the rotoscoping technique which was to be used in the redesign process of the animations. The examination of rotoscoping and the realistic physics in hand-drawn 2D platformer video games evinced why using the said technique would prove challenging and time-consuming during the redesign process.

The extensive background research proved to be a beneficial for the creation process of the redesign. A deeper knowledge was achieved of the characters to be redesigned and to which direction they should be redesigned as well as the techniques to be used to archive the desired outcome. In addition, a confidence towards the project was formed. On the other hand, a time management could have been better. Some of the information acquired was searched for too long which caused unwanted delays.

The delays in the background research affected the production part of the thesis. In the planning stage of the redesign process, the descriptions for the new story and characters could have been even more detailed. However, the setup for animation was covered thoroughly as well as the tools and techniques used for the redesign.

The redesign process of the characters was mostly successful. More than couple of sketches could have been done at the beginning of the design process, to potentially produce even more interesting looking characters. Experimenting with the characters with different clothing and hairstyles was productive and eased the final design creation process. The preliminary color palettes for characters proved to be useful, although some of the colors meant for the shadowing had to be changed for the final designs as they did not look pleasant in the final product. The end result was originally planned to be more polished, but the time constraints hastened the creation process. The final designs ended up being detailed, but the shadowing was left simple and the linearts were not faded out in any way but left distinguishable.

Creation of the Mario's redesigned animations was prolonged but an instructive experience. The equipment and planning for the filming process was rudimentary and caused challenges later on, when the footage was to be traced digitally. With more time and effort, detailed animations could have been potentially produced. However, adding Mario's features for the character in every frame proved to be impossible task in the end. The decision to leave the details from the animations out left the turnaround sheet of Mario unused.

In case of Super Mario, changing the character designs and animations to realistic ones could change the very core of the franchise. Over the course of its history, Nintendo has created a successful brand and gained countless devoted fans. Realism could feel boring compared to the exaggerated mechanics and visuals, and it would be by no means profitable in the case of Nintendo take such course.

Overall, the aim of the thesis was mostly fulfilled, as all the character designs and animations produced could be potentially used as guidelines for a finished product. It is yet unclear, whether or not a finished redesign of Super Mario is someday produced. However, the redesign could not base the gameplay in the same mechanics as the original franchise but take a more serious approach. The original Super Mario franchise and the concept of the redesign were compared regularly during the research and redesign processes. Not all minor goals set during the production were reached and some of the delays could have been avoided, but both the research and the redesign processes were successfully carried out in the end.

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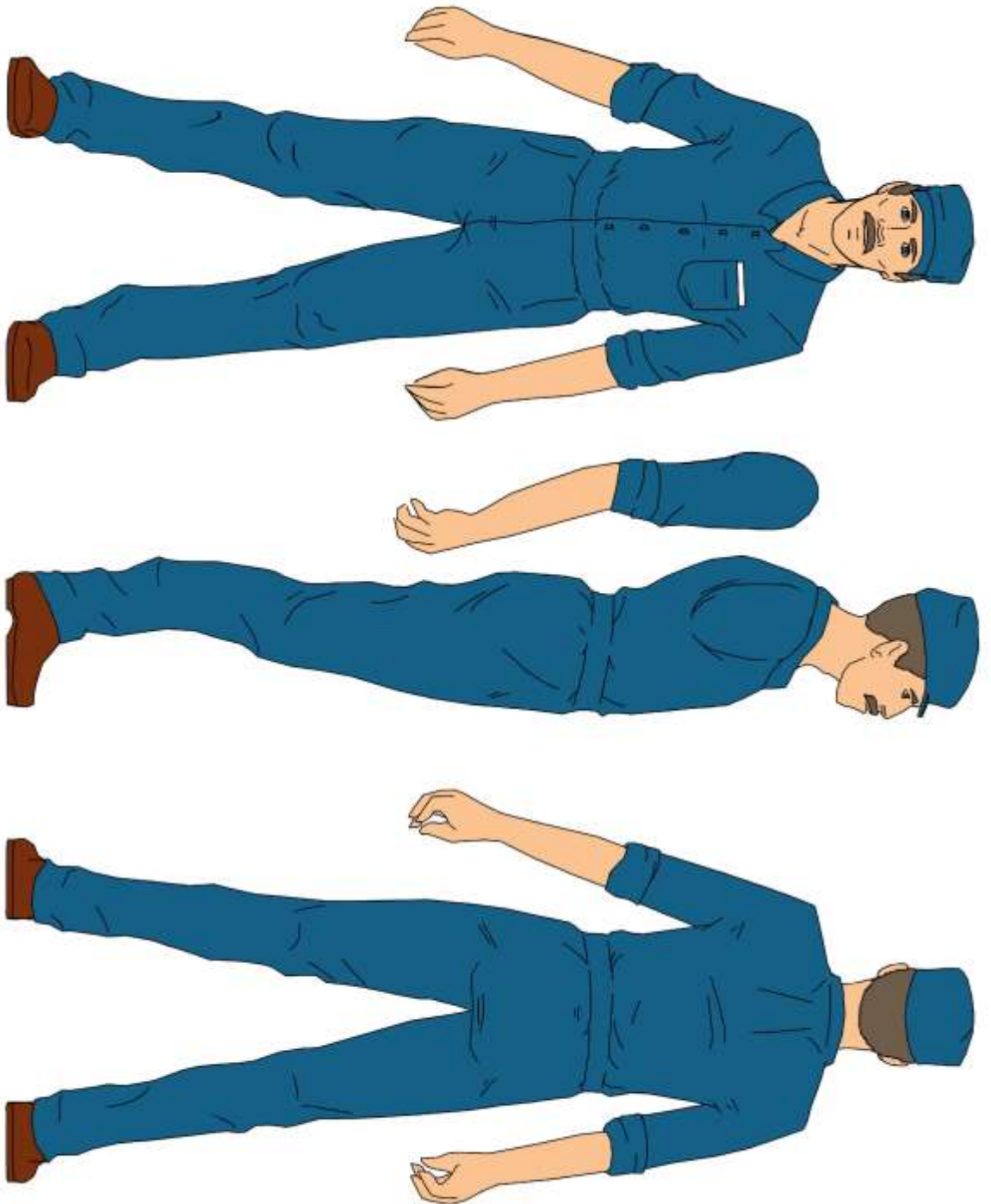
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1. Choosing the next frame of the footage



2. Centralizing



3. Tracing



4. Polishing



