

PIXEL LOGIC

The PDF archive



Chapter 4: Readability

Introduction

Ever looked at a sprite and wondered: "what is this supposed to be?"
Misinterpreting sprites is common because they lack detail.

Zelda: LTP had some muddy sprites.

Agahnim is the peak of pixel misinterpretations.

Agahnim



So is he wearing a hat, or is it a face?



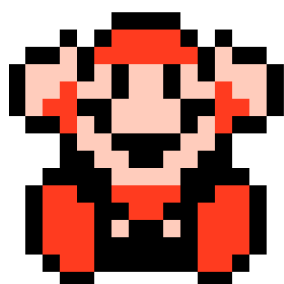
Readability means Clarity.

How easy is it for the viewer to understand what you pixelated?

How well does your pixel art convey what you're TRYING to show your audience?

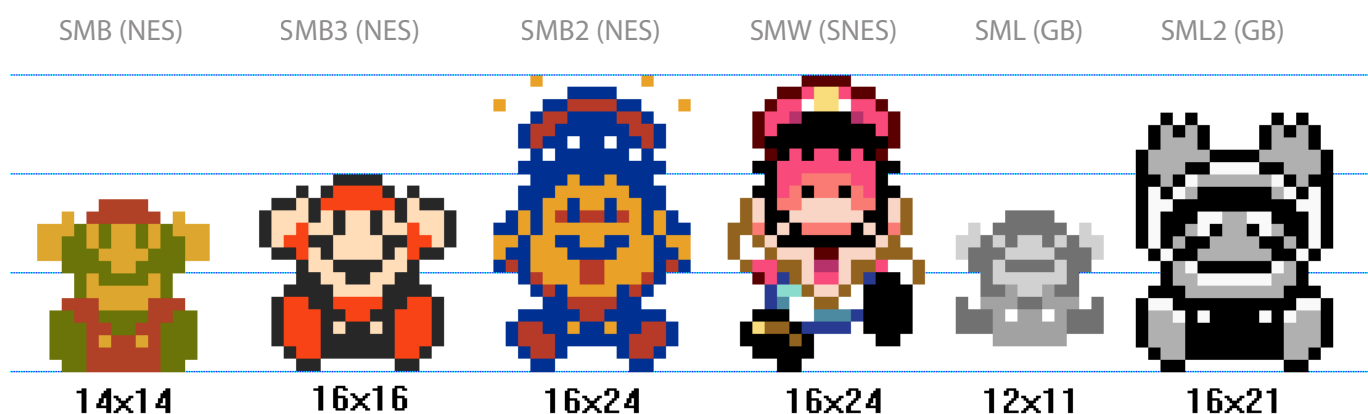
How well does your sprite read?

Size matters...



Is Mario smiling or shocked when you lose a life in Mario 3? At 16x16 pixels, it's hard to tell he's shocked with his moustache. When he is on a bigger canvas, it is easier to tell.

SMALLER sprites make it **HARDER** to convey things



Big sprites need clean lines and solid drawings. Small sprites need recognizable features for readability. You can't squeeze details

into tiny sprites, so make sure to adapt character designs.

The size of your sprite and canvas will determine what your focus should be.



Guest artist: syosa

Case Study: Cryamore



One of the most important decisions in the development of Cryamore was the sprite size.



Original sprite model ~190px tall

PROS: Clean and detailed at high res.
More room to animate.

CONS: Time and effort for animation.



70% of her original model ~130 px tall

PROS: Moderate high res quality.
Frames are finished sooner.
Simplified facial expressions.

CONS: More readability issues, less HD.
Less detail for complex character design.



We were kinda setting the bar extremely high when it comes to ultra-high res HD sprites. [...] Frankly, it would've made no difference to just hand draw it at that point. Of course, we could just keep the HD sprites and reduce the frame count, but that would make things look ten times cheaper, [...] So, we sat back and took a constructive approach at the way we were doing things, detached from the emotional appeal of how much we were in love with this look.

Cryamore Dev-Blog

The smaller the sprite animation, the smoother the illusion of movement is. Just by the size being cut down, animations will look even more fluid. Smaller sprites also allow you swap costumes more easily!



Persona 4 Arena (Arcade/PS3/xb360)

Guilty Gear XX (Arcade/PS2)

The King of Fighters XIII (Arcade/PS3)

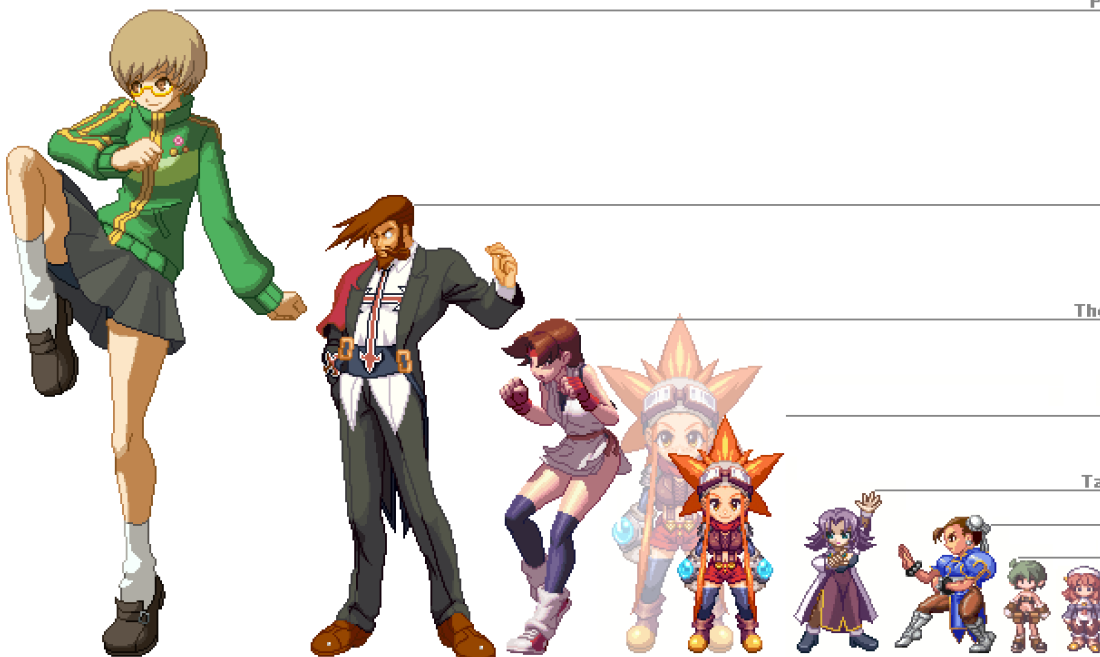
Cryamore

Tales of Destiny: Director's Cut (PS2)

Namco x Capcom (PS2)

Disgaea 1 (PS2)

La Pucelle: Tactics (PS2)

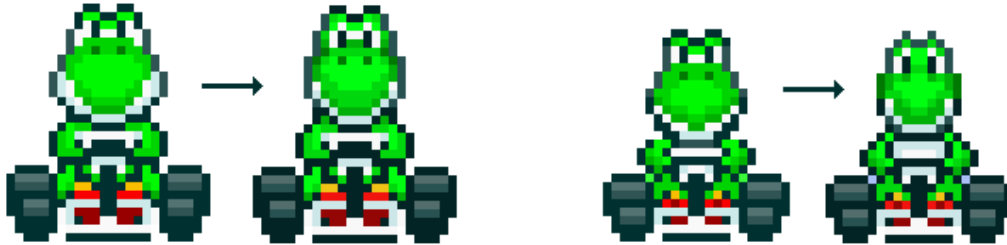


The line between binary art and pixel art starts to blur when sprites get too big. Games like *Dengeki Bunko Fighting Climax* (PS3) are borderline binary art.

...but pixels matter more!

Bigger sprites have little readability issues. Smaller sprites tend to be a bit trickier.

Obvious right? But it's not that simple.



Super Mario Kart (SNES) had improved Yoshi sprites for the Japanese version. When he shrinks on screen, he gets less READABLE. Does he still look like Yoshi?



Even within the same canvas,
your sprites can always be improved.



By guest artist Neorice/ Guido Bos (@Neoriceisgood)

Pixel-Logic Bonus #5



Editing a sprite over and over is common. Make multiple versions and have people pick, if you feel uncertain!



This sprite from *Pokémon Red/Blue* (1998, GB) is meant to be a boy playing his Game Boy. The sprite is within 16x16. **However many people see this as a boy holding a cup.** Most of the square looks white. It has 2 black pixels and the 2 grey ones to show the shadow of the rim.

Let's move the pixels around and see if we can fix it.



If we change the sprite drastically, we risk creating **new readability problems**. Right now it looks like the Game boy became his shirt, and his torso.



We can extend the cup and move it up covering the face even more, but **this could easily look like a beard or all kinds of other things**. It's too muddy.



We now have a flat grey shape with a white line of 4 px wide. **The white highlight makes the object more 3D**. But it still looks like a random cube/prism



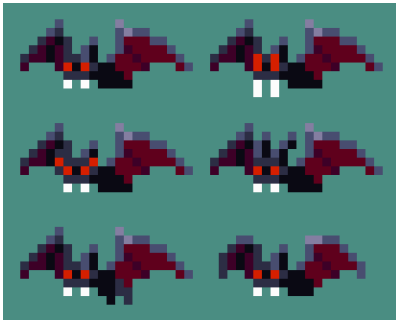
By simply adding a 2px line to define the Game boy's cartridge slot, it works! **This looks more like a kid holding a Game boy!**



For small sprites, simplicity usually works. Don't overdo details and stick to simple shapes.

Why every pixel matters I

Guest writer: Glauber Kotaki



Very small resolutions can easily get problematic as every pixel, **including its colour**, makes a big difference in the whole piece. Thus **pixel placement plays an important role** in order for viewers to understand your work.

One pixel might just change how people interpret it!

Changing just a few pixels can make this bat:

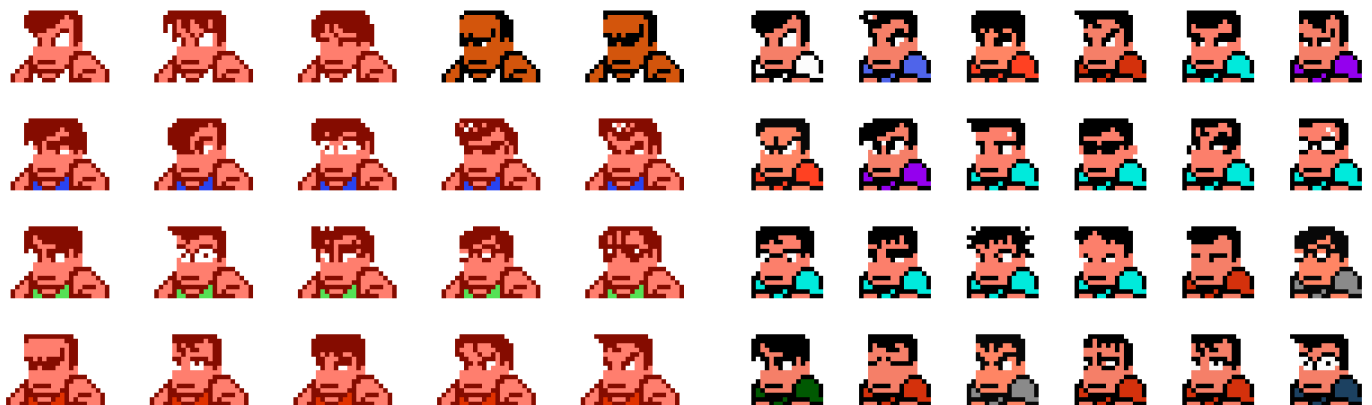


Chasm (PC & PS4) (Work in Progress, future release)

Why every pixel matters II

Older video-game graphics may be small, but the place of each pixel is not trivial!

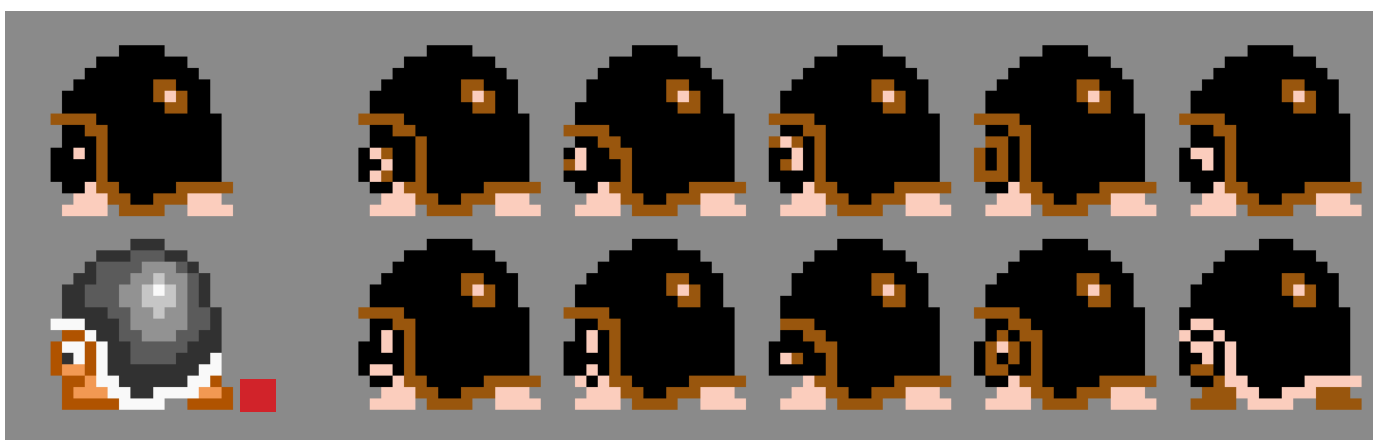
A tiny area like 6 by 6 pixels can offer you a large amount of variety!



Characters from Technōs' Crash 'n' the boys & River City Ransom (NES/Famicom)

The Kunio-kun series made each character look different by slightly adjusting pixels of only their eyes and hairstyles! They were enough to show diversity.

Even the smallest pixel can make a difference for low-res graphics. **The buzzy beetles from SMB** somewhat resembled shells with a big black pearl-like eye.



Buzzy beetle from Super Mario Brothers (1985, NES)

In the *Super Mario All-Stars* remake (pictured bottom left ■), they look more like the concept art.

Recognizable features

Guest writer: **Ellian**



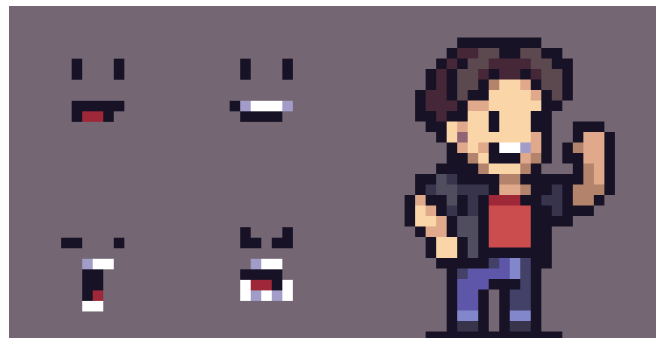
So you need to create a new sprite. What size does it actually need to be?

Ask yourself a few questions:

Do I need to see their hands moving? Do their mouths need to be visible or animated? **Must facial expression be readable?** Do they wear or hold an item? Does the sword have a magical gem in it?



No matter how big or small the item is, on a small pixel canvas it needs to be recognizable!



The smallest part I want here is facial expressions. I don't care about hands or other body parts.

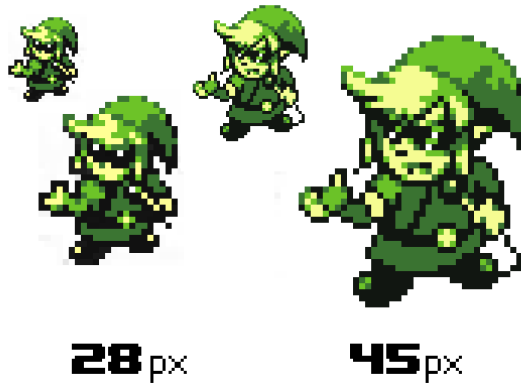
Try to figure out **the smallest part that needs to be visible**. Once you've got that down, it's easy to figure out the **minimal** sprite size you can work with.

Don't focus on getting every detail into your sprite. Find out what makes the character unique and represent the concept the best. You'll often hear "**less is more**", and it tends to be true.

If you have the slightest doubt about your sprite being readable or not, **ask someone else**, and don't tell them what it's supposed to be! Even better, ask someone with little to no pixel art knowledge.

Easy to read symbols

A few pixels in height can make a **BIG** difference.



By Michafarar

With less space, there is little room for many facial features or hands.
You still can add them, but they will make your work crowded and muddy.

If you're using concept art, photo references or any sort of guiding,
be ready to sacrifice unimportant details if necessary.

Working in bigger resolutions may seem easier, but anything is possible with small resolutions.
Choose what is essential, so don't worry if some details don't fit your canvas!



Original art by
Monolith Soft



By Michafarar



By guest artist
Neorice

Symbols I - Hands

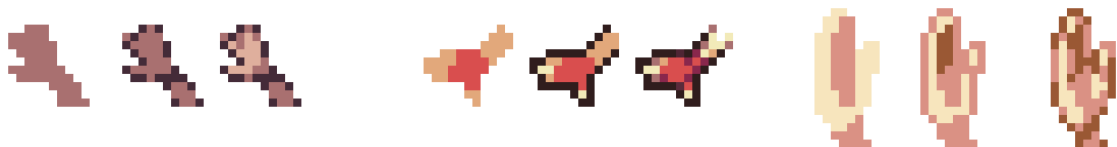
The next few pages will discuss **hands** and **eyes**. We'll tackle more in future chapters. They are the trickiest at small scales. You won't have enough space to pixel every finger!

1 Start hands by painting shapes. Tiny line art is too hard.



Line art is tricky with barely any space! It will confuse you even more. **Use flat shapes, then detail.** Much easier! It will help you picture the hands in 3D in your head.

2 Draw hands like mittens - then add detail.



There is no point highlighting every single finger. You won't have the space to. Focus on basic shapes. Even when you have fingers spread out, start with mittens.

3 Focus on the index and the thumb. They define the hands.



An opposable thumb and an index finger define the human hand. **Those two fingers are enough** to show gripping, pinching, pointing, and so much more.

4

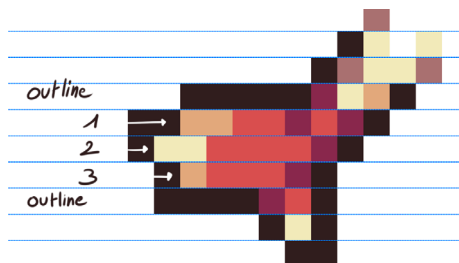
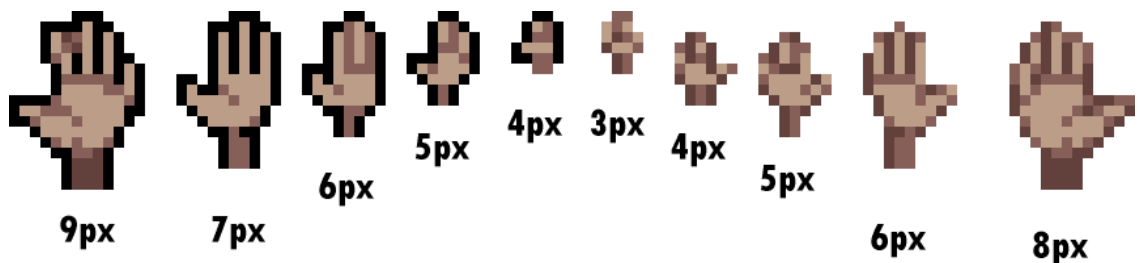
Draw only 3 fingers and a thumb if needed.



Cartoons sometimes draw 4 fingers to simplify animation. Pixel art too. **Only draw 5 fingers if you have enough space.**

5

Use different colours to separate each finger.

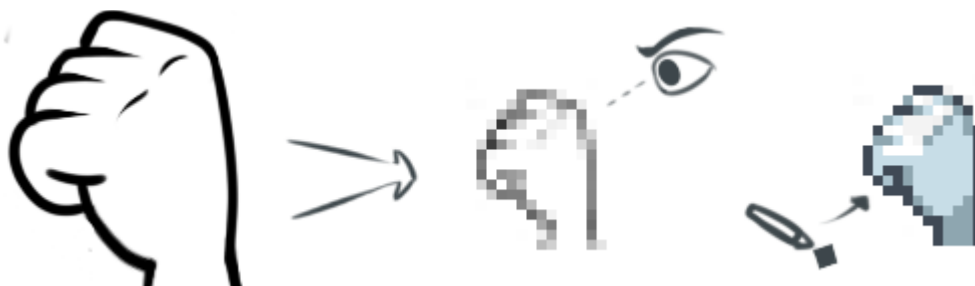


You won't always have room to have all fingers or give them an outline. The more different colours there are, the more they stand out.

To tell where each finger is, you will have to play around with colour brightness. **Highlights and shadows help bring volume** to your otherwise flat hands!

6

Draw the hand, shrink it and it use as reference.



Working at small scale can be tricky because you can't "draw" spontaneously. If you're really having trouble or work under a deadline, draw a hand in your regular painting program and shrink it. Then use it as a reference. You can also study the anti-aliasing to help you out a bit.

Symbols II - Eyes

1 Eyes are the main focus and highly important.



Art by guest artist Temmie Chang

Human beings are captivated by emotions and faces. For this reason alone, you should polish your creature sprites, may it be animals or humanoids. Your audience identifies faces by looking for eyes. **They are generally the first thing people notice.**

2 Sometimes there is no space for eyes!



Beyond Oasis (Genesis/Megadrive)

Sprites that don't have enough space for any facial features usually can't fit in eyes because they would be smaller than 1 px. If so, **focus on the shadows cast on the face to create the eye area.** If you are unsure, look up some references of games.

3 Glasses: keep it simple!



Ace Attorney Investigations: Miles Edgeworth (NDS) + Tales of the World: Narikiri Dungeon 3

You might have to sacrifice detail depending on sprite size. You either focus on
The glasses themselves and exclude the eyes. OR
The top of the frame and exclude the bottom side of the frame.

4

A few pixels make a big difference when zoomed out.



By Guest artist Untitled-Works

It's hard to tell at first glance, but a few pixels difference can have many outcomes. When zoomed in, some pixel placement may not make ANY sense to you. It may feel unnatural if you're used to brush strokes. When zoomed out, some pixel combinations may give eyes a completely different feel! **A-A and sub-pixeling really come in handy here!**

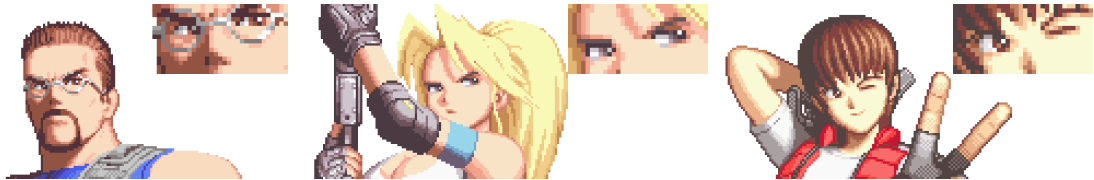
A white shine can also affect the outcome! Sometimes it's a single pixel, sometimes it's AA or sub-pixels.



By Michafrar

5

Eyes come in many styles, but don't avoid pixel detail.



Shock Troopers: 2nd Squad (Arcade)

Eyes usually define your style. **With pixels you can do whatever you want in terms of eyes.** There are no limitations besides your canvas. You can further develop your style but just like regular art, make sure to polish your technique.

6

Use *subtle* Anti-aliasing if needed.

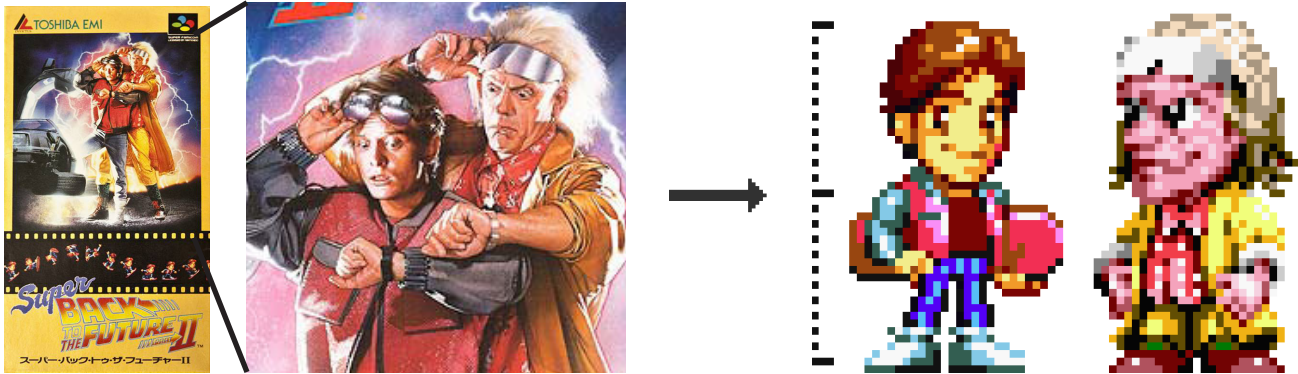


By guest artist Thernz

As seen in **Chapter 2**, AA can improve clarity. It has nice results!

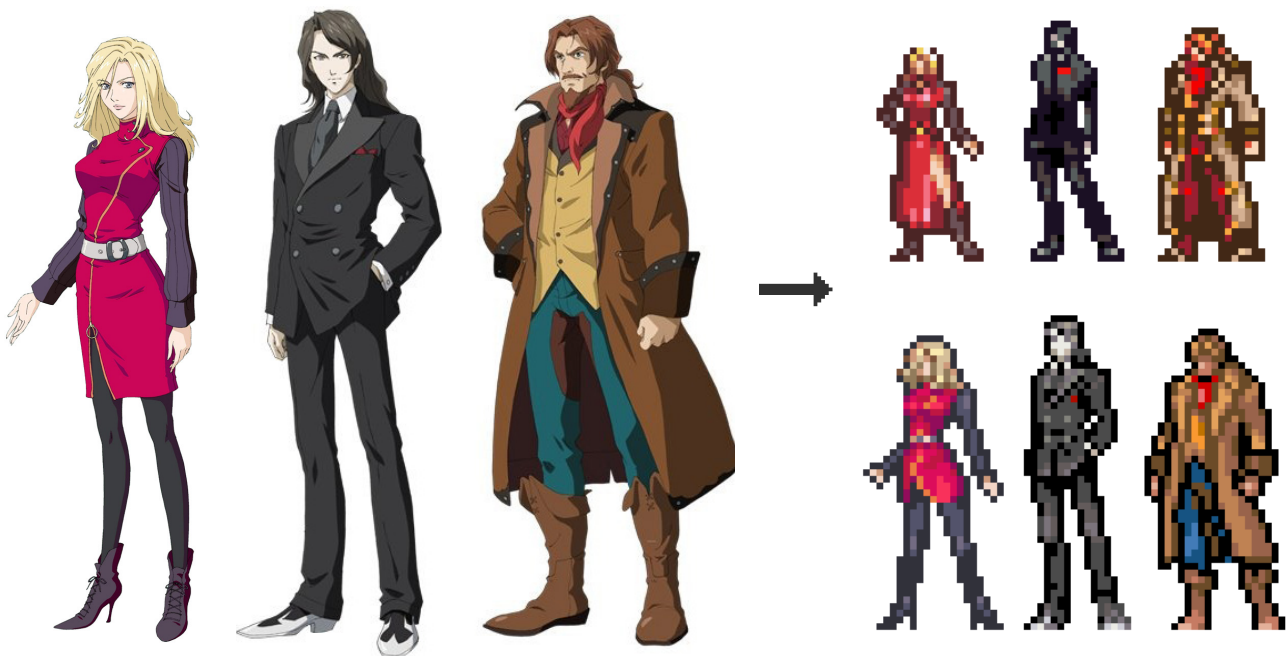
Character design & Proportions

Head vs. Body



Super Back to the Future 2 (SNES, 1993, Japan exclusive)

Big heads have many advantages. They **give room for emotions and expressions** and clearly show who the character is. It's a stylistic choice so it may not be suited for every situation. **Heads are the main reference for human proportion and they easily vary!**



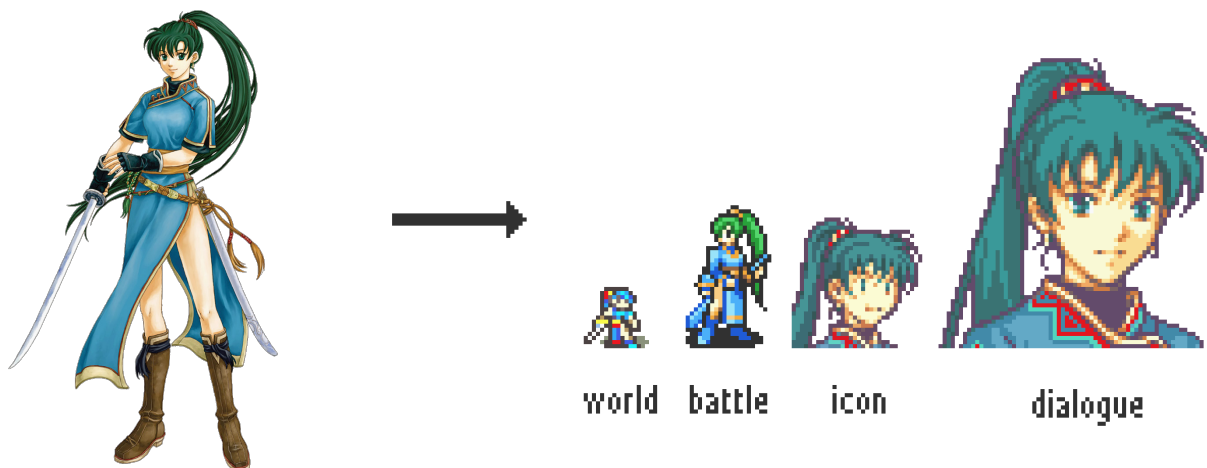
Castlevania: Aria of Sorrow (GBA), Castlevania: Dawn of Sorrow (NDS)

You may depict characters with **realistic proportions**. They **focus on body language**. As a result, you should pay attention to volume, shading and anatomy within these restricted areas. Make sure to use silhouettes. Your characters have personality and act.

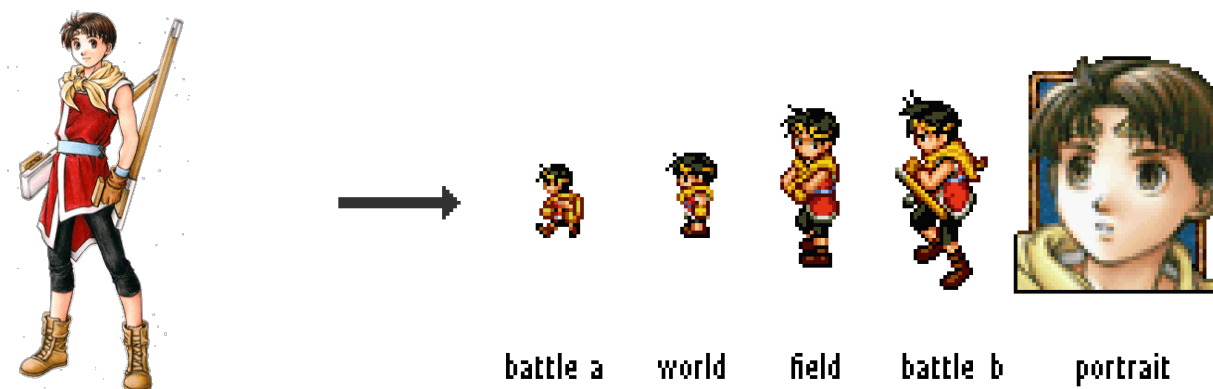
Give bodies personality by diversifying poses and body proportions

Different proportions have different functions.

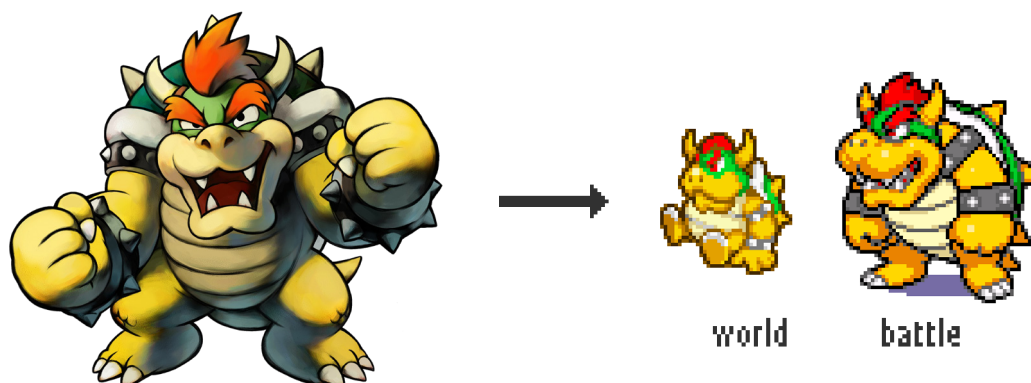
The proportions you choose depend mostly on what your sprite is used for. General artwork, user icons, overworld sprites, dialogue sprites, different perspectives: you name it!



Lyn - Fire Emblem (GBA)



Riou - Suikoden II (PS1)



Mario & Luigi: Superstar Saga (GBA)

Pixelart finds a way to adapt all character designs to fit small areas.

Silhouettes

Feat. guest writer: Glauber Kotaki



A clear silhouette shows important features like head, limbs, cloth, etc.

Anything that highlights the character or object's action or function is a good start.

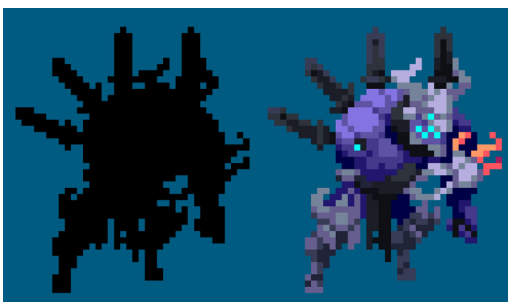
This is also very useful if you're going to further animate it.



Streets of Rage 2

Streets of Rage 3

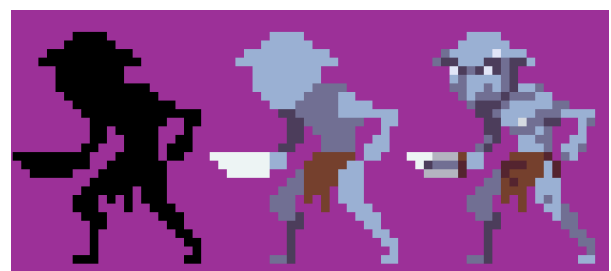
Streets of Rage - like most sequels do - would improve their sprites over time. The silhouette of *Signal* is better in the 3rd instalments as his stance, his fist and his hairstyle is highlighted.



Duelyst (PC) (Open Beta, 2016)

The silhouette doesn't show too much, but it became **readable by using different colours in all sort of ways within the drawing.**

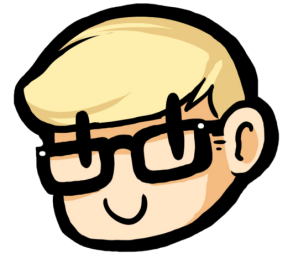
Drawing a rough silhouette base and filling up with details is a good practice. **Try not to overlay things, and if that happens, use colour contrast to tell features apart.**



Chasm (PC & PS4) (WIP, future date)

Colour design

Feat. guest writer: Paul Veer



Giving your characters a **main and secondary colour**, gives you nice side effects. Their design becomes more recognizable and more readable. Don't include unnecessary details on your sprites. **Break them down to 2 or 3 main colours like other recognizable characters.**



Nuclear Throne (PC, Steam)

- Fish?** That's the **green** guy with the **yellow** lips and fins!
- Rebel?** She wears a large **blue** scarf.
- Robot?** He's defined by his **red** scary and ominous eye, separating top and bottom.

Well-known characters seen in many games have designs with vibrant colours.

Mario ■ ■

Sonic ■ ■

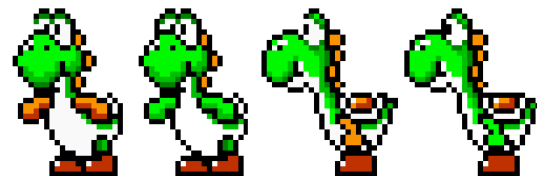
Pikachu ■ ■ ■

Pick the right colours to represent your characters features. Wrong colours lead to confusion.



Nose or beak?

Swoopers from *Super Mario World* (SNES) are bats. However their nose was coloured orange, which makes it look like a bird with a beak. Later games fixed this.



Why were Yoshi's arms orange?

This isn't due graphical limitations. Probably so that the arms wouldn't blend with the main body, but alas, they look like the stirrup of his saddle. *Super Mario Maker* (WiiU) fixed it. This issue is similar to Link's infamous pink hair from *Zelda: LTP*.

Light & Shadow

Guest writer: Glauber Kotaki



Drawing outlines can take a lot of precious space, so playing with dark and light tones instead might do the trick.

Light is used to **show important details**,
Dark pixels **fills the silhouette or outlines different features**.

Light and dark could change roles depending on your background colour or light source. **Use both together to form shape, volume and depth**.



Chasm (PC & PS4) (WIP, future release)

The darkest tones are used not only as shade, but to give depth and outline elements!
The brightest tones highlight edges and crucial details.



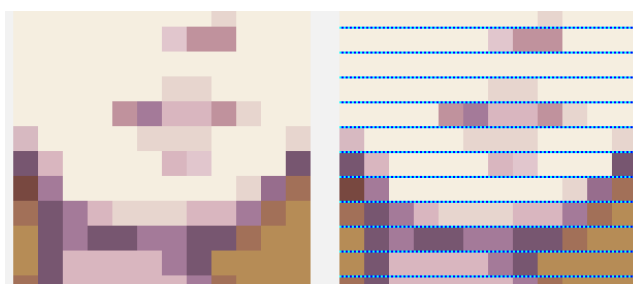
Using a different light source (e.g. in this example, from the bottom) to tell muscles and other body parts apart.

Duelyst (PC) (Open Beta, 2016)

Spacing and tangents

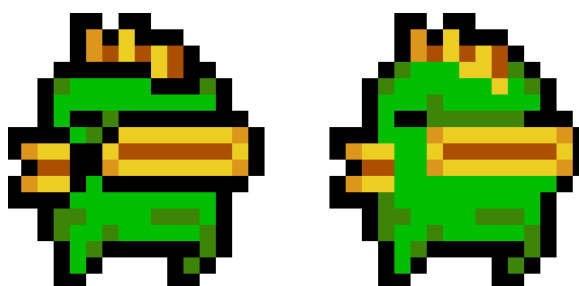


Spacing refers to **how far apart things are**. If two areas of the pixel drawing touch, the viewer may have a hard time telling what's going on. Spacing is using limited space to fit in as much information as possible. If you use up too much space in your sprite, **give it more room to breathe!**



Think of it like letter-spacing with fonts!

For example: a mouth needs space above and under it, so you can tell it's a mouth. If the mouth were to touch the chin, or even the nose, it would be unclear what it's meant to be.



Nuclear Throne (PC, Steam)

One way is to get rid of in-lines.

They can hinder readability as seen in **Chapter 1** (p9) , **Chapter 3** (p20) and in this chapter on the previous page you just read! They're not bad per say, but can be annoying.

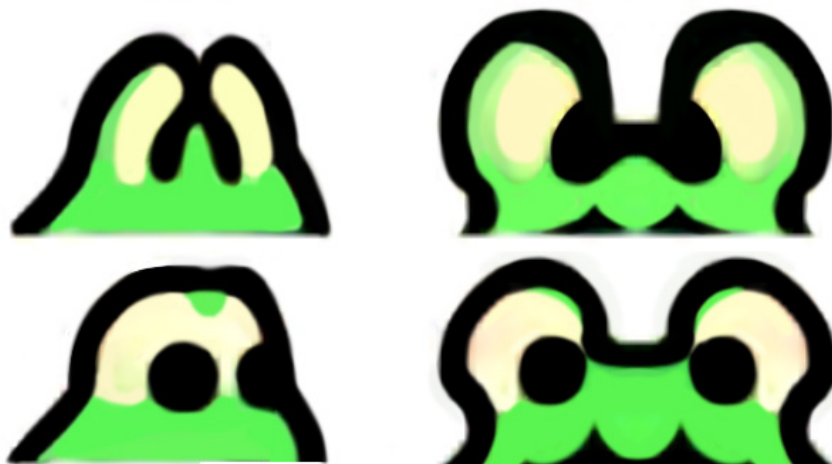
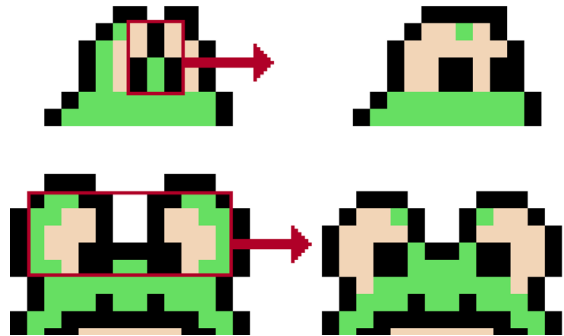
Another way is to re-arrange pixels.



In *Super Mario Brothers 3*, the frog suit is meant to have eyes on top of Mario or Luigi's head. The way pixels are spaced out makes it look like bunny ears instead! Except for one good frame: Mario kicking a shell is undoubtedly a frog head. Let's use it as a reference to fix this.

Top row: Original
Bottom row: Edited

Not only did I remove the black inline, **I simplified the design**. The eyes are completely white with no eyelids. The pupils are now 2x2 pixels and don't blend in with the outline!



Here is how we interpret the frog eyes if they were in HD
(top row = unedited, bottom row = edited).

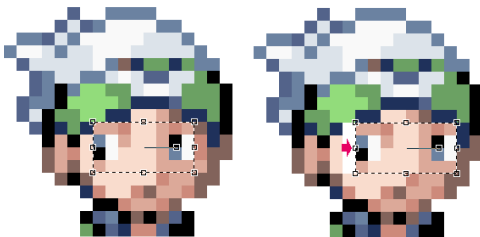
Moving areas and adding more space



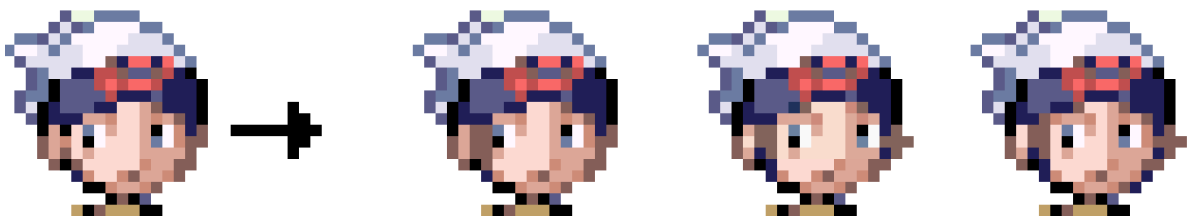
Before the remakes of *Pokémon Ruby/Sapphire/Emerald* (GBA), Brendan created some confusion: **Is it white hair or is it a hat?** The back pose doesn't help the problem: his hair is painted blue and blends with the headband!



If we use the space between the eye and the sideburns, we create a tangent!



We can create more space for the hair **by selecting a part of the face and move it to the right**. Now the hair has 2px of width, enough for it to stand out. Make sure to try multiple versions!



The palette doesn't allow for a dark brown. So to paint the hair we have to use the darkest skin tone and make the hair more noticeable.



Sprites and Backgrounds

Sprites should always stand out from backgrounds for game play purposes.

What do you want your audience to focus on?

If you are not making a game, **you still want to distinguish backgrounds from objects.** This happens in other mediums such as Photography. This is for Readability.

Adding Outlines



Correcting colours



Focus (foreground is sharp/background is blurrier)

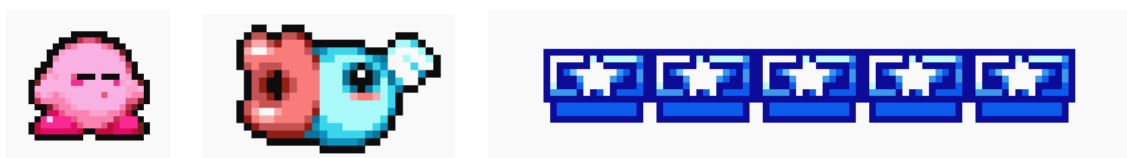


Case Study: Kirby and the Amazing Mirror

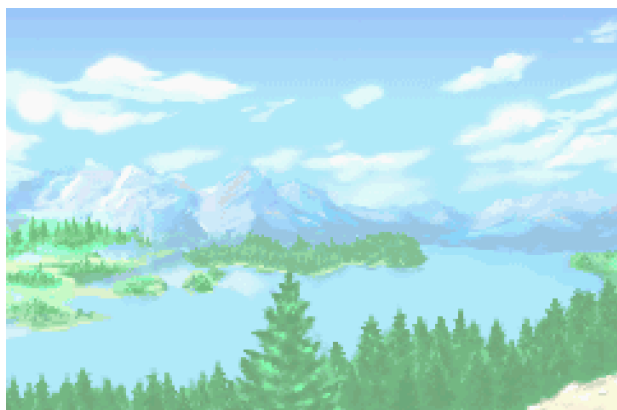


Kirby and the Amazing Mirror (GBA) made the decision to include highly detailed paintings as back-grounds. It's no surprise all 3 techniques were used:

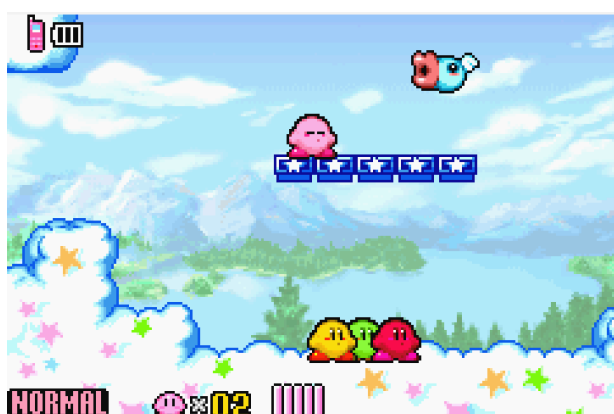
Objects and sprites have clear outlines to stand out.



The colours of the background are softer to compliment the foreground.



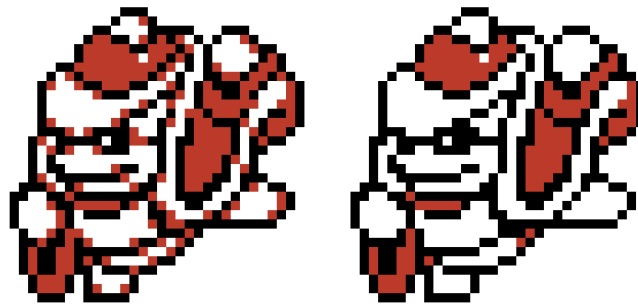
The background isn't in focus and appears more painterly.



Anti-aliasing & Dithering

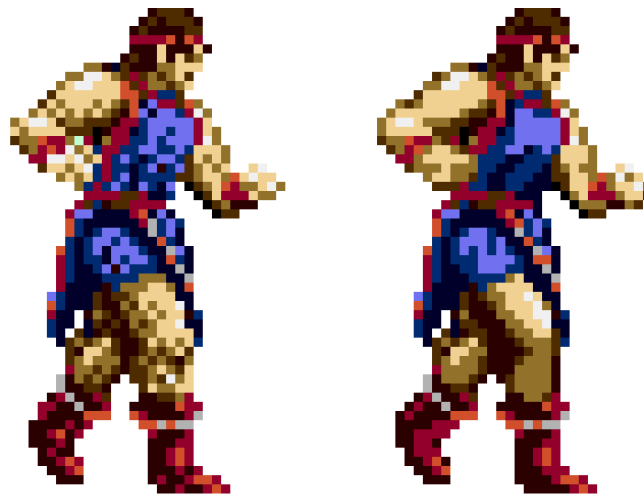
More advanced techniques such as AA and dithering might not get a chance to be used, as they take critical space.

As seen in **Chapter 2**, AA can slightly improve readability *when used moderately*.



From Kirby's Dream Land 2 (GB)

The original King Dedede sprite (left) has subtle AA to clean up the curves. The sprite on the right is just as good, but lacks colour and it's easy to misinterpret blobs of pixels.



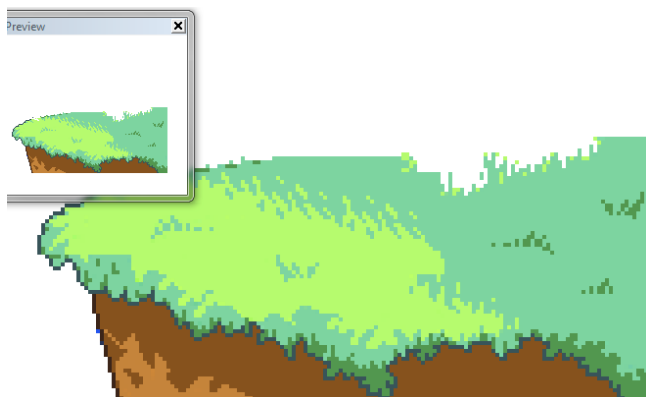
From Jewel Master (Genesis)
Left: Original. Right: Edited.

Dithering (checkered shading) is pretty useless on small scale sprites. **Dithering works well on larger pixel art or textured surfaces**. It makes your sprite look rougher and less smooth.

**This will be detailed in the chapter titled: "Dithering".
A less common technique nowadays, but useful for colour limitations.**

How to spot readability issues

Use preview thumbnails.



By Michafrar

When working on a picture, make sure to zoom out a lot. To prevent this you can also just have a permanent preview of what your work looks like at its true resolution.

(1x- 100% size)

This example is within Graphics Gale.

Blurring the picture.



By Michafrar

Sprites will most likely look blurry on different devices, or even the human eye will blur pixels when viewed from far away. Blurring can also help you find banding.

If it looks bad when blurred, you have to go back and fix it in the pixel version.

Waifu2x

waifu2x
[en/ja/ru](#)
Single-Image Super-Resolution for anime/fan-art using Deep Convolutional Neural Network

Image
URL: or
FILE: No file selected.

Limits: Size: 3MB, Noise Reduction: 2560x2560px, Upscaling: 1280x1280px

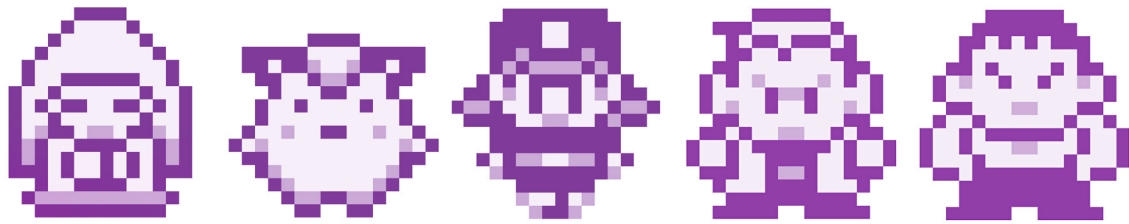
Noise Reduction (expect JPEG Artifact)
 None Medium High Super(tmp)

When using 2x scaling, we never recommend to use high level of noise reduction, it almost always makes worse, it makes sense for only some rare cases when image had really bad quality from the beginning

Waifu2x allows you to upscale any picture, not just pixel art. It upscales your work, reduces the noise level and carefully optimizing your work for higher resolutions.

When curves don't look right, you might want to go back and fix those jaggies! It's... also really cool.

Conclusion



Big or small, pixel art can occasionally create confusion. With limited space we sometimes have to have to sacrifice detail to keep things clear and readable.

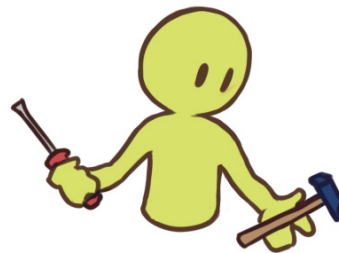
Remember that every single pixel matters.

If you're unsure of how readable your sprite is, **don't be afraid to go back and fix things!** Working small is a challenge, but it will make you realise how important every pixel is.



Food for thought

Introduction
Size matters...
...but pixels matter more!
Why every pixel matters I
Why every pixel matters II
Recognizable features



Tips and tricks

Easy to read symbols
Symbols I - Hands
Symbols II - Eyes
Spacing and tangents
Anti-Aliasing & Dithering
How to spot readability issues



Art design

Ch. design & Proportion
Silhouettes
Colour design
Light & Shadow
Sprites and backgrounds

