



Making Visual Effects for Mobile Games

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ABSTRACT

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The purpose of this thesis was to find an optimal way to approach animating 2D visual effects in a mobile game, making it easier for video game artists to approach animating visual effects and helping to understand what should be taken into account when creating them for a mobile game. The objective was to study and create visual effects for the case game, Bomber Friends. The chosen approach was hand-painted sprite animation as it fit the game's overall visual style and was an optimal choice for the performance optimization.

In the beginning the 12 principles of animation structured by professional Disney animators Frank Thomas and Ollie Johnston are introduced. A video game point of view was also included to the principles as well as covering visual effects basics based on the game League of Legend's visual effects guide in order to help form a general understanding of what making the effects contains. Next, the requirements and limitations of the mobile platform were presented. Finally, the project was created and the theory applied to the animation process.

Not all designed effects were applied to the actual game, but were included for demonstration purposes. The work methods used here are but one approach among many in the visual effects department. The learning curve for a beginner animator was quite steep and there were many challenges. It is recommended to learn the basics well prior to working on complex animations.

Key words: visual effects, special effects, VFX, 2D, hand-drawn, animation, mobile game, video game

CONTENTS

1 INTRODUCTION.....	5
2 12 PRINCIPLES OF ANIMATION.....	6
2.1 Squash and stretch.....	6
2.2 Anticipation.....	7
2.3 Staging.....	7
2.4 Straight ahead action, pose to pose.....	9
2.5 Follow through and overlapping action.....	10
2.6 Slow in and slow out.....	11
2.7 Arc.....	12
2.8 Secondary action.....	13
2.9 Timing.....	14
2.10 Exaggeration.....	16
2.11 Solid drawing.....	17
2.12 Appeal.....	17
3 VIDEO GAME VISUAL EFFECTS BASICS.....	19
3.1 Gameplay.....	20
3.2 Value and color.....	21
3.3 Shape.....	23
3.4 Timing.....	24
4 REQUIREMENTS AND LIMITATIONS.....	25
4.1 Platform.....	25
4.2 File type and size.....	25
4.3 Time.....	26
5 SPECIAL EFFECTS PROJECT.....	27
5.1 Project research.....	27
5.2 Napalm flames.....	28
5.3 Slime explosion.....	32
6 CONCLUSIONS AND DISCUSSION.....	34
REFERENCES.....	35

ABBREVIATIONS AND TERMS

PC	Personal computer
VFX	Visual effects
In-between	Frames that fill the gaps between key frames to make the animation fluid
Sprite	A singular image or an animated image
Particle	a particle effect or particle system simulates and renders small images or meshes to produce a visual effect
Frame	An individual picture or a sequence of images; an animator's standard unit of measure
Saturation	Colorfulness
Value	Lightness or darkness of a color
UI	User interface
Hitbox	An invisible box or rectangle shape that is used for real time collision detection
Vector graphics	Artwork comprised of paths and lines based on mathematical equations instead of grid based square shaped pixels

1 INTRODUCTION

Explosions, flashes, and sparks grab players' attention, while smoke, bubbles, and dust add life to empty space. There are even creations that defy physics, like upward-flowing waterfalls and beings made of pure light. All of these impressive effects are more compelling and more believable when they make use of our core understanding of physics and natural phenomena.

This thesis covers the theory, the meaning, the limits and the creation of visual effects. Other related theses are not addressing comprehensively enough the technical requirements and limitations that affect making of visual effects, so this will help to specify and to help understand that part of making effects for mobile games.

Mobile games are popular for their easy availability, simplicity and inexpensiveness, and they are also relatively cheap to develop and to publish, compared to their console or PC counterparts. But there are many things to be taken into account to make the game be able to run and to look as good as possible on as many different mobile platforms as possible. The reason why hand-drawn sprite animation was a good choice for this project will be explained further in this thesis. This thesis can be used as a checklist and as a base for creating visual effects.

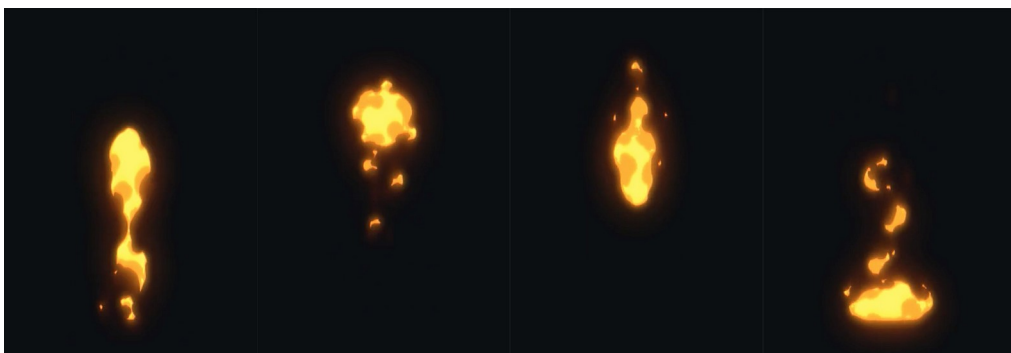
2 12 PRINCIPLES OF ANIMATION

The long time Disney animators Frank Thomas and Ollie Johnston summarized the principles of animation in 1981 in the book *Disney Animation: Illusion of Life*. These fundamentals form the basis for quality animation. The book has been written with a hand-drawn character animation approach, but many of the principles are applicable in 3D animation as well as visual effects. This chapter consists of the principles, showing how they are utilized in traditional animation and video games.

2.1 Squash and stretch

Squash and stretch means applying contrasting changes of shape, which gives life, flexibility and energy to any animated object. It emphasizes movement and feeling of the material. Overusing squash and stretch can break the object's believability. The lack of squash and stretch will give the feeling of rigidity. Both are powerful tools in animation.

This principle is focused on character animation and physical objects, although squash and stretch can be applied i.e. a quick swing of a baseball bat. For special effects like fire, smoke and water this principle is not directly applicable as they are gas and liquid materials. Unless the effect is given a clear shape, like a fireball, then the squash and stretch can be applied when moved around (Picture 1). Squash and stretch on inanimate objects will make them have life and personality.



PICTURE 1. Screen captures of a bouncing fireball. (Alex Redfish, 2016)

2.2 Anticipation

Anticipation is the preparation of an action. It gives more power and meaning to the following action. One must bend their knees first to be able to jump. In special effects, a wave pulls back before it crashes into a cliff, and cracks appear on the surface of a frozen lake before the ice gives in and the character causing this falls into the water.

This principle is closely tied with character animation as someone has to do something to cause anticipation related with special effects, i.e. light a match to set up a fireplace, or hit ice to make it crack (Picture 2).



PICTURE 2. Screen captures presenting anticipation from Mulan (Walt Disney Feature Animation 2003)

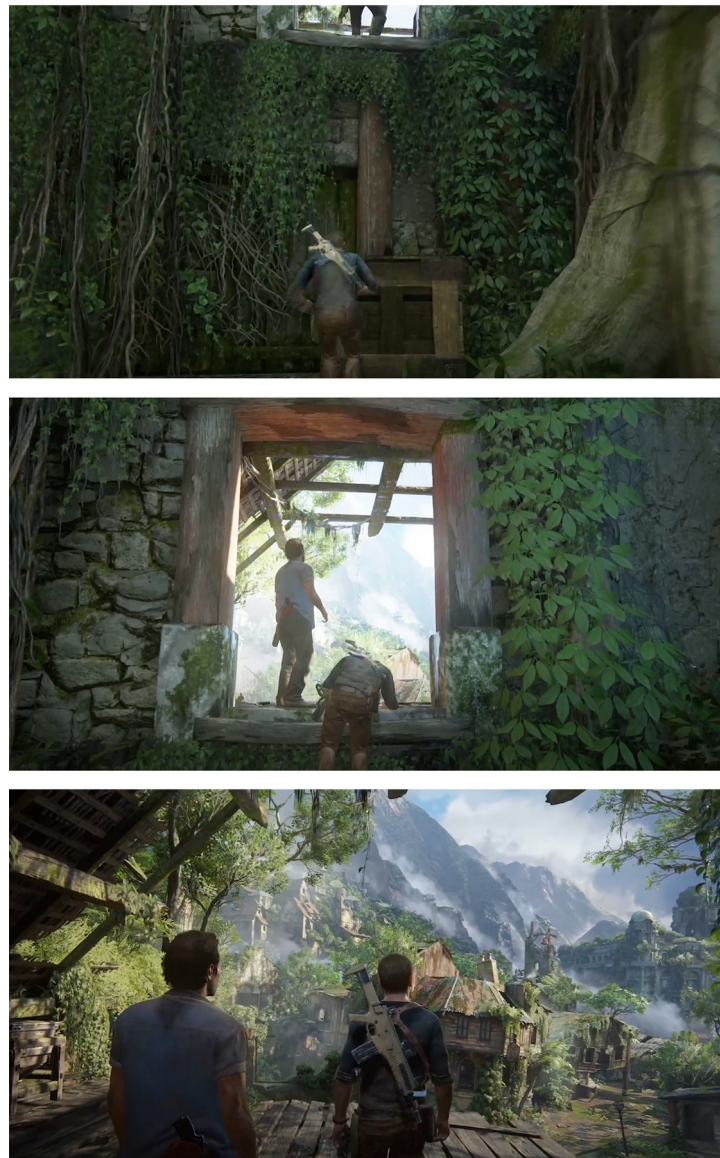
In video games the most common use of anticipation is in combat situations. Enemies pull back their weapon to indicate they are about to strike the player which gives the player time to react by avoiding or countering. The player may in turn build up strength to unleash a powerful move. To increase the feel of power the moves may be enhanced with special effects gathering around the player and then releasing in a satisfying, flashy burst.

2.3 Staging

How the elements in the frame are set. The purpose is to focus on what is relevant to the scene, and includes lighting, perspective and character positions (Cooper, 2019). It helps to emphasize the size of the subjects, which directly affects the feeling in the scene. A hurricane will look massive if the 'camera' is set near the ground, behind the character. Special effects may be given their own shots, like a lightning hitting a tree, which make them feel quite powerful,

but in general they shouldn't draw too much attention from the main action and characters, but help the viewers focus on them instead.

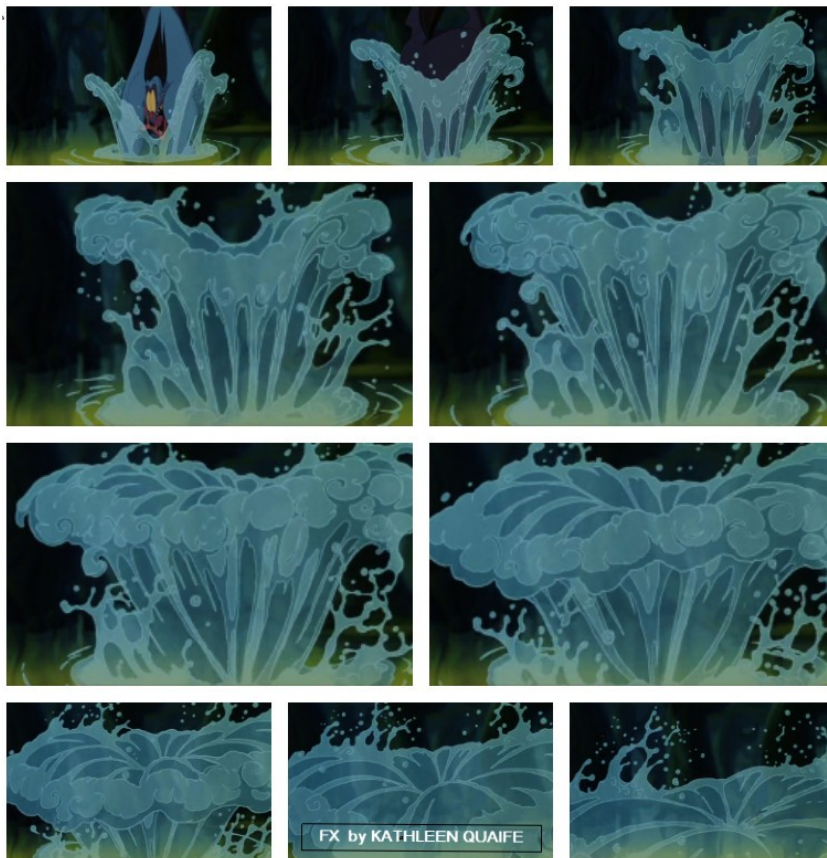
When working in 2D, it's possible to stage visual effects in the levels and reveal them as the player progresses, either with a cutscene or by careful placing and timing the effects when the player reaches the destination. But when the camera is controlled by the player, staging becomes less clear. In many 3D games the camera can be controlled freely and players can explore their surroundings. Staging is used in level design to draw the player's attention to important locations or to follow a certain direction that is natural to the way of storytelling in game (Picture 3).



PICTURE 3. Screen captures of the player character arriving at a new location (Uncharted 4: A Thief's End)

2.4 Straight ahead action, pose to pose

Drawing animation frame by frame versus key poses first and then fill in the gaps. Special effects are often drawn the former way because it is considered the easier way to maintain the energy, natural look and fluidness of the effect. For example, a water splash animation (Picture 4) where the water breaks into multiple parts is likely easier to keep consistent by drawing them one frame at a time than by planning and calculating the parts movement beforehand with a key posing method. (Gilland, 2009)



PICTURE 4. Screen captures of frame by frame splash animation in Hercules (Walt Disney Feature Animation, 1997)

Pose to pose approach is commonly used in computer graphics animation. This is because animations need to be reworked a lot to suit the gameplay as the game development goes further. This is to avoid wasting working time and to be able to produce more animations for testing. Especially character animations

have to be able to blend to each other well to get fluid looking results (Picture 5). (Cooper 2019)



First blocking poses is the recommended method for gameplay animation.

PICTURE 5. Pose to pose method preferred in computer graphics animation (Jonathan Cooper, 2019)

2.5 Follow through and overlapping action

The movement that follows the main action. Different parts of an object move at different speeds, thus their timing being called 'overlapping', like when a character runs and stops but the hair, loose clothes etc. move a bit longer before stopping. Follow through conveys the weight of a character or an object. Visual effects such as flames or smoke that are combined with a character enhance the character's movement and even help visualize their mood (Picture 6). This principle is rarely directly applied to visual effects on their own.



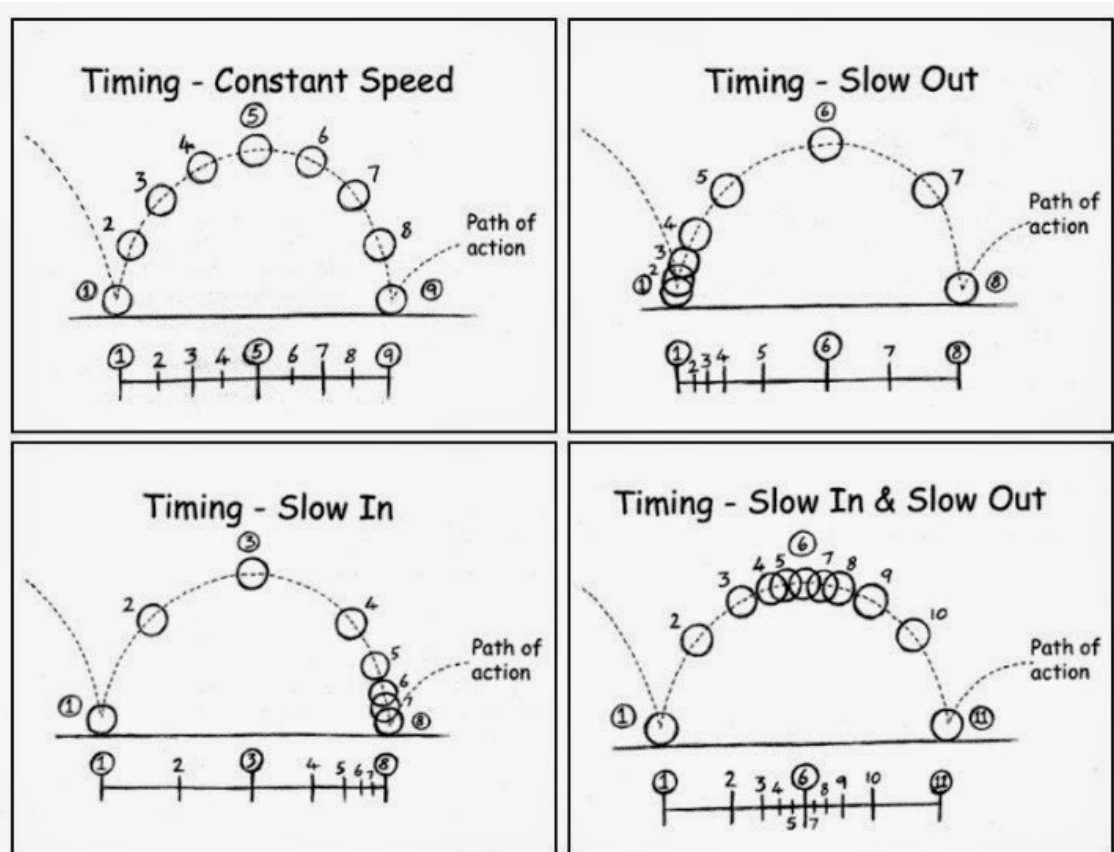
PICTURE 6. Screen captures of Sinbad: the smoke effect of the character's body follows the transformation (Dreamworks Animation)

2.6 Slow in and slow out

How the animated object accelerates and decelerates. The effect is achieved by adding more frames to both ends of the action, which then adds to realism and smoothness (Picture 7).

This principle is crucial to how the game plays and feels and its use varies a lot from game to game. Many video game characters have very little slow in and slow out as they have to react to the player input immediately. Meanwhile in racing games this principle is crucial and adds to the realism and the gameplay

itself. The player needs to know how their vehicle behaves and how quickly and smoothly they can speed up and brake to be able to navigate their way through the course. Bumping into an obstacle usually slows down the vehicle, which often makes a difference in the outcome of a race.



PICTURE 7. Slow in and slow out (Animation World Network, 2014)

2.7 Arc

Most things in real life follow an arc or a path when they move. When you throw a football, it will fly in an arc as the Earth's gravity affects it. Continuous, well done arcs are realistic and pleasant to watch, whereas the lack of an arc in movement feels stiff and mechanical. Arcs can also indicate the weight of an object when something is being lifted or thrown, like how easily you can lift a football above your head, compared to lifting a bucket full of water. Waves, flames and wind all flow in arc shapes (Picture 8). In an explosion like a glass of

water hitting a floor, the shards bounce on the floor forming many arcs, the smallest pieces travelling the furthest.



PICTURE 8. Arc motion can be seen in the trail of the fireball as well as in the motion trail of the hand (Super Mario Galaxy, 2007)

Natural feeling arcs in video games are usually achieved with a physics engine, which is a part of a game engine. Some animation programs like Autodesk Maya, have an ability to track animated arcs which helps the animator to spot unnatural looking movements and fix them. In hand drawn animation the arcs are drawn before the actual animation to help keep the object on track.

2.8 Secondary action

Secondary actions are small conscious acts made by the character which complement and add visual appeal their main action (Picture 9). It could be shuffling of a pen in a character's hands while they are explaining something, or a flying dragon breathing out embers as it circles above the player, ready to spew flames. If these are used correctly, they add detail and appeal to the primary action, giving it a more polished look. Secondary actions may be applied to some

visual effects, like fire producing smoke, smoke serving as the secondary action.

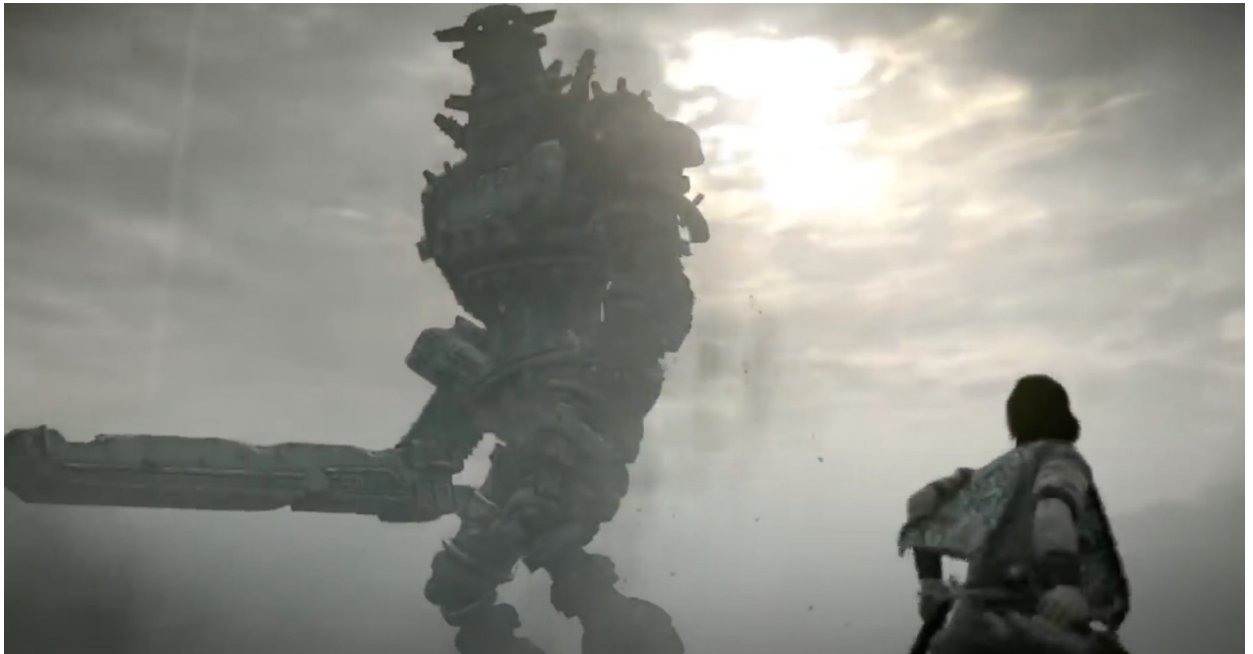


PICTURE 9. Screen captures from Hercules where flames are part of the character design and emphasize the character's emotion (Walt Disney Feature Animation, 1997)

2.9 Timing

Timing is the duration or rhythm of an action. It can be the rhythm of a character's steps, the time it takes a ball to bounce until it stops, or the time used opening a

heavy door. It conveys the weight, size and speed of characters and objects: the faster a move is, the less weight it appears to have, and the opposite applies as well. Timing can be used in conveying character's emotion and thought process, like having a character slow down or pause before they proceed. It can also set the mood for the game, like making everything move slower than in real life can make them seem majestic (Picture 10). (New Frame Plus, 2019)



PICTURE 10. Screen capture: everything in Shadow of the Colossus move at a slow, soft pace, especially the colossi which enhances their size. (Shadow of the Colossus, 2018)

Most fighting games are very fast-paced; some attacks take only a few frames to connect, which makes the characters very responsive, but also almost impossible to react to without learning to predict opponent's moves (New Frame Plus, 2019). In video game animation, one of the toughest problems is to allow the player input to be as quick and responsive as possible while still maintaining weight (Jonathan Cooper). In fighting games this feeling of weight is achieved by having the characters pause for a few frames when the hit connects and by adding visual effects using the follow through principle (Picture 11).



PICTURE 11. Visual effects displaying weight and strength of different moves (Street Fighter V)

2.10 Exaggeration

Too much realism can ruin an animation, making it appear static and boring. Real movement doesn't have the kind of appealing arcs, timing or silhouettes animations can. Instead, adding exaggeration to your characters and objects to make them more dynamic. Finding ways to push the limits just beyond what's possible will make the animations draw attention. It is good to note that using exaggeration should be kept consistent throughout the whole project or the particular animation might stand out in an unappealing way (Cooper, 2019).

Exaggeration is a key element in making visual effects, as many of them don't look as interesting in real life, like an electric charge running through an object usually cannot be visibly seen. The bigger and flashier the more eye-catching

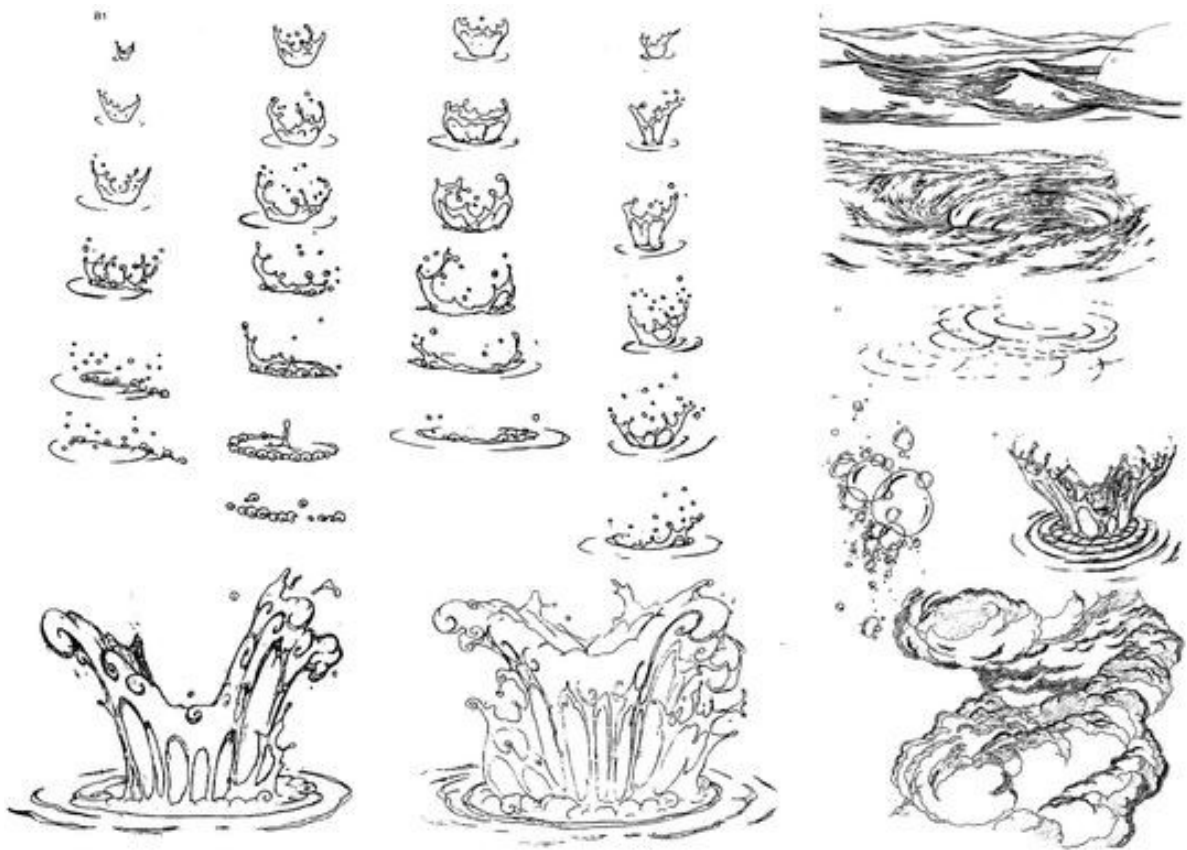
they are, but a balance with moderation and variation in the game's overall VFX design is important to give the flashier effects a chance to stand out and feel that much more entertaining. Visual effects are used to exaggerate movement to make it look more impactful (Picture 11). Making the strongest attacks a visual spectacle gives them that extra punch and satisfaction when they land in the opponent.

2.11 Solid drawing

Even though animated characters and effects are created to have a stylized look, they still need to appear believable in the context. They must have volume, weight, and balance, and they should be able to be drawn from different angles. Understanding how visual effects behave in different circumstances makes them feel more real, i.e. how a campfire looks like when it's windy. In 3D animation it seems to be less relevant, but especially in the early stages of the animation, thumbnail drawings are still commonly used in sharing information or solving problems in a team (Cooper, 2019).

2.12 Appeal

Appeal has a great impact on believability of the animation. Whether an animated face shows real emotions or looks unintentionally creepy and unnatural, showing the force of an action, or character's or object's movement displaying the earlier principles of animation correctly instead of appearing unintentionally stiff and machine-like all have an effect on how appealing the animation is for the audience (Cooper, 2019). Appeal also applies to the designs of characters, environments and visual effects, but it always doesn't mean everything should look cute or polished. Interesting stylistic choices draw in attention and help make the animation stand out (Picture 12).



PICTURE 12. Stylized water effect design used in Hercules are both unique and believable (Walt Disney Feature Animation, 1997)

3 VIDEO GAME VISUAL EFFECTS BASICS

In video games, special effects are widely used from the menus to the environments, to the characters and their abilities. They enhance the gameplay and make the player's experience more exciting and appealing. They also add to the aesthetics and immersion of the player. Most commonly used effects include fire, water, lightning, clouds, smoke, explosions and motion trails (Hubbell, 2014). They serve similar roles to their film industry counterparts, and more. According to Sárosi (2017), the animations should also communicate the mechanics, conditions and goals of the game. That is achievable by communicating with the team members, especially the programmers, and setting shared goals.

Visual effects often work as indicators for an interaction or danger. Animated objects draw attention, especially if they produce light as well as sound. Glowing or sparkling item laying on the ground makes it easier to be noticed and picked up by the player. And on the other hand, structures or objects that crackle with electricity are easy to read as hazardous to the player so they may be careful around them.

In some games, like fighting games, the special effects play an important role in the game's appeal. The basic movements of characters are enhanced with lines and streaks and successful hits produce sparks. The stronger the moves the flashier the effects, and the strongest move will get the most emphasis to make it feel extra powerful and satisfying to pull off successfully. Each character may have their unique set of special effects to complement their fighting style and visual aesthetics.

Some visual effects are meant to play a minor role i.e. mood building. Effects like rain, flame on a torch or other small elements are usually meant to be subtle to not distract the player too much from their other goals. Instead they add up to the scene and give life to the environment. Sometimes these small

elements serve to guide the player, i.e. follow a trail of lights to find a nearby village.

The principles and methods listed in the following chapters implement the fore-mentioned animation principles and are to some extent built upon them. Some aspects of the principles may be difficult to apply as the gameplay and especially the player input has to be prioritized. For example, usually only a couple of frames are reserved for anticipation in player character animation, but in enemy animation in action games the anticipation is a great tool used when designing gameplay.

3.1 Gameplay

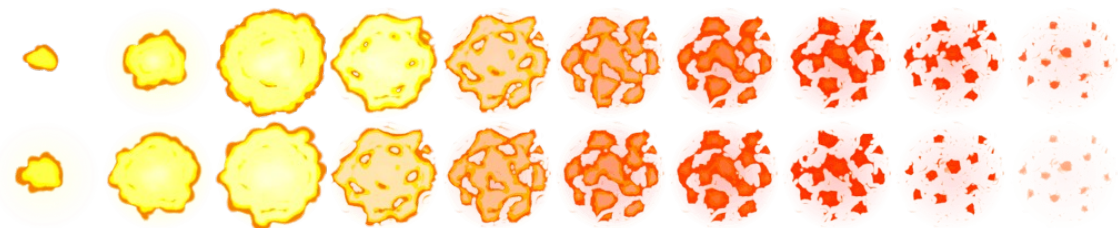
Gameplay is always the most important aspect of designing VFX. They are usually closely connected so it is crucial to understand the gameplay when designing VFX. Visual effects should not obstruct gameplay or be too cluttered to cause visual noise. Visual noise consists of effects happening on the screen, and too much flashing and blinking happening at the same time can make it not only hard to read the screen but also overwhelming to watch (Picture 13).



PICTURE 13. High saturation, high opacity and complementary colors in this visual effect make a lot of visual noise and therefore makes it hard to read (Jin Ho Yang, 2017)

Bomber Friends' levels are tile-based. A player character as well as a bomb, a basic explosion sprite covers one tile, and there are usually multiple explosion sprites spawning in a line. The player instantly loses if they touch the hitbox of an explosion. Tile layout makes it easier to predict how far the explosions will reach and thus helps the players to plan their positioning so they can avoid getting hit.

The bombs usually have a little delay before they explode, but the bombs have no other visual indicator than a scaling animation for when they're about to explode, so players need to learn the correct timing to avoid getting blasted by bombs of other players, enemies or their own. Because of this gameplay design, the explosion animations have little to none of anticipation. The frame with the most energy from the explosion is in the first four frames, and the rest fade out. The current basic explosion sprite's final frames have very small particles in it, which sometimes lures the players into false safety and step into the explosion, making them feel confused or frustrated about being hit by 'invisible' frames (Picture 6).



PICTURE 14. Basic explosion sprite sheet in Bomber Friends

3.2 Value and color

Value and color are keys to communicating visual effects. The higher the value and saturation range, the more focus it draws in. Contrast especially with surroundings creates clarity, and light gives life to the effect. But the designed values and colors shouldn't clash too much with vital parts of the game, like UI. Di-

viding colors into primary and secondary colors help to create a balanced design (Picture 15). (Jin Ho Yang, 2017)



PICTURE 15. Color schemes (Jin Ho Yang, 2017)

Explosions naturally have very bright and intense colors. Bomber Friends has vibrant color schemes throughout different levels, with varied color themes like volcano stage with shades of dark red and fiery orange, and an icy stage with cool blues and white. To make the explosions stand out from the stages, they need clear outlines to separate them from the background. For example, a flame animation uses a dark outline and a semi-transparent glow effect which not only clarifies it but makes the flames appear hot.

3.3 Shape

According to Jin Ho Yang (2017), shapes play a major element in reducing visual noise and defining the art style. Well-defined shapes and silhouettes help communicate gameplay. In action games the visual effects often represent hit-boxes of attack animations where the players need to know what part of the attack may hit them.

Visual effects often compose of multiple elements with different textures: a fire effect can be separated into the initial flame, the sparks and the smoke. As an animator it is easy to get carried away in making all parts prominent, but if all components are be given an equal emphasis, scale and strength, the end product may turn out messy or noisy. Balanced shapes with variation in size, sharp and soft textures and fine-tuning makes the difference in a good visual effect. (Keyser, 2018)

Basic shapes such as circle, square and triangle evoke different kinds of emotional responses. Circles and curves have energy and dynamic to them; squares and upright lines feel balanced; triangles and edgy shapes express aggression and force (Solarski, 2013). The following picture (Picture 16) demonstrates the use of simple shapes in various subjects. Understanding how different shapes are interpret is a great tool when designing visual effects for communicating their function.



PICTURE 16. Shape language utilized in design (Solarski, 2013)

3.4 Timing

“Timing is important to VFX and serves a critical role in creating meaningful movement and visual interest for effects. The way an effect changes over its lifetime offers essential visual information about its function.” (League’s VFX Guide, 2017). In visual effects there are many things that can be taken into consideration under this topic: anticipation, dissipation, fading, color variation, value, opacity and size.

Bomber Friends is a fast-paced action game with gaming sessions consisting of multiple rounds, each match usually lasting for about a minute and thirty seconds. The bombs have no visual indicator for when they’re about to explode, so players need to learn to time their actions correctly. The explosions are instantaneous, they have little to no anticipation so the first frames of the animations matter the most. The duration of a basic explosion animation is 1.00 seconds, but some bombs have effects that last longer.

4 REQUIREMENTS AND LIMITATIONS

There are many things to be taken into account when creating visual effects for mobile platforms. There are quite many similarities in mobile game development and console game development, the most notable differences being performance, available memory, size and portability. It is different from making animation for example cinematic experiences. This chapter attempts to list the most important points about platforms, files, and development time.

4.1 Platform

The platform defines most how visual effects can be used. Home consoles and PC can handle much more than mobile platforms can, simply because they are more powerful and don't have as limited frame rate and memory. For mobile game development there are numerous types of hardware of different model years available. If the aim is to target as wide a user audience as possible, the game should be able to run smoothly on the most commonly used hardware, which presumably does not consist of the fastest or most powerful ones available. (Unity Technologies, 2020)

The current mobile market mainly divides into Android and iOS operating systems. Apple has a more limited range of devices and more consistent quality of hardware, and for Android there is a wide range of options from very powerful devices to low budget ones. Android also has an increasing number of manufacturers making devices for it and therefore there is a lot of variety to screen sizes and shapes. (Felgo, 2016) Tablets with their larger screens and generally longer battery life also cover a portion in the mobile game market.

4.2 File type and size

In mobile games, the total file size of the game package has a surprisingly great impact on how many people choose to download the game from an application store. Large file size may discourage the potential user from downloading the game for many reasons: mobile hardware have generally very limited memory

space, large file size increases the downloading time and in game loading times, which is not preferable in the eyes of the modern day mobile game audience which favors a smooth experience. Therefore smaller files make the game more accessible to more people.

Visual effects can easily be a cause for serious lag and long in game loading times. Mobile hardware have limited frame rate and memory; if a great number of complex computer generated particle effects run simultaneously on the screen, it will considerably drop the frame rate and can almost freeze the device, making the game practically unplayable. Therefore it is important to prioritize the effects and to learn how they can be simplified without sacrificing too much of the quality. While sprites are generally more light, too many layers of sprites displayed on top of each other will cause problems (Unity Technologies, 2020).

4.3 Time

Making hand-drawn animation is generally time-consuming and laborious, and learning to do good 2D animation takes a lot of time and practise. Planning, collecting references, studying real life phenomena as well as professional work, and sketching help speed up the whole process. VFX artists face new challenges on a regular basis, like animating a waterfall flowing upwards (Hubbell), therefore the time estimates rely a lot on the animator's experience. Another variable is the software itself. Sometimes the software may stop functioning the way you expect, or the effect looks different in the game engine from the initial plan. Learning the software and to troubleshoot are important.

5 SPECIAL EFFECTS PROJECT

Roughly 2 months were reserved for this project. The time needed for learning, drawing and testing the effects were underestimated due to inexperience; only a single effect made it into the actual game. Regardless, some of the designed unfinished effects are included in the thesis for learning purposes. All of them followed the same work pipeline: sketching and designing the initial look and function in Adobe Photoshop and drawing rough keyframes and later cleaning and in-betweening in Adobe Animate. The drawing tablet used in the project was Wacom Intuos Pro M.

5.1 Project research

During the making of this project I was working for a mobile game company Hyperkani. My main focus was on one of their games named Bomber Friends, a fast-paced 2D action game where your goal is to either finish a stage or to win a match by destroying obstacles and enemies with explosives. In Bomber Friends, there are several aspects that should be taken into account when working on special effects: gameplay, color, value, shape, size, file type, timing and visual clarity as well as the time and tools needed in making the effect. The main focus of the visual effects in Bomber Friends were explosions related, and the following chapters focus on them. Explosions come in many varieties, like common phenomenon we don't generally think of as explosions such as a raindrop landing in a puddle or a match being struck to light a candle (Gilland 2009, 2011).

Not all explosions have an igniting fire at their core. Explosions can be caused by any sort of pressure building up within a space that can no longer contain that pressure building up in a pressure cooker, or a river swollen with rainfall pressuring a dam. Explosions can be full of liquid, gases, or any variety of natural or man-made elements. (Gilland 2009, 211).

Regardless of the cause behind them, the anatomy of all explosions is very similar. The initial action is an extremely abrupt outward burst of energy from the source of the explosion, which then collides with the resistance of its surroundings - be it air, water, or objects with which it collides.

Representation of explosions in video games generally reflect real explosions, but they can be more abstract, like a stylised pop or burst. The purpose they are created for affects the visual shape and impact they can have. The shape of an explosion may consist of several, if not all of the following shapes: circle, spikes, debris and a cloud. (Video Game Animation Study, 2018)

5.2 Napalm flames

The napalm bomb power-up is a fire explosion with a lasting effect; it sets the ground on fire and will hurt the player on contact. Since the explosion may cover different numbers of squares depending on how far the powerup has been boosted with certain collectibles, the burning effect should fit the square and also be tileable.

The initial designs were created in Photoshop (Picture 17). They were partly inspired by Redfish's flame animations (Redfish, 2014) as they were vibrant and very clean and therefore highly suitable for the game. The effect was designed to be an after effect for the napalm bomb and to have a seamless loop, because the napalm effect duration may change when upgraded to be more powerful. The onion skin tool in Animate was very helpful in the making of the effect; the onion skin tool can show the frames before and after the the selected frame as transparent layers with simple colors like blue and green, making it easier to follow multiple transforming parts and their changes through each frame while working on them.



PICTURE 17. Flame designs with varying shapes

The designs were tested with a screenshot to see how the shapes work with the existing style and detail (Picture 18). The square shaped flame was chosen as the shape was clear and readable in the game where the levels consist of squares. It also helps the player assess their distance to the hazard.



PICTURE 18. Flame shape testing done directly on top of a screenshot of the gameplay

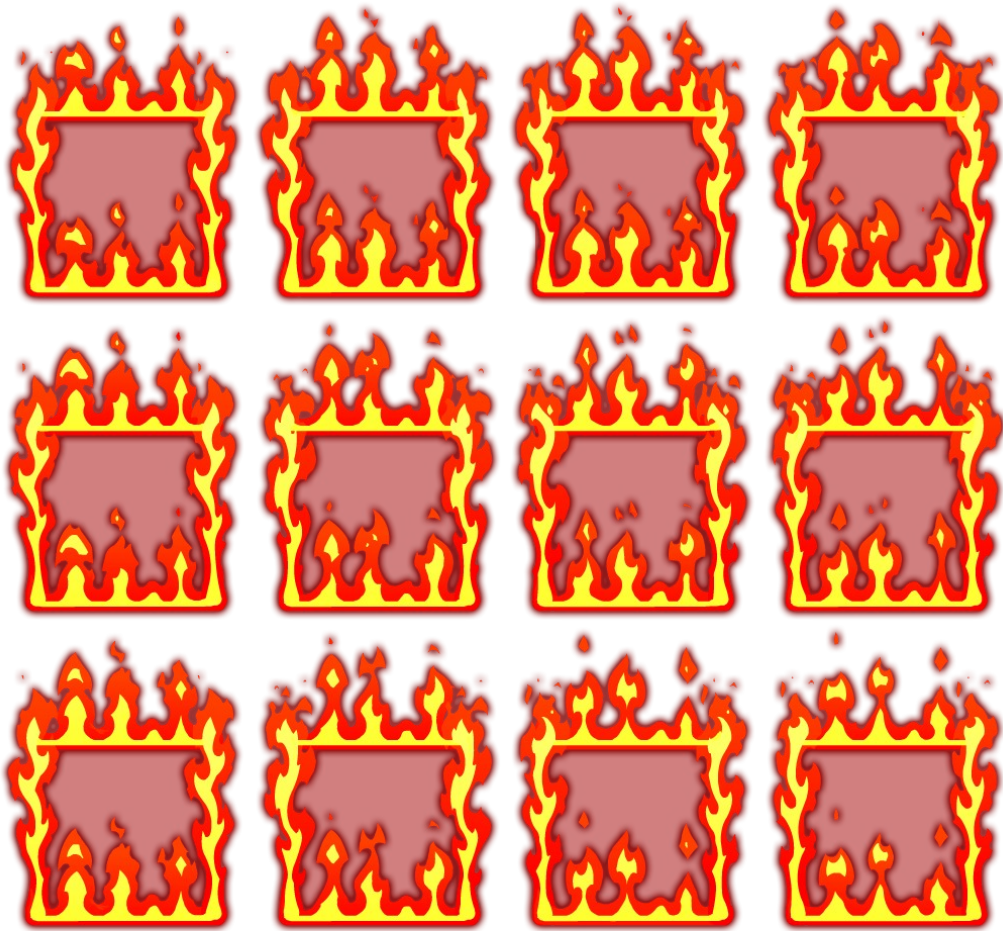
The first part was to create a vertical flame that would make up the sides of a burning tile, and later a horizontal row that consisted of multiple small flames. Drawing, cleaning and timing was done on the yellow part of the flame first. It began as a simple wavy yellow line that made up the flame's body: fire follows arc motion as the heat created by the fire and cold air surrounding it push each other, thus the arc principle mentioned in the second chapter applied. The red edges were added after finishing the body part (Picture 19). The flames were drawn with pose to pose method to ensure smooth looping and made relatively even to not draw too much attention from the characters or other explosives.



PICTURE 19. A frame of the vertical flame.

After the vertical part the horizontal part was designed in a similar fashion, but this time there were multiple individual flames rising upwards. Different shapes and sizes were used to make the effect more interesting. The transforming shapes use the slow in and slow out principle and they reach their tip and low points at different times to give the natural feeling. After the frames and in-betweens were finished in Animate, they were exported as a sprite sheet for editing in Photoshop. Dark red, semi-transparent gradient in the middle was added for contrast to enhance the effect and make it look hotter. The middle part was left empty so that the player can still read what type of ground tile is underneath the effect, and also for cases where another item lands or otherwise overlaps with the effect (Picture 20). The final sprite sheet was then compressed with TinyPNG which is a website designed for reducing file size for

PNG. files and is used for all visuals in the game which is very helpful in keeping the game file size as small as possible.

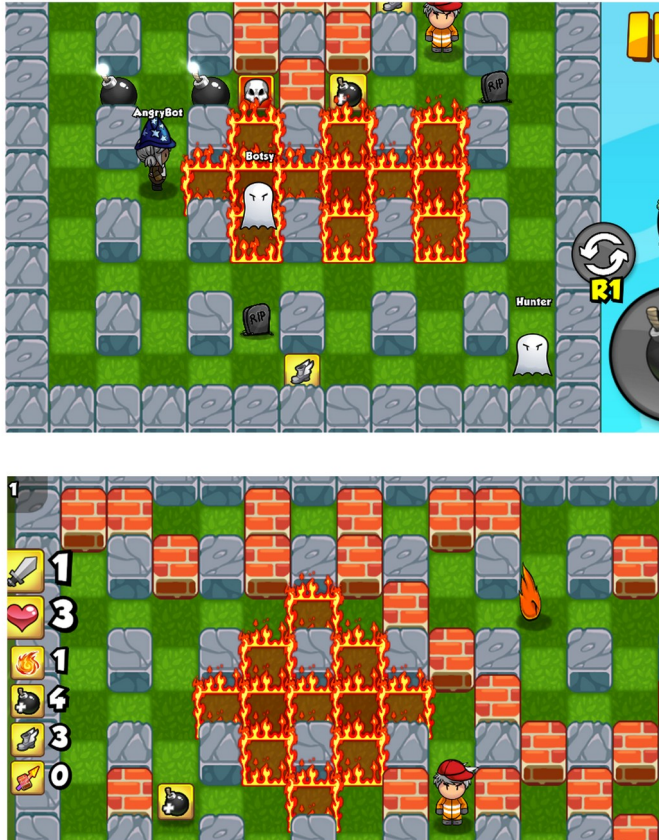


PICTURE 20. The complete sprite sheet of the napalm effect

The author had very little experience in animating visual effects beforehand, so a lot of effort had to be put in to achieve the quality and smoothness needed for the game. Creating, fixing and flipping between the frames was constant; sometimes whole frames had to be removed and created again. Many important lessons were learned during the making of this project, including not to use too much time on small details before the main movement and shapes work.

The chosen art style for the flames worked well for the game, although it could have been more simplified (Picture 21). For a beginner VFX animator this was a time consuming and challenging learning project with lots of trial and error. This

was also the only animation that was completed and imported to the final game. The rest did not make it in as the focus shifted on other parts of the game soon after completion of this effect.

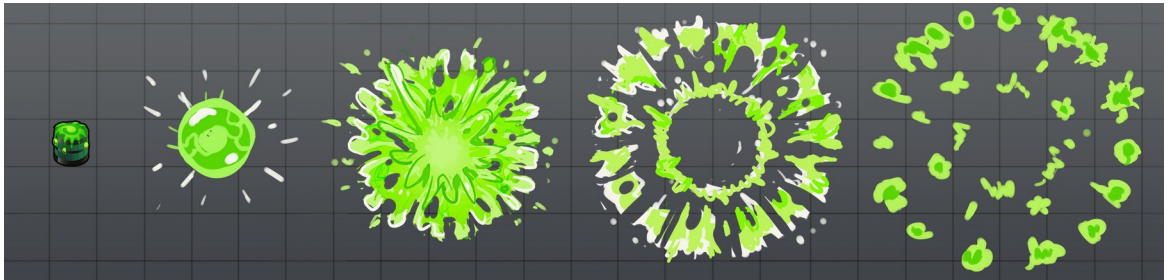


PICTURE 21. Screen captures; napalm flames seen in action in game

5.3 Slime explosion

The slime bomb is a non-damaging bomb that makes the surroundings covered by slime, making travel through the area slowed down. The initial plan was to test a little buildup in the beginning and start the explosion in the shape of a bubble that expands, then bursts in a flash and splatters slime around (Picture 22). In the game the explosive can be later upgraded to cover more area, so the animation should be scalable. Working in vector graphics of Animate was ideal for scalability since the quality of the images would not suffer. The final details

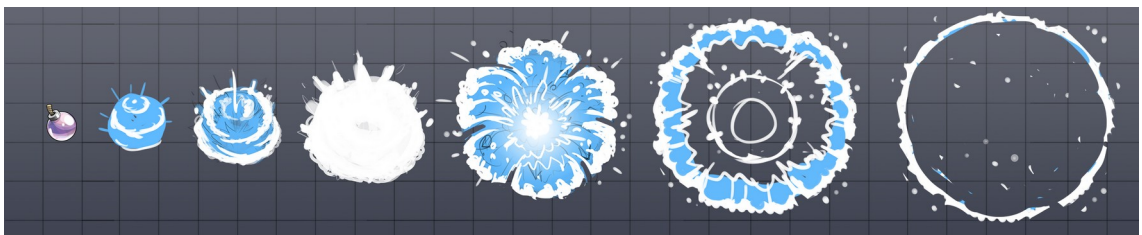
would have been added in Photoshop, to enhance the slime texture shine and depth.



PICTURE 22. Initial sketches for the keyframes

Slime, lava and mud effects were referenced to get the feel to the material. Slime has more viscosity than water and has more weight. The splattering effect should not break into too many particles to avoid visual noise, so it should have been even more simplified. The center part of the explosion in the second key frame could cast a faint shadow to give the effect more 3D feel to it.

Using the slime explosion sketches as a base for shapes and size, a water explosion could also be created. Instead of splattering, it would spread like waves (Picture 23).



PICTURE 23. Initial water explosion sketches

6 CONCLUSIONS AND DISCUSSION

The mobile game industry may come behind the console game and the PC game industry, but it is the fastest developing game industry, with new and more powerful models coming out each year. Mobile phones might not catch up with the performance the game consoles have to offer, but with the right knowledge and tools visual effects can bring satisfaction and excitement even on the small screens.

For visual effects, there are numerous ways of approaching them and new methods and tools are constantly developed. For making 2D animation, Adobe Animate is just one of many animation applications. Finding an optimal style in terms of visual interest and time allows the animator to make the most of animating and help the game draw attention in the gaming market. Understanding and applying design and animation principles are power tools for making visually interesting and delightful visual effects. Hand-drawn approach is very laborious, and is preferable only in mobile games or in projects which need a very specific type of animation that is too complicated to be created with particle effects, but it also gives a lot of room for experimenting and creating unique looking effects for very specific purposes.

Alas, the animation project did not cover as much as was originally planned, but this still serves as an example. Demonstrating the process, design choices and errors may help a future animator to have an idea of what kinds of problems they may run into when they start working on their own animations.

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