There are two properties that matter with a wavedash: movement and actionability.

Here I will be assuming the player wants to go as far as possible (rather than going at a precise spot). Overall, the closer the angle is to horizontal, the farther you go - there are exceptions to that rule at the microscopic level but it hardly matters here.

Regarding actionability (when can you act after the wavedash), you undergo 10 frames of landing lag from the airdodge when you touch the ground.
However, you are only guaranteed to touch the ground on the first airdodge frame if you airdodge on the first airborne frame (as all characters have Y=0.0001 on their first airborne frame).
If you airdodge on frame 2, what height you're at (which depends on which character you play and whether you full or short hopped) and the angle of your airdodge will determine how many frames you take to reach it, and any frames of the air dodge spent airborne delay your timing of actionability by that amount.

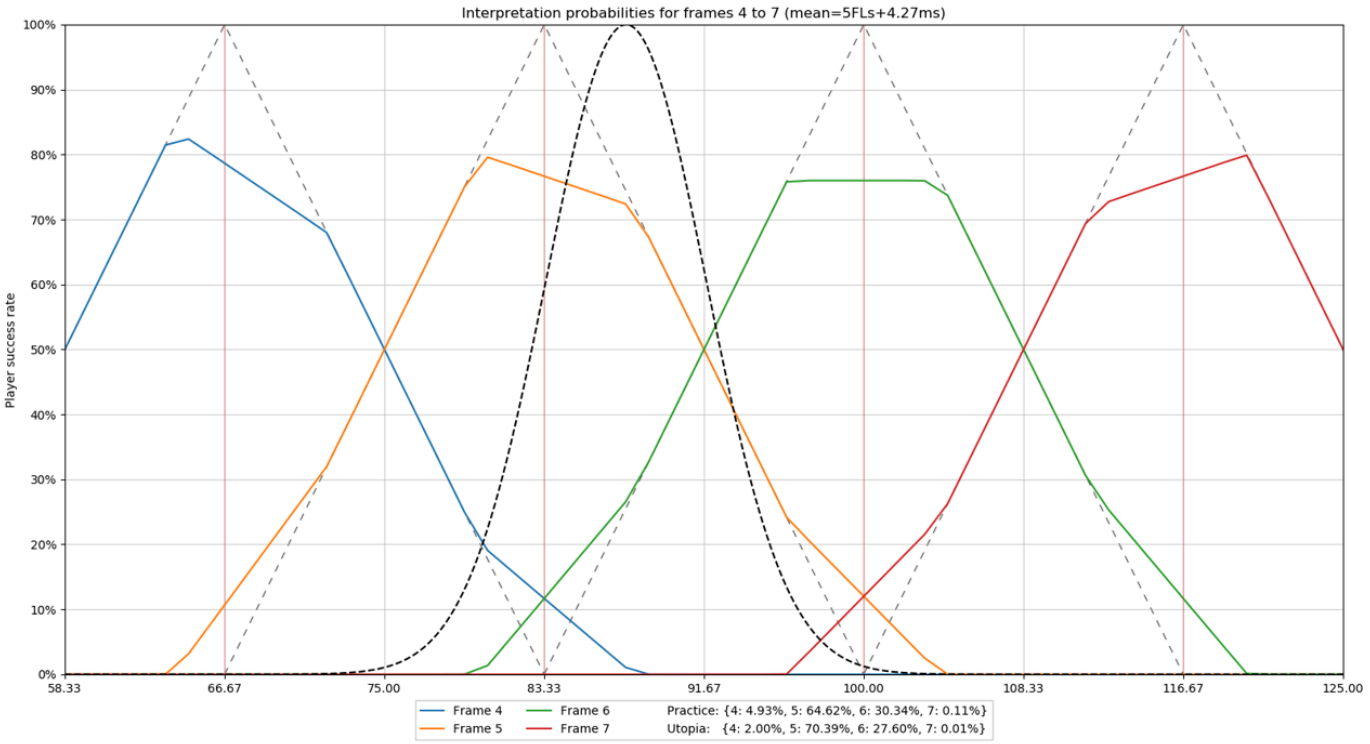
For actions out of wavedashes (ie dashing, attacking, as opposed to crouching/shielding that can be buffered), the timing you would've been actionnable at if you had air dodged on frame 2 is always the timing that matter - even if you air dodged on frame 1.
The reason being that with the way the game (polling) works, you can neither react to nor know (from how your fingers moved) that you air dodged frame 1 or 2.

With a 5 frames jumpsquat (JS) character, pressing Y and R 5.2 frame lengths apart will have 80% and 20% chance of resulting in a frame 1 and 2 air dodge, respectively. 5.6, 40% and 60%. 4.9, 90% frame 1, 10% empty jump.
Only pressing them exactly 5 frame lengths (5*16.683ms) apart will have a 100% chance of resulting in a frame 1 wavedash.

Considering that:

- Humans are limited in their temporal accuracy
- Air dodging too early is a LOT worse than air dodging 1f late

We can modelize the situation as follows:



What you care about here for interpretation probabilities is the dashed lines and ‘utopia’ legend (the colored lines are what happens with a non-OCd official adapter; I salvaged that slide from a presentation on timing dispersion that never came to be).

This is the input timing distribution (modelized here as a normal law) that a player with the following properties will end up using:

- Would get 80% success rate at a frame perfect technique [-> Normal law variance]
- Is only fine with failing its wavedash (empty jumping) 1 time out of 50

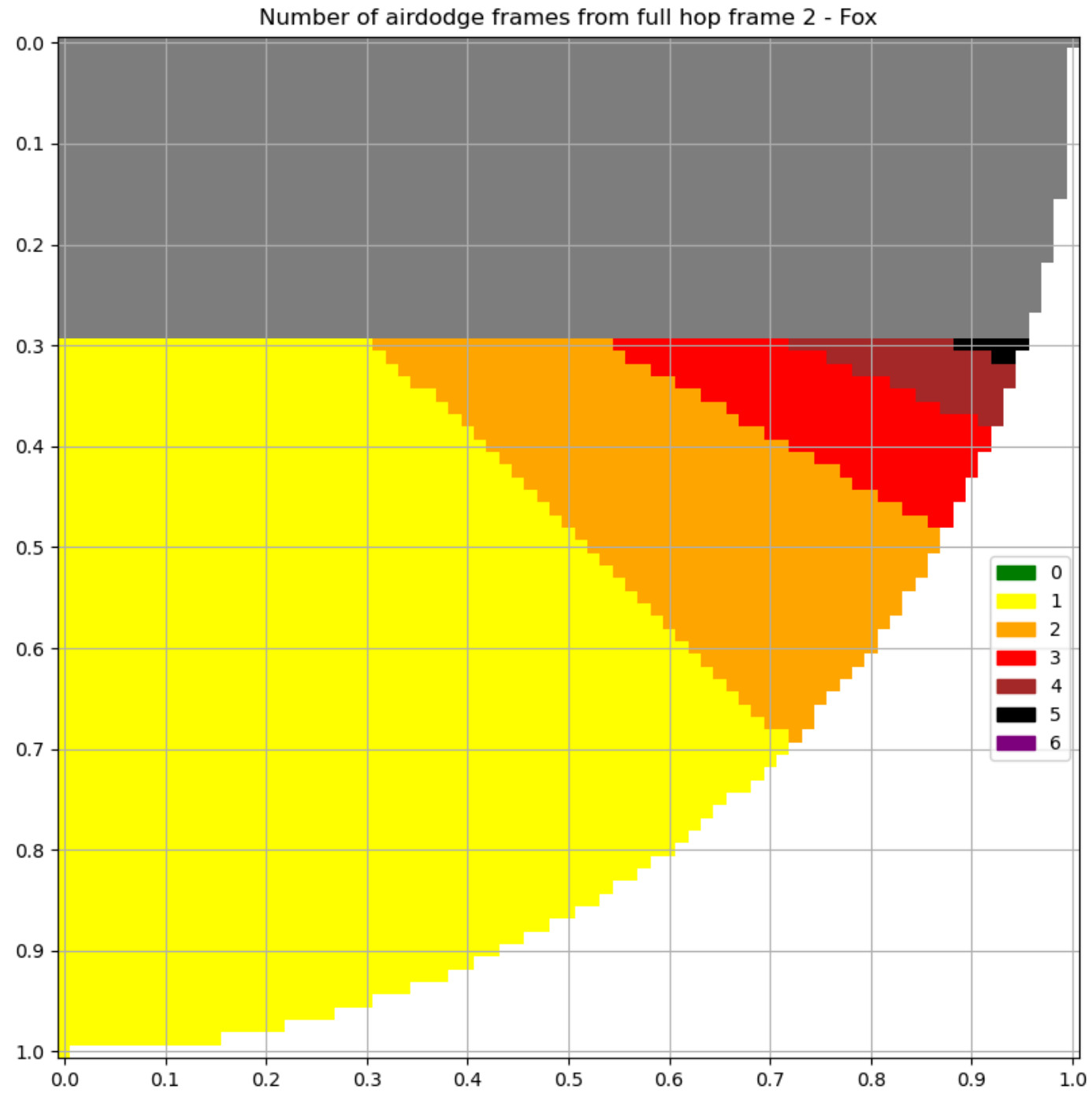
Shifting your timing to avoid being too early implies being late a significant part of the time (here 27.6%).

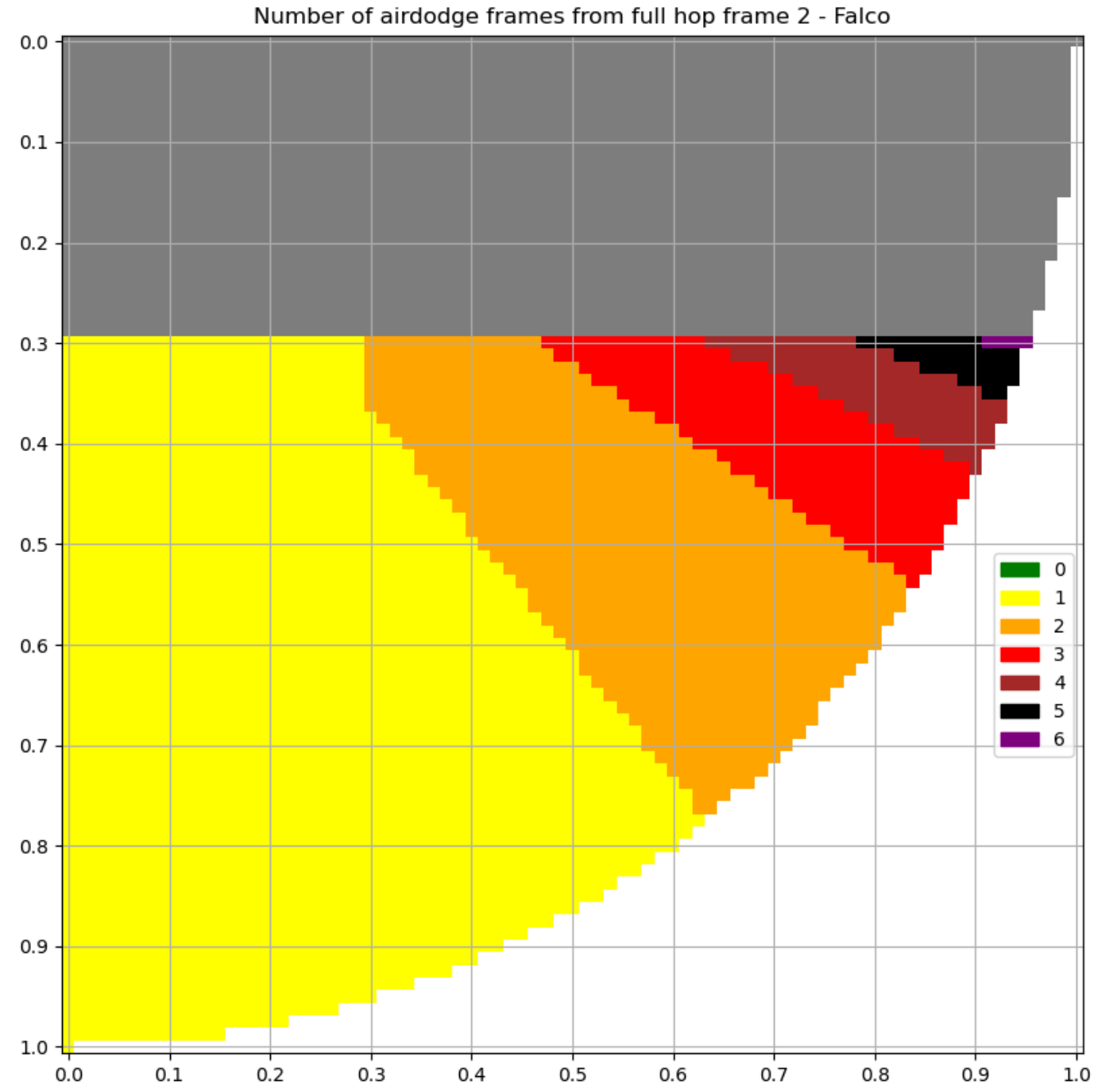
The same logic applies to the action following the wavedash, it’s usually a lot worse to be early (not do the action) than to be late. Because of this, whether the air dodge was frame 1 or 2 hardly matters for active follow-ups as the player will always assume it was frame 2 with regards to when they should act.

Similarly, even if you short hop sometimes when wavedashing, unless you full hop so rarely that you’re willing to have your full hops result in you not acting out of your wavedash, you will assume that you full hopped with regards to when you should act.

Consequently, **provided the angle is known in advance, the minimum time at which a player effectively acts out of their wavedash is the one at which they could start acting if they had full hopped and air dodged on the 2nd possible frame.**

For Fox and Falco, the characters with a highest F2 position, this looks like this:


Number of airdodge frames from full hop frame 2 - Fox
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
1
2
3
4
5
6



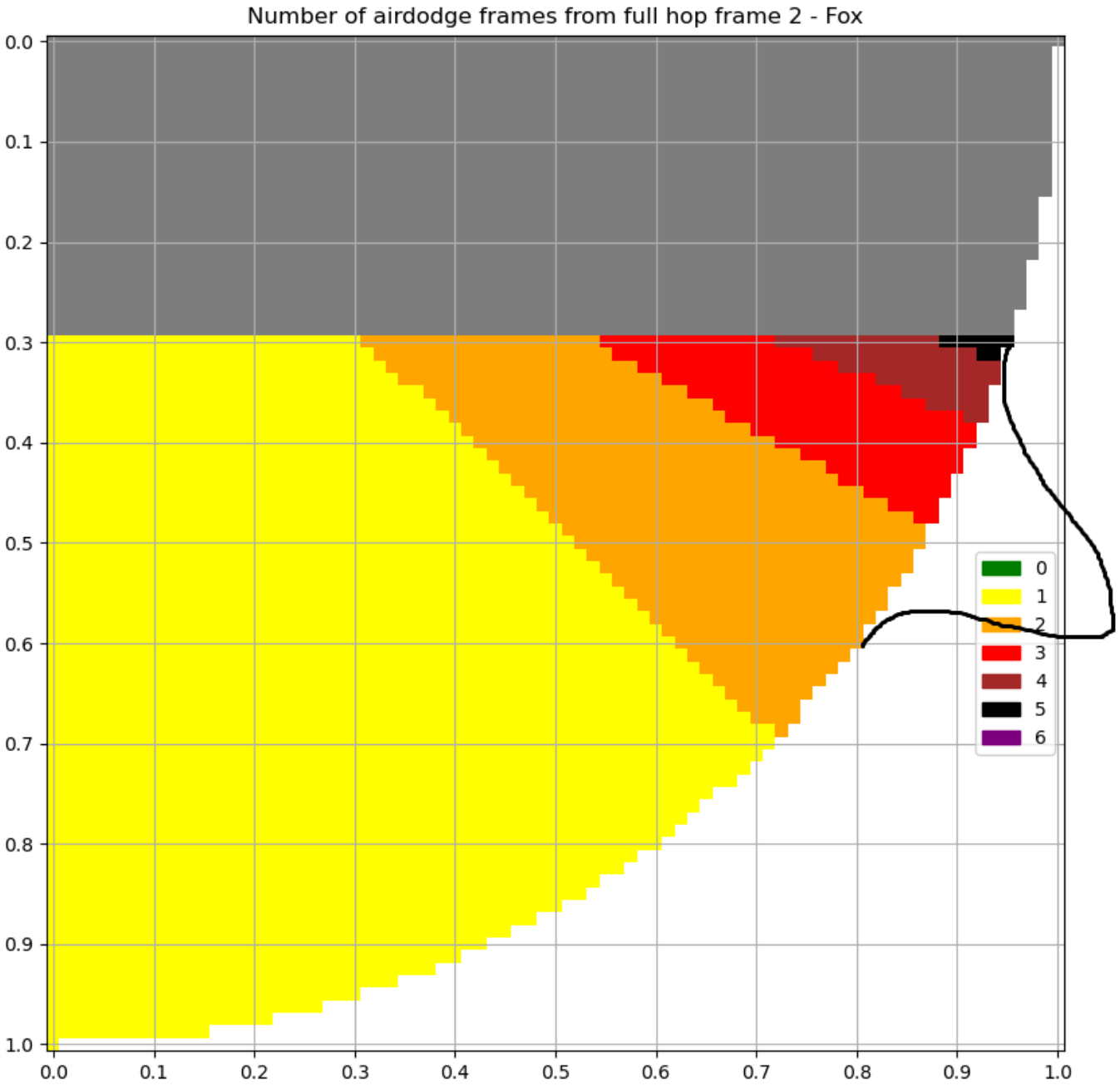
Note that the number of airborne frames is the number of air dodge frames plus 1.

As the angle approaches the horizontal, it will take more and more time to reach the ground from your F2 height (for Fox, this is Y=3.6801). **There are rapidly diminishing length/actionability returns as you approach the horizontal.**
This implies the existence of several "perfect angles" for every character. These are the angles resulting in the longest wavedash for a given actionability. In the length/actionability tradeoff, they are local maximums.

Looking at Falco's graph above, it is objectively better to airdodge at (0.8125, 0.525) than to airdodge at any other coordinate in the orange area, as you will go farther for the same actionability. However it is a LOT worse to airdodge at (0.825, 0.525) as you will lose one frame of actionability for a negligible length gain (if any).

Speaking of local maximums, the (0.95, 0.2875) angle shouldn't be used for wavedashing by spacies. It's awful. The tradeoff isn't close to worth it. On that note, "wavedash notches" are really poorly named.

This brings me to my next point: if you're not using a notch (or a digital controller) to wavedash, then the angle isn't known in advance. You will go for a given angle and end up in the vicinity, with your accuracy depending on your analog stick control, something like this:

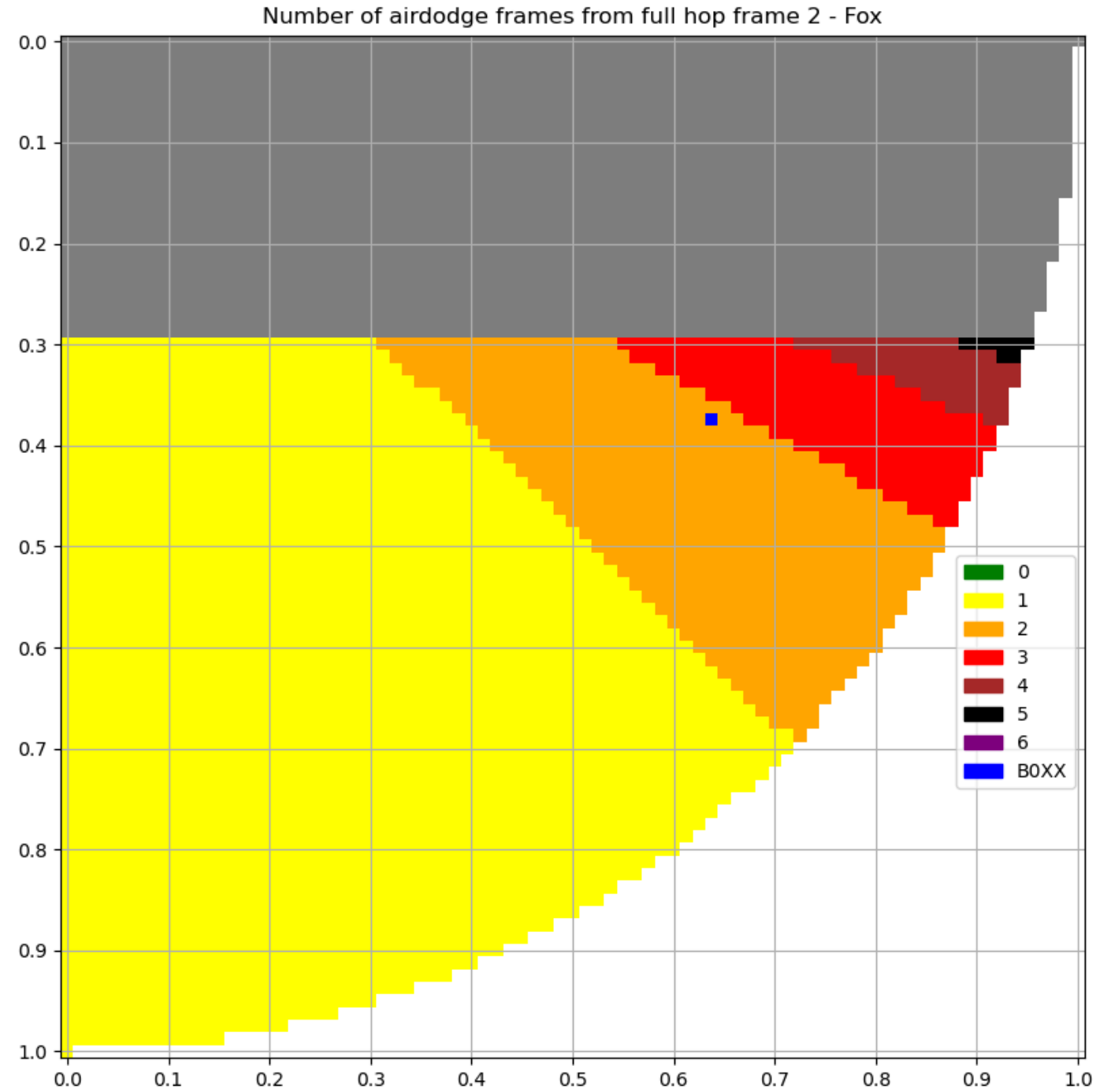


And once again, being too early is a lot worse than being too late. So, the muscle memory optimized for the highest average return that you will build through repeated attempts will have you not act if there's a chance you can't act yet.
So, **analog controllers get worst-case actionability and average-case length.**

This is not the case on a digital controller. Digital controllers (B0XX/F1 today) always use the same angle (30.47°). So, **digital controllers get fixed actionability and matching length.**

This may not be intuitive, but this means that even though the game's rules are the same, **digital controllers allow you to effectively act earlier out of wavedashes.** This is one of the many consequences of not properly modelizing the imperfect analog controls in the way the B0XX works.

But that's not all. The B0XX wavedash coordinate is the following:



The B0XX angle is **very close to being a perfect Fox angle.**

I also suspect it's close to being *the* perfect angle, as the brown/black angles suck and I doubt the 29.13° vs 22.55° tradeoff is worth it, but I'd have to compare the two angles on things such as dashing asap after the wavedash (i.e 1f earlier for orange area) to be able to decide between them.

The orange area is delimited by (43.97°, 29.13°) and the B0XX angle is 30.47° (91% of the way through).

Note that that angle is optimal for Fox but not for other top tiers.

					B0XX:	30.46554		
F2	Full hop	Short hop			Inf	Sup		(sup-B0XX/sup-inf)
Fox	3.6801	2.1001		3f	29.12573	43.96569	2f	0.909716
Falco	4.1001	1.9001		4f	25.29793	32.83876	3f	0.314715
Marth	2.4001	1.5001		2f	26.92113	59.34477	1f	0.890684
Sheik	2.8001	2.1401		3f	21.73656	31.88534	2f	0.139898
Falcon	3.1001	1.9001		3f	24.20592	35.78986	2f	0.459629
Puff	1.6001	1.0501		2f	17.56867	34.99553	1f	0.259943
Peach	2.2001	1.6001		2f	24.52151	52.05173	1f	0.784091
Yoshi	2.5001	1.8001		2f	28.14003	63.64919	1f	0.934509
Ics	2.6001	1.4001		2f	29.37295	68.73856	1f	0.972245
Pika	2.6001	1.7001		2f	29.37295	68.73856	1f	0.972245

ICs, Pika and Yoshi are in a fantastic spot too.
Marth too, although it's not as impactful as Fox's case as there is still a 4.5° margin before the next perfect angle.

The characters that are done dirty are Falco, Puff and especially Sheik.
Falcon, also among the highest F2 jump height, is average.

In conclusion:

- When wavedashing, there is a tradeoff via the angle between length and actionability.
- Due to imperfect analog controls and the value of resulting situations when wavedashing, GCC players get a worse-case actionability and average-case length.
- Digital controller users don't incur that disparity.
- Having a fixed wavedash angle is therefore a substantial advantage.
- Using a 30.5° angle is marketed as a nerf with no mention of the benefits of having a fixed angle with regards to this tradeoff.
- For high vertical air accel characters (Fox, Falco, Falcon, Sheik), the traditional "perfect angle" (0.95, -0.2875) is dogshit, and replacing the MX wavedash angle by the "perfect angle" would result in a significantly worse controller for the majority of players.
- On a GCC, you would not, as far as I know, be able to notch one of the perfect angles for your character and make another notch that's even more horizontal for firefox angles, for example. Right now the B0XX has various notches that are incompatible with one another yet all give the technical benefits of a notch.
- In light of this, the WD nerf feels silly. It nerfs only low vertical air accel characters, which happen not to be the top tiers. The angle variance is the problem, not the

angle itself.

- On top of the benefits of having a fixed angle, the B0XX almost has the perfect Fox angle. It is also good for Yoshi, Pika, ICs, pretty good for Marth, but bad for Falco and awful for Sheik.

- In light of the Fox coordinate map, the marketing of the “extra” WD nerf on the B0XX is quite dishonest.

  I don’t believe for one second Hax doesn’t already know all of this, especially considering the tweets back then about picking the WD angle depending on length for every coordinate in the vicinity of the eventually chosen angle.
  Besides, crossing the threshold makes Fox “attah” on frame 2 wavedashes so you literally can’t miss the mechanic.

  Although I have yet to look in detail into the ledgedash mechanics, I would guess this largely plays a part in the choice of the B0XX angle. I would go so far as to say this is one of the main advantages of B0XX. A small improvement on something that happens all the time is a much bigger deal than a big improvement on some esoteric thing.

Album for the wavedash tradeoff coordinate map for every mid/high tiers:
https://imgur.com/a/dU5RkIp

Python script used for generation of these maps: https://pastebin.com/1Qjy7sHC

I verified the Fox map around the B0XX coordinate in-game. The rest is generated. Also my maps are missing the .02875 coord.