

PIXEL·LOGIC

The PDF archives



Chapter 2: Anti-Aliasing

Introduction

A picture is worth a thousand words. So for the **next few pages**... **Zoom in!**

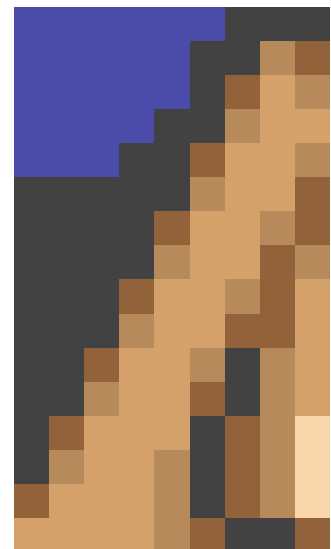
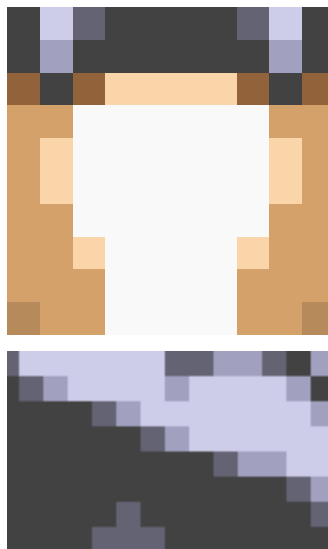


Aliased



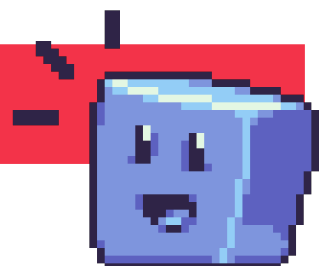
Anti-aliased

Anti-aliasing helps you smooth out edges **by placing pixels in little corners**. Pay attention to where these little blocks are: they usually **blend** dark areas with light areas. They're sometimes found between 2 shades too, **smoothing** highlights from shadows!



Starfox 2 (SNES, unpublished)

Anti-aliasing is often abbreviated as "AA".



To AA or not to AA?

One is not better than the other, but anti-aliasing is of **utmost** importance for pixelart. Should I use anti-aliasing or not? Is it worth my time? **Let's have a case by case study.**



with anti-aliasing



no anti-aliasing

A custom pixel art of Nintendo's Metaknight. I originally created this with anti-aliasing. However, when removing all anti-aliasing, the picture didn't lose much quality. It's not easy to tell the difference. **AA is just icing on the cake here.**



original graphics



extra anti-aliasing

Three sprites from *Scribblenauts* (NDS). The original graphics already had some anti-aliasing on the kangaroo. Can you tell the difference? It's hardly noticeable. These sprites don't benefit from anti-aliasing. **The style of the game pretty much dictates anti-aliasing is useless and doesn't add anything!**



original graphics



no anti-aliasing

A King Dedede sprite from *Kirby Super Star Ultra* (NDS) . This is where it gets painfully obvious. These sprites are all about soft and smooth shapes. **Without anti-aliasing, all detail is lost.** It is absolutely necessary for this style.



original graphics



no anti-aliasing

An Unown from *Pokémon Crystal* (GBC) . The sprite without AA feels blocky. The original graphics had an abundance of AA. The battlefield was displayed on a white background. **Since sprites could have a total of 4 colours, they maximized AA.** The black sprite feels harsh on a pure white background.

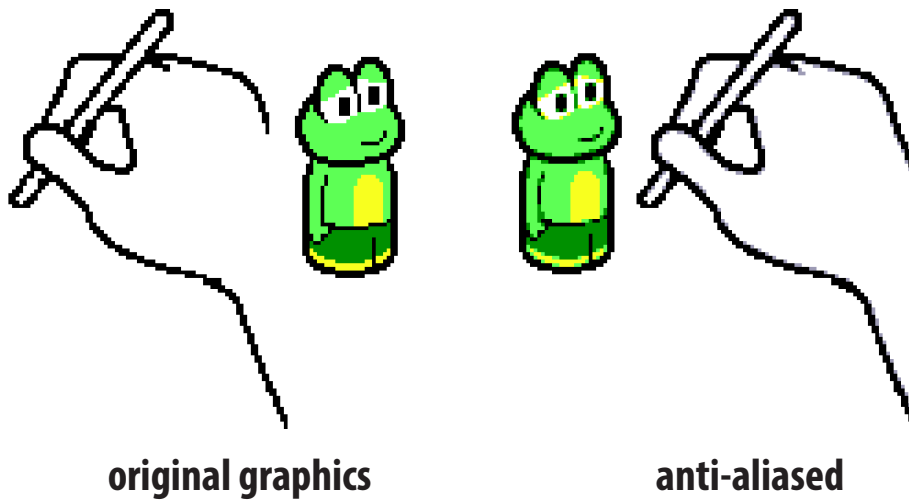


original graphics

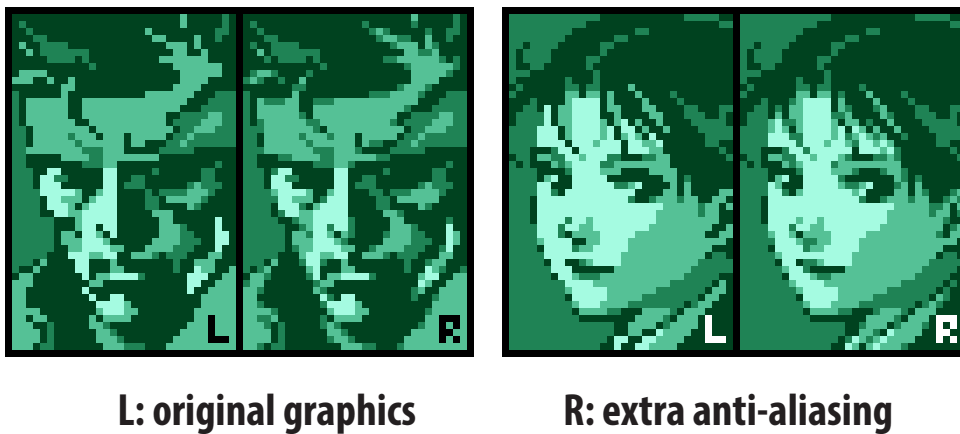


no anti-aliasing

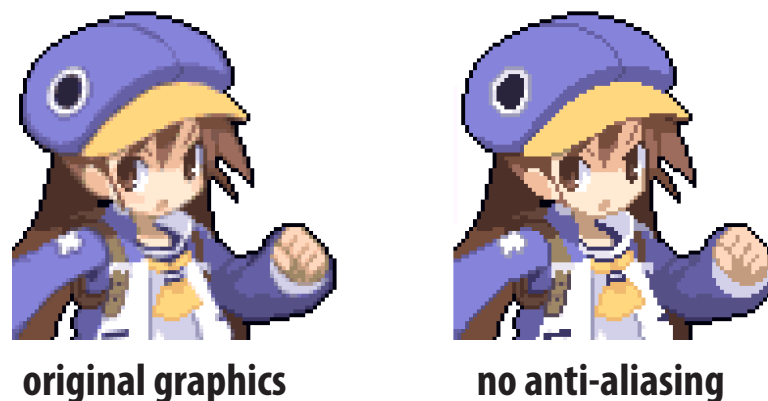
Portrait from *Fatal Fury 2* (GB). Removing the AA makes the sprite more readable, but at a cost: there's less detail. **To get the most out of a gameboy palette, it's best to add anti-aliasing.**



Objects from *Rhythm Heaven/Paradise* (NDS). Most of the graphics in this game are entirely aliased, sharp, and jagged. It tries to mimic Ko Takeuchi's art style. However adding slight AA makes the sprites nicer to look at. **It's entirely subjective**, but anti-aliasing can give it a much softer look.



Portraits from *Metal Gear: Ghost Babel* (GBC). Here, the difference is only noticeable when zoomed in. When these portraits are displayed at a small resolution, you can barely tell the difference. **The sprites look good without any anti-aliasing in the original graphics.**



Fuka Kazamatsuri from *Disgaea 4* (PS3). These sprites are scaled down drawings and touched up by pixel artists. If you remove all the AA, there isn't much difference, due to low contrast. Colours with low contrast, don't need much AA. Nonetheless this was displayed in HD resolution on a Playstation 3; smooth anti-aliasing is a definite must.

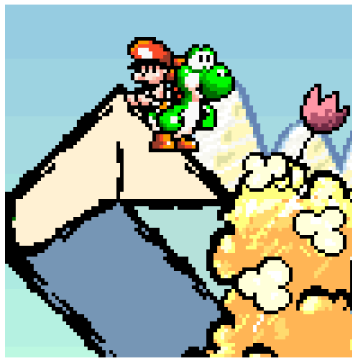


original graphics

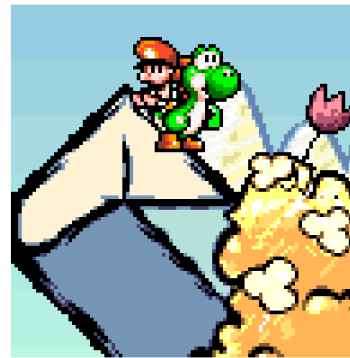


no anti-aliasing

Advance Wars (GBA). As with *Disgaea*, this sprite is art scaled down and touched up manually to fit the limitations. **They used AA to preserve the detail of the original art.** Without it, it's just a pixel mess.



original graphics



with anti-aliasing

SMW2: Yoshi's island (SNES). Just ... NO. The game clearly went for a crayon look. This needs to stay crisp and sharp. **Anti-aliasing makes it worse.**

Conclusion

Anti-aliased



Aliased



Pros

- + Smooths curves on small sprites
- + Necessary for large sprites
- + Sub-pixeling animation

- + Makes sprites more readable
- + Limits your colours
- + Faster

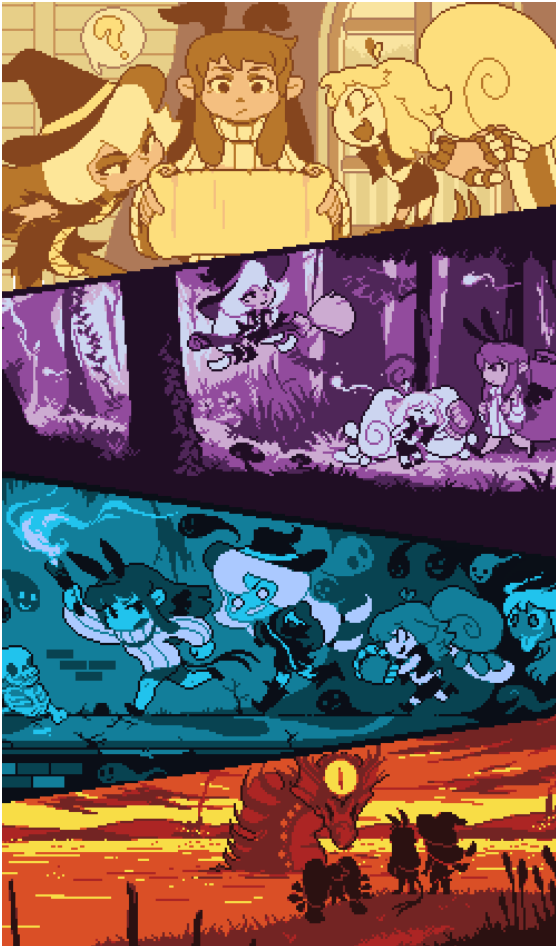
Cons

- Tedious if overdone
- Blurs tiny sprites

- Creates jagged lineart
- Sharp & blocky

When is it necessary?

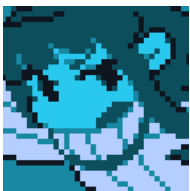
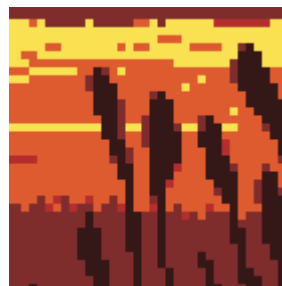
Guest artist: **Temmie Chang (Tuyo)**



TuyoART.Tumblr.com

Temmie's work focuses on smooth and easy to read line work. Although there seems to be little anti-aliasing at first glance, she uses it quite strategically.

AA is used to **smooth out those unavoidable jaggies**.



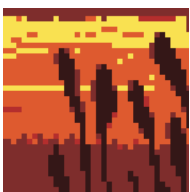
Clarity

Characters, faces and eyes usually draw people's attention. It's best to make them clear, recognizable and easy to read.



Detail

This area contains a lot of small curves. Smaller curves are often more jagged. It requires more AA than bigger curves.



High contrast

If you have 2 highly contrasting colours, try blending them using some intermediary pixels

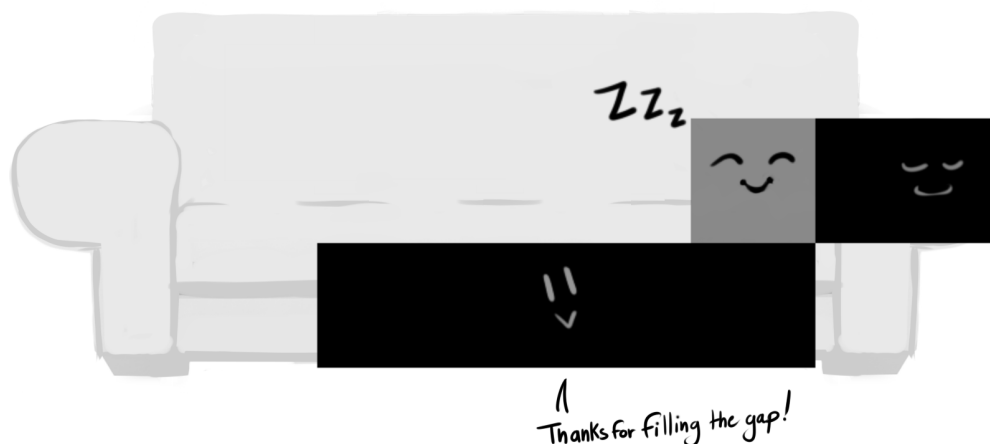


Line weight

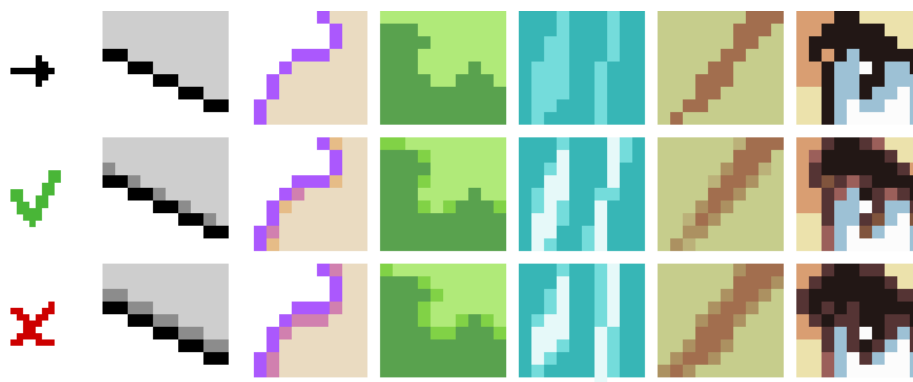
Anti-aliasing is used to add or remove some line weight. By adding AA, you can make things look thicker or thinner.

How to apply

AA is simply putting pixels in little corners to make lines and shapes smoother.
It's kind of like **cushions on a couch!**



These examples should help you identify good AA from bad AA. They range from simple to more complex.



How many blocks do I add?

Usually about half of the length. Too little is better than too much.

How many shades do I use?

- one, to start practicing
- two for smoother results
- three, if you have enough colours and feel confident.

Note: too much AA blurs the line between pixel art and vector art

Which corners do I fill?

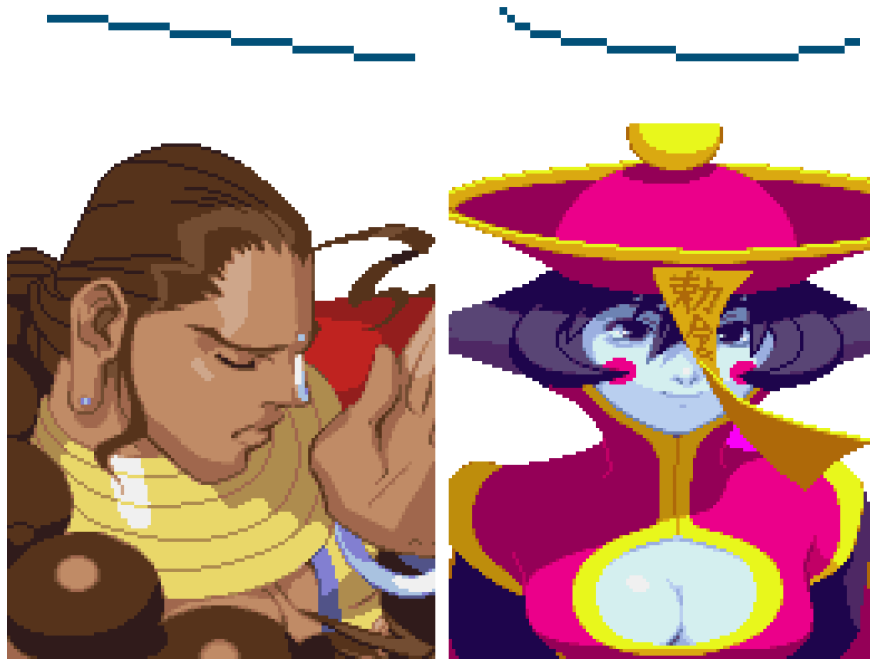
The next following pages will help you with techniques to help

I recommend a mix of 1 and 2 shades. Go look up some of your favourite sprites that have AA. Try and see how they do it. See what suits YOU.



Steep lines

These are staircases with **very long flat steps**. They're rare for small sprites, but are more common with larger pixel art. If you're not happy with the aliased look, you can still add AA.



Darkstalkers 3 (Arcade/PS1)



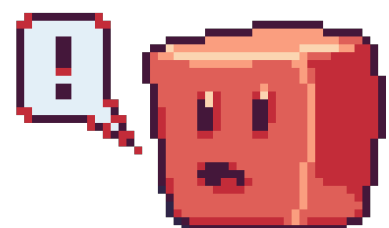
longer steps = longer AA

Remember:

There are many exceptions. Longer AA isn't *always* necessary.

You can have shorter blocks. It's completely up to you!

Always make sure to zoom out and judge for yourself.



Although drawings are not pixel art, they're still made up of pixels on screen. This is known as the technical term of raster graphic images, or in simple English: "images in a pixel grid".

Let's zoom in on a steep curve that is very horizontal. We'll then compare it to a line that is more diagonal.



Hat in Time (PC)

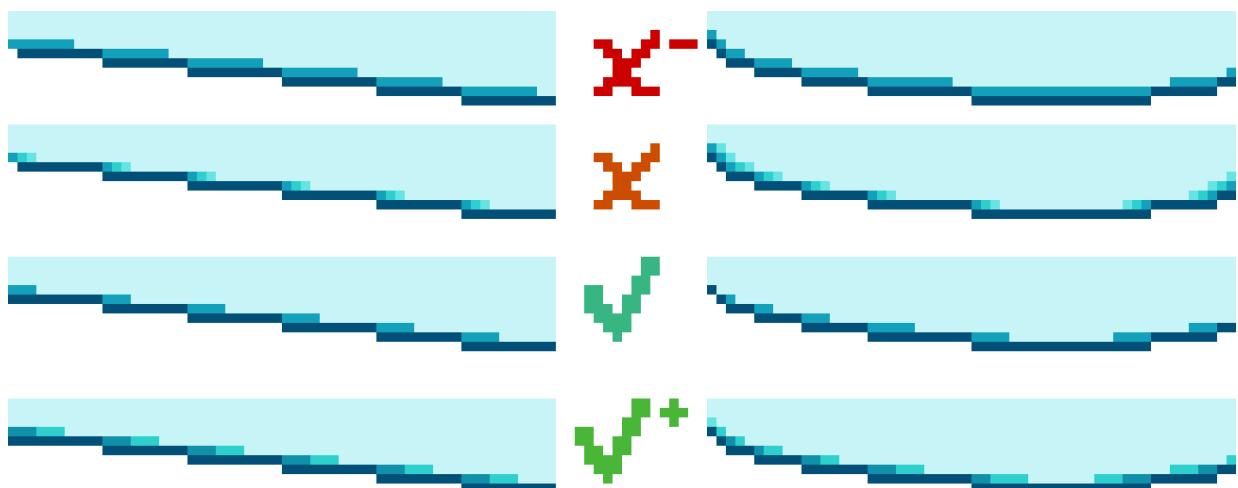


Notice how **the steeper the curve, the more colours there are.**

Of course, for pixel art, it would be too blurry with too many colours. It wouldn't resemble traditional pixel art any, but a regular picture instead. The number of shades is up to you.

longer steps = more shades of AA

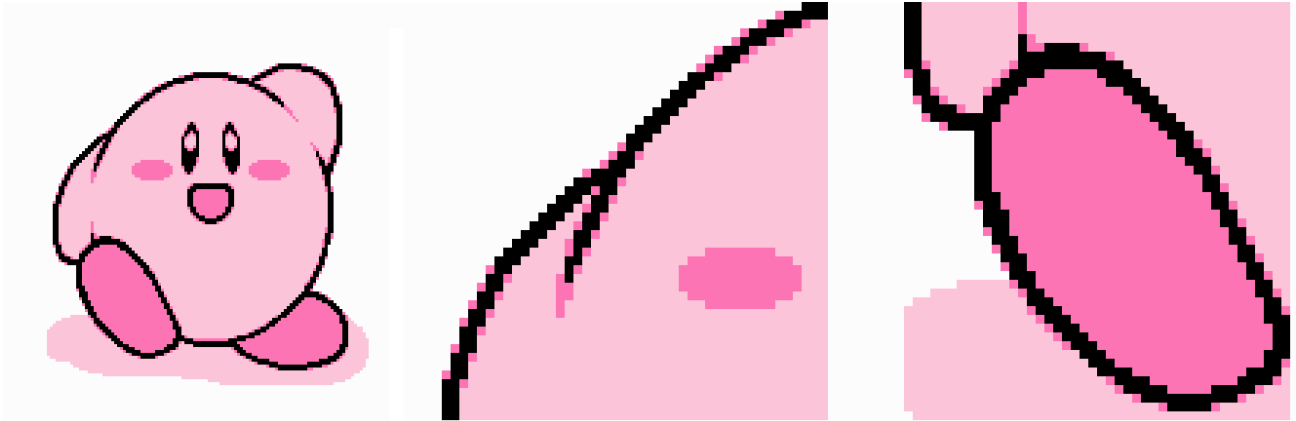
Summary



45° lines

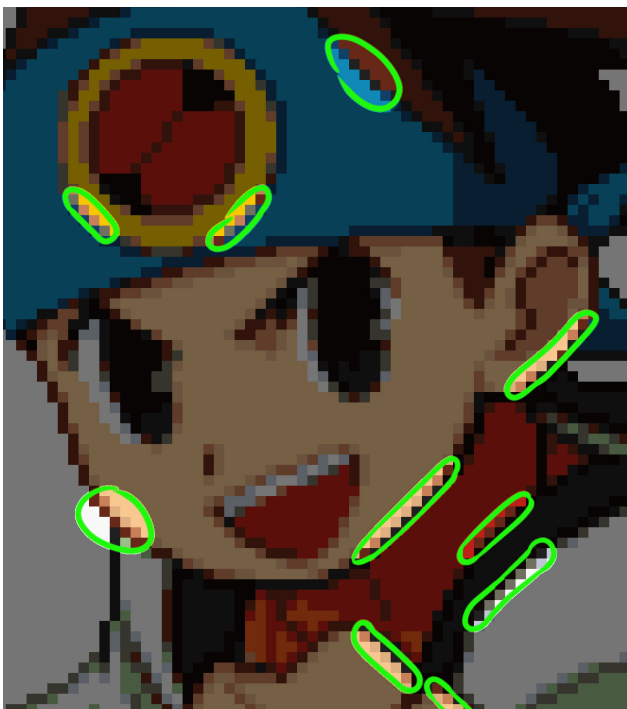
Anti aliasing on 45° lines is uncommon but there are exceptions!

Here, NES limitations showcase the lack of AA nicely. With **few colours**, there is little to **no need**.

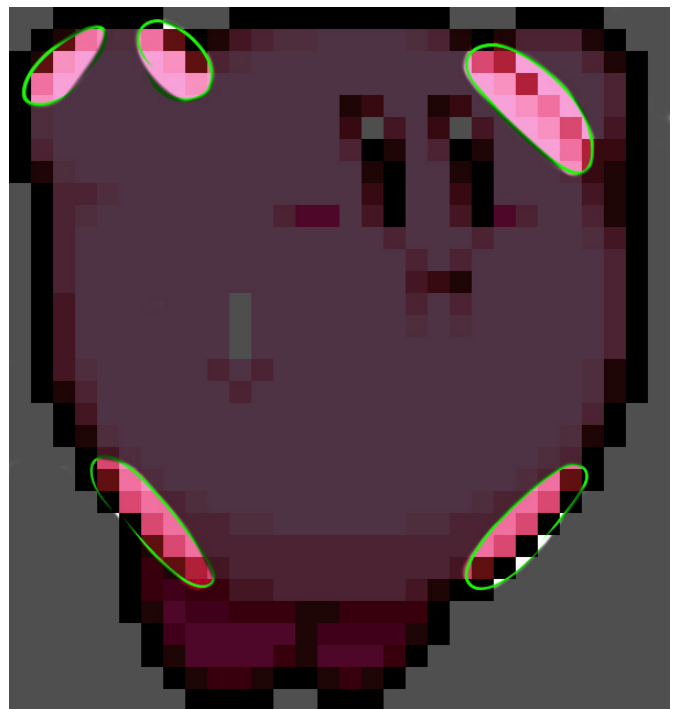


Kirby's Adventure (NES)

With sprites that have more colours, there's more variety:



Mega Man Battle Chip Challenge (GBA)



Kirby's Super Star Ultra (3DS)

The centre of the curve is either **lighter or darker**:
it depends on the type of curve



Convex Curve

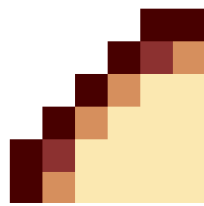


The center has **light colours**

The ends have **dark colours**



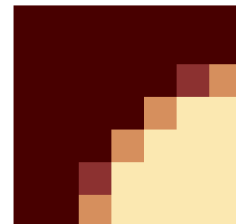
outwards



↑
outline

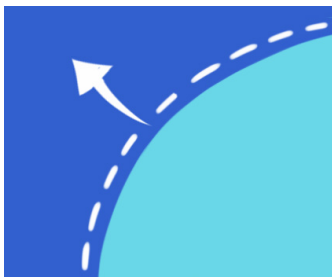


↑
w/o outline



↑
dark BG

Concave Curve

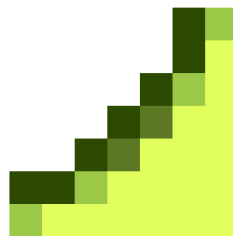


The center has **dark colours**

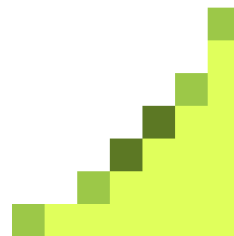
The ends have **light colours**



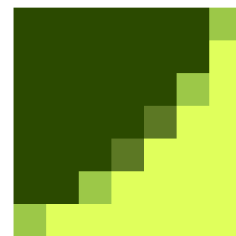
inwards



↑
outline



↑
w/o outline



↑
dark BG

Darker or lighter pixels change the **weight** of the 45° part.

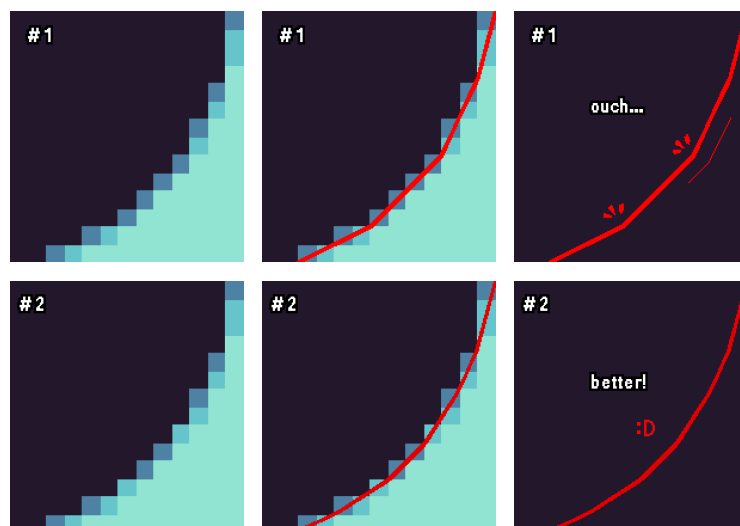
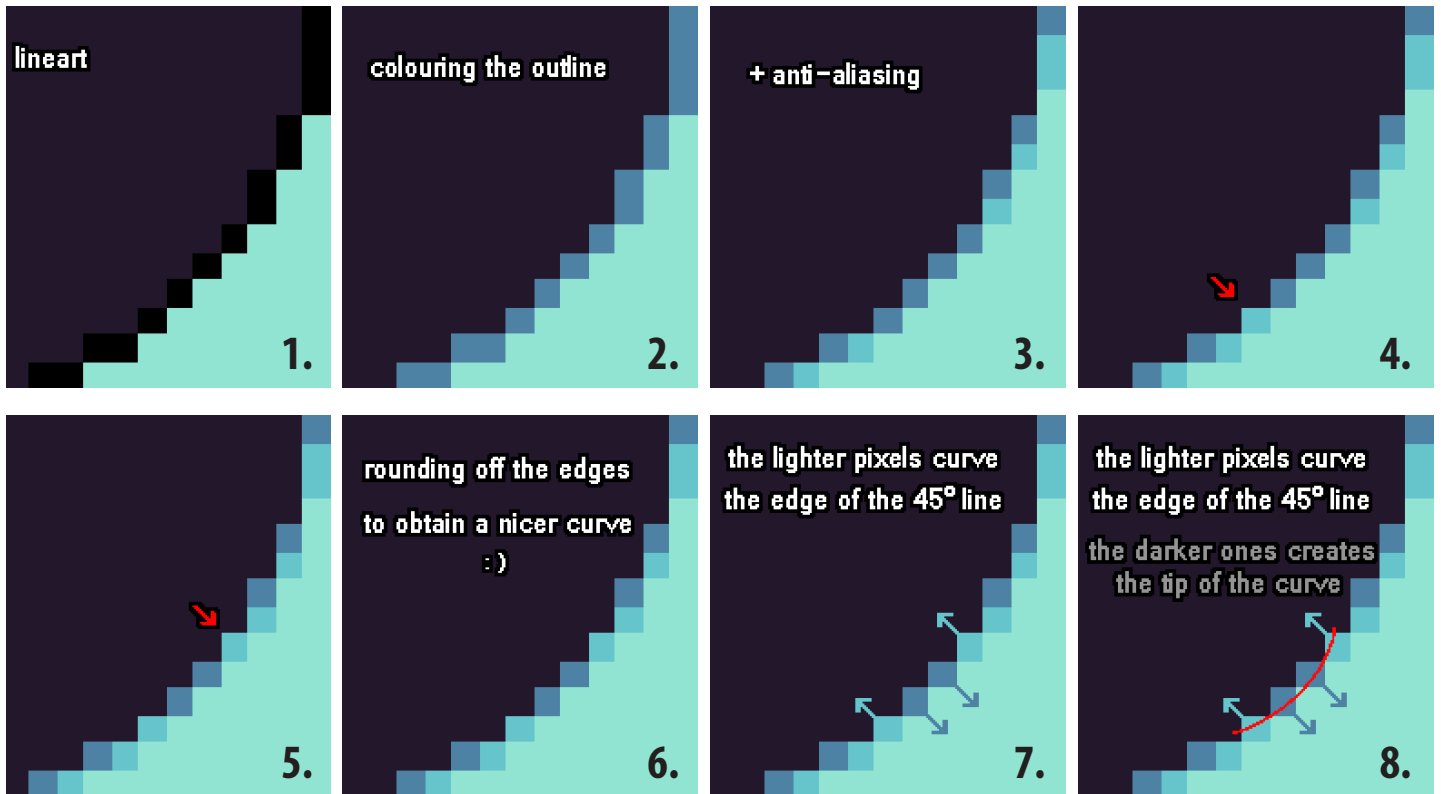


Pixel-Logic bonus #2

Still unsure how to make a 45° line slightly curve? No problem!
Here is an example of a curved in line.

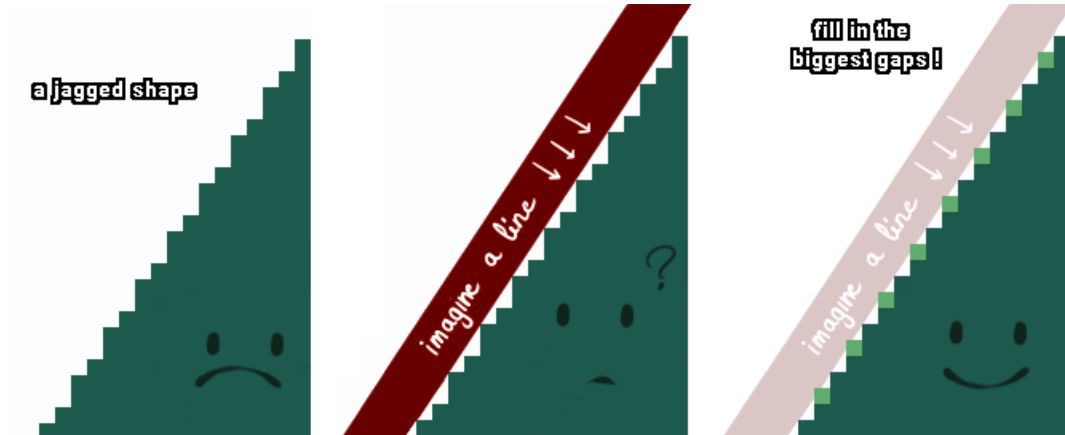


The following curve is from the red frame featured on this sprite.
It's an outline, but it could easily be blended with a background.



Jagged lines

What to do with a naturally jagged line? They are rare, but exist nonetheless. Try this trick.



Wish to stop there? Fine, the line is smooth enough.
Want to go even smoother? Try this.



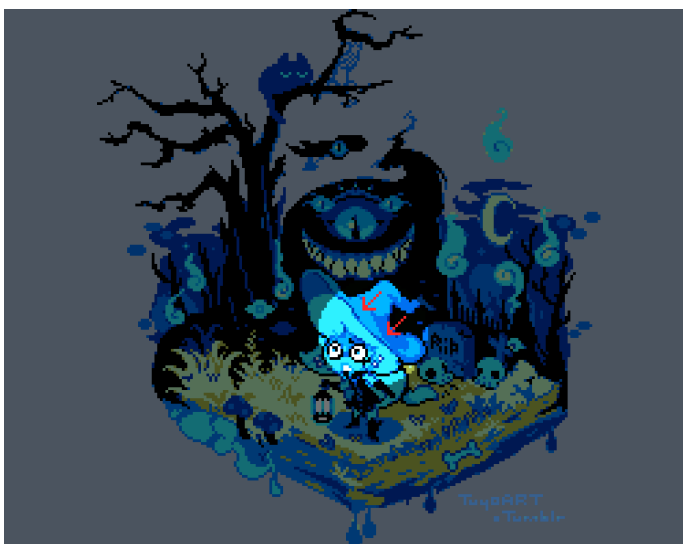
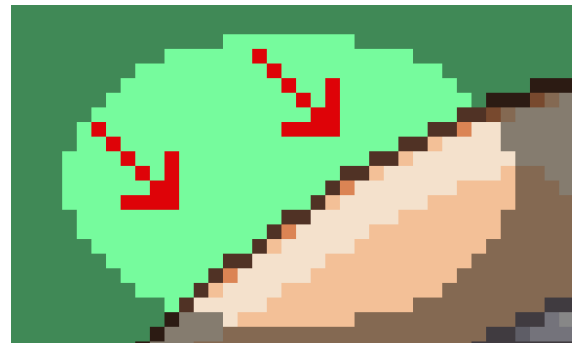
This works for other types of jagged lines!



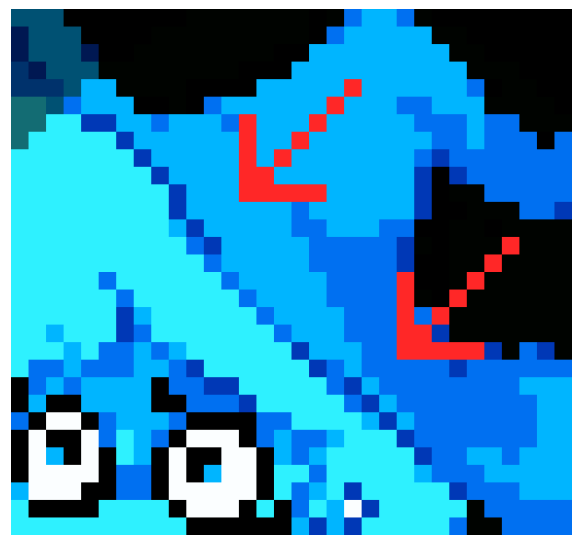
Some examples of this technique being used:



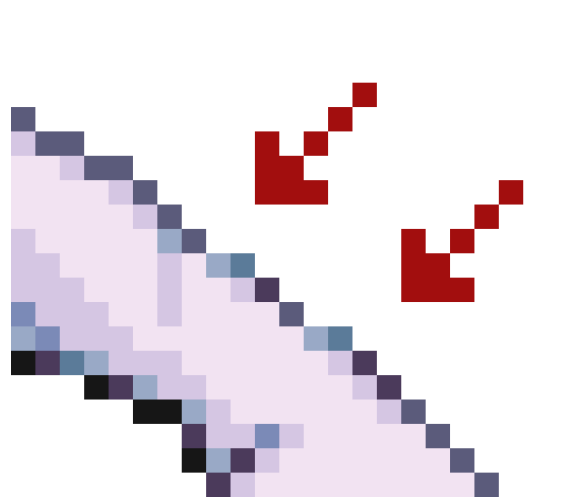
Maho Sensei Negima! Private Lesson 2 (GBA)



Temie Chang's isometric Halloween scene (@tuyoki)



Darkstalkers 3 (Arcade/PS1)



Line weight and thickness

Manipulating colours can help you **make lines look thicker or thinner**, even at 1 px!
Mouths usually tend to be just a simple line. So let's take mouths as an example!

Breath of Fire IV (PS1)



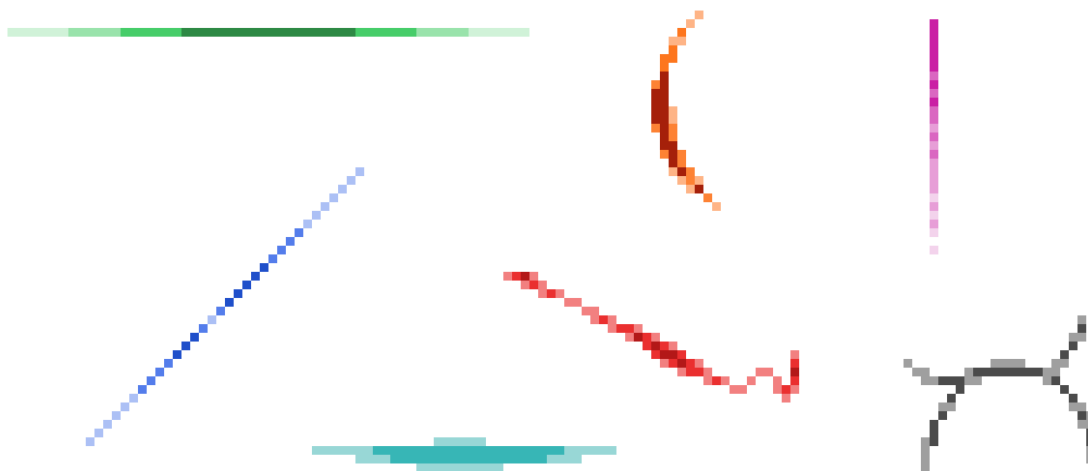
dimples are light, lips are dark

dimples are dark and appear thicker!

Look! What is thicker or thinner?

DARK = **THICKER**

LIGHT = **THINNER**



You can even add lighter lines on the tip of a curve (black and cyan examples)

Just play around, but don't use too many shades!

Observe the lines on the following sprites. Focus on the face.

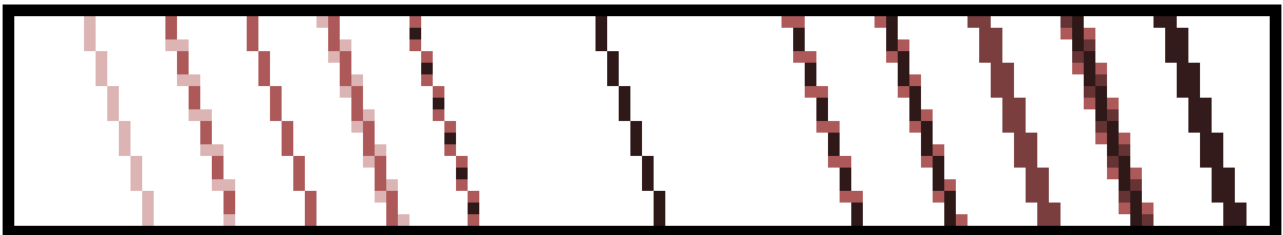
By adding more anti aliasing, lines appear thicker. **Less anti aliasing makes lines sharper and thin.**



Earthworm Jim (Sega Genesis)



Disgaea 4, Disgaea D:2 (PS3)

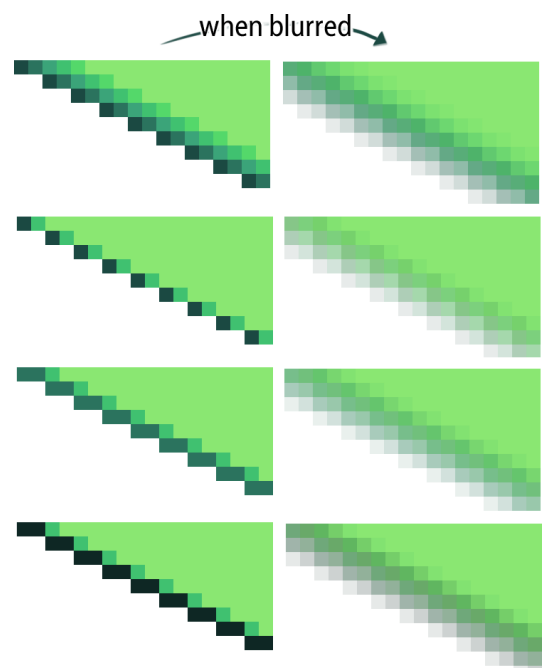


Look how a line can be thicker or thinner. Look at the colours and the pixel placements!

Remember:

There's no point in overdoing AA. You can get the same result with less effort: When blurred the 1st one is almost identical to the last one. So there's no need to overdo AA. **Just stick to 1 or 2 colours.**

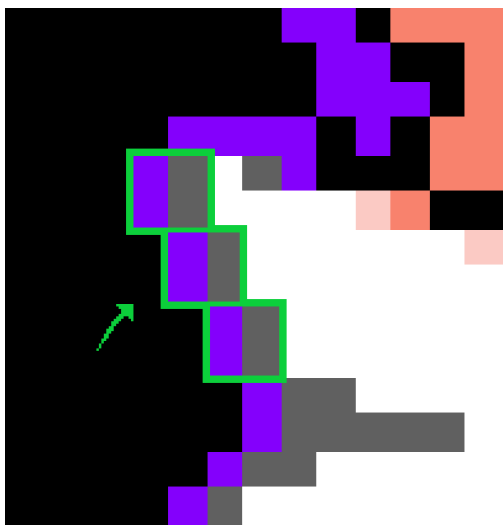
Line weight is complex. It's the basis of sub-pixel animation. This will be continued in the chapter: **"Sub-pixeling"**.



Banding

...is simply BAD.

This happens when two rows of pixels perfectly *hug* each other. Sounds cute, but it *really isn't!* They are the same length and **stick to each other**.



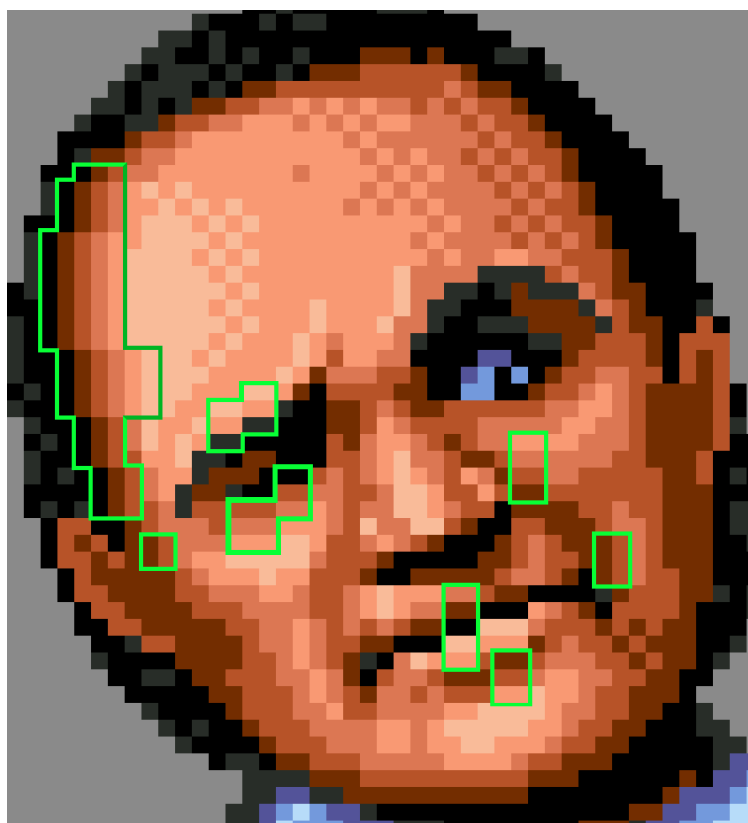
Little Nemo: Dream Master (NES)

This can get worse:



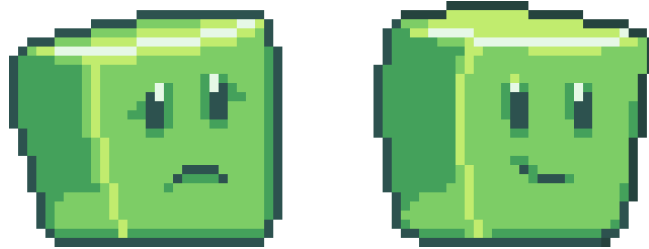
Ghostbusters (Genesis/Megadrive)

Worst part is that this picture has way more banding. So much I'm not going to bother with it.



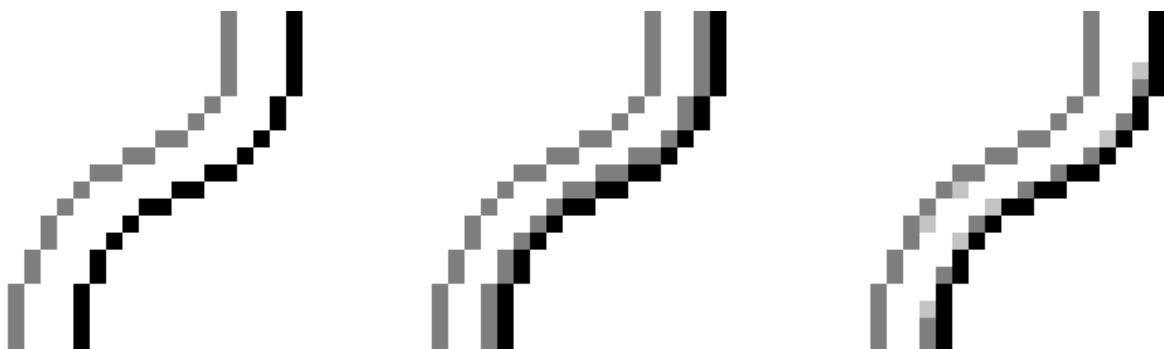
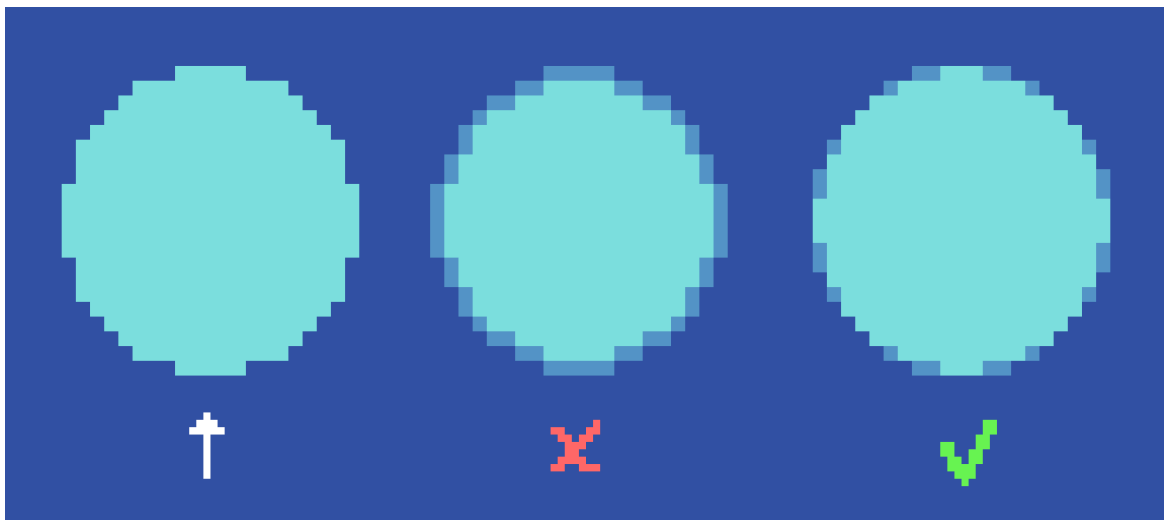
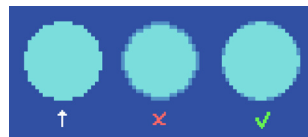
Why is this so bad?

- It makes your curves look **blocky**.
- It makes lines appear **thicker** than you originally wanted them to be.
- It **blurs** your outline too much.
- It follows the outline perfectly, resulting in **pillowshading**.



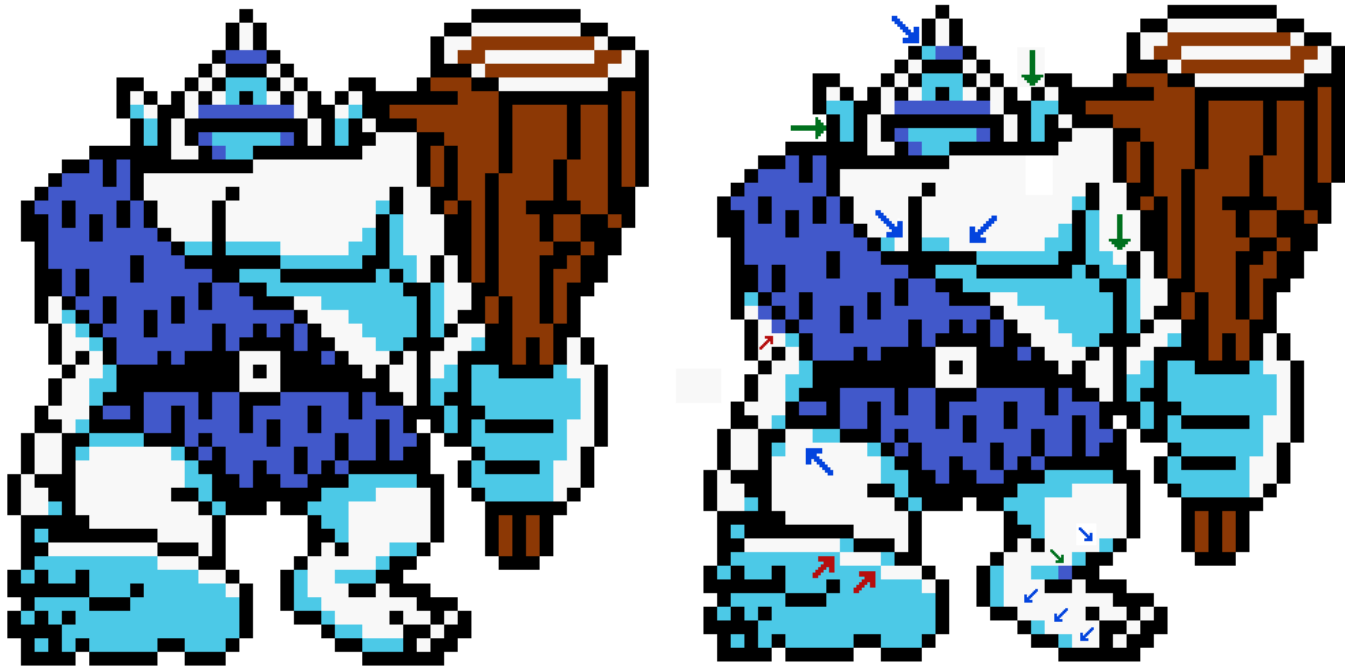
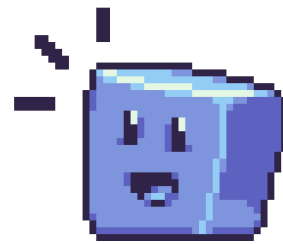
You might be thinking: *"I don't see a problem with it?"*

This is because **you're looking at it zoomed in**. When viewed at 1x or 2x size, it really bleeds into the sprite, and that's when you notice banding



How do I fix it?

- Remove a **pixel** or two from the edge.
- Add a **pixel** or two to the edge.
- Use **Anti-aliasing**.



Dragon Warrior Monsters 2 (Game boy Color)

Left: With banding

Right: Fixed with the advice above.

Banding is bad, but don't worry.
Sometimes it's unavoidable.
When you see it . . . fix it!
Just try to eliminate it as much as you can!

There are less significant types of banding such as parallel, dithering banding and AA-banding, but those will be mentioned in the chapter "Clean-up".



Pixel-Logic bonus #3

Still don't see what's so wrong about banding? Let's examine.

If banding were in a regular digital painting or drawing it would look like this:



no banding



banding

Note that this is just cell shaded. It would far get worse if it were soft-shaded.



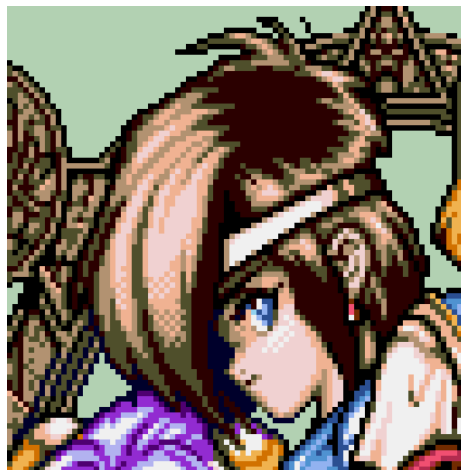
Another way to prove banding is a pain to behold is by blurring the image.

Just...ew!

Conclusion

Anti-aliasing is a **big subject**. It's no surprise this is a longer chapter. Don't worry. Most of these techniques **will become instinctive over time** as you make more pixel art.

Some people make pixel art without any AA... and they do an incredibly beautiful job! Remember to **look up videogames** that inspire you and **see how they use AA**.



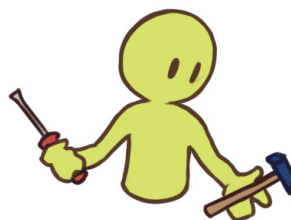
Shining Force CD (Sega CD)

Here's a quick overview of the chapter:



Food for thought

Introduction
To AA or not to AA?
When is it necessary?



Practice

How to apply
Steep lines
45° lines
Jagged lines
Line weight



Avoid

Banding

Next time we'll have a good look at **colours** and how to pick palettes!