FINAL Rebunk for Yumeko Dice Control

This is a response to the self proclaimed 'Ultimate' debunk made after quite a lot of debunks and rebunks were thrown around for the Dice Control Feat for Yumeko. For some additional context, me and Cris-mix had quite a long discussion under the Reddit post with the original debunk. I told him that I didn't want a doc war, as it was inefficient when we could communicate directly. For some reason, Cris has decided not to communicate his latest arguments to me directly, but instead abandoned our debate and put them inside a doc, despite already being engaged in discussion with me. This should already be a sign that his arguments can't even withstand direct debate. I do not wish to have a doc war, I don't have the time for this, so Cris, if you still wish to contest this after reading this rebunk, just debate me on Reddit or Discord, your choice, and we can make sure everyone sees the verdict. I'm not making another doc.

Now, moving onto rebunking stuff. Cris' most recent doc is mostly giving context on different arguments that we've exchanged (he notably omits how I destroyed his alternative theory of intuitive learning in this doc, and the multiple times in our Reddit debate where he provided studies to try and support his point despite them doing anything but). However, the main point of the debunk goes as such:

"*Let's just say even with all the unknown micro factors she still has a 99% accuracy per calculation, that's pretty unrealistic but we will just use it as an example. It takes about 3 seconds to roll a dice in a cup which would make this 1956000 calculations. Now when she has a 99% accuracy on every calculation the chance of her completely controlling the outcome would be ca. 1 in 10 −8.534, that's a one followed by 8.534 zeros, basically impossible. This gets even worse if we take an accurate guess of 60 - 70% accuracy. The more you calculate, the higher the accuracy becomes. Means if you calculate 99% your accuracy is 99%, if you calculate 70% your accuracy is 70% etc. This is because the micro factors influence every calculation.*

If someone wants to know the math behind it: ***log10(0,99) ≈ -0,0043648***

log10(P) = 1.956.000 * (-0,0043648) ≈ -1.956.000 * 0,0043648 ≈ -8.534”

This is an absolute abomination of an attempt to estimate the impact of error, it goes wrong multiple levels. Two incorrect assumptions are being made here:

1. All calculations are independent

2. Failing any of the calculations results in the total failure of the feat

Assumption 1 is made the moment he uses a simple compound probability calculation to try and determine the likelihood of success. It’s wrong to assume this, because I quite clearly laid out in the original doc that the calculations involve predicting trajectories, comparing actual trajectory to intended trajectory in real time, and calculating necessary adjustments to put it back on course, all centred around the same underlying physics. It’s easy to miss how dumb his method of figuring out the likelihood of success is, since it’s just a bunch of numbers to someone who doesn’t understand the full process, so let me give an analogy.

In Cris’ method, each calculation is treated as an independent probability, so like a spin of the wheel for instance. The accuracy is set to be a fixed amount like 99%, so that’d mean a 99/100 chance of success for each spin, hence on the wheel there would be 99 green spaces and 1 red space, all equal size. For every calculation, you spin the wheel. So he’s likening dice control to the process of spinning a 99% success chance wheel almost 2 million times and praying it doesn’t land on the one red space. This entirely ignores the process that Yumeko is actually doing and undermines the control she has, since she is predicting the trajectory of dice and making constant comparisons and adjustments to keep them on course. A more accurate analogy would be like trying to steer a bike down a lane, with every calculation being a tiny movement with an accuracy of 99%. The movements aren’t completely independent from each other, cuz you’re reacting to your previous movements and ensuring you stay on course. If you make one tiny error in your movements you don’t automatically crash, because your movements are INTERdependent and reactive, so if you mess up a movement, your next movements will be centred around adjusting yourself to make sure you stay on track. And now you can see how wrong assumption 2 is.

My explanation has always accounted for small errors in each calculation. That's exactly why this section of the original doc entails recalculating the 100 states of the future every timestep instead of just reusing the old ones:

"*She needs to know where and how exactly the dice will collide with the walls of the container or each other beforehand to allow for adjustment. To predict an immediate bounce before it happens, perhaps she would need to predict around 50 ms ahead.*
However, to perform larger physical adjustments in order to manoeuvre the dice towards a final result, predicting around 0.5 seconds ahead would be the bare minimum to allow for the time needed to move. Since one timestep is 5 ms, and 0.5 seconds is equivalent to 500 ms, that's predicting 100 steps ahead per timestep. For every step, she'll do the same number of calculations for step 1, so 16 x 100 = 1600 calcs per die. 2 dice = 3200 calculations"

Notice how it says that she's predicting 100 steps ahead PER TIMESTEP? That means she already has a prediction of the trajectory of the dice 100 time steps into the future, yet once the dice moves onto the next time step, she immediately calculates 100 steps ahead, which means she's REcalculating 99 of the steps in order to correct errors. Ironically, I got asked by someone on my original Reddit post of my doc why she needs to recalculate the trajectory so much instead of just reusing it, and I explained that if she reused it, errors would compound, making it difficult to actually control the dice.

Relevant part of their question:

> I do have one small problem with the math. Hopefully I'm just misunderstanding something. You mention how every timestep she has to calculate 100 timesteps into the future. However, if she's already made the calculations she doesn't need to make them again right? So she calculates 100 timesteps, then the next time step she's already calculated 99 steps, so she only calculates the 100th one, massively reducing the amount of calculations.

Relevant part of my answer:

> the total by an arbitrary amount. Regardless, I likely would have gone ahead and done just that if not for the fact that reusing the same predictions is inherently flawed in the first place. I mentioned in step 1 that Yumeko would only be able to calculate approximate values, because the starting values for the variables in some of the calculations were determined simply by estimating them based on sensory input in step 0. That means that while predictions would be necessary to guide decisions on what adjustments to make, if she did not continuously update them, the error from estimation would keep compounding, making it hard to believe she'd actually make any progress in reaching the desired trajectory. Hope that makes sense!

Here I overtly recognise that Yumeko can only estimate the values with high accuracy, and so each calculation may involve slight error, which is why I accounted for this when determining how the process would work, i.e. through including error correction calculations in the total.

It's funny, because Cris has been desperately trying to find a basis for assumption 2 in multiple studies, you can see his struggle under our long discussion under the initial Reddit post of his initial 'debunk'. Eventually he gave up after it became exceedingly obvious that these studies didn't actually support such an absurd conclusion, and instead he decided to presuppose that the assumption is true based on nothing and use it to construct an entire faulty calculation of the impact of errors. In actuality, even if we don't assume the accuracy per calculation is 99%, the overall error is a small amount due to mitigation by error correction, so Yumeko succeeding it thrice in a row via this method is perfectly fine.

Oh, and while I'm at it, I might as well address the claims that this feat runs contrary to the narrative. Yumeko states and displays that she doesn't like games where she's guaranteed to win or lose. This is **not** one of those games.

She isn’t guaranteed to win, especially not from the perspective of 6 year old Yumeko who has never played dice before. She’s trying to imitate Souko’s skill for the first time ever, after Souko just failed whilst using said skill. All she’s doing is trying to increase her odds of winning, which is the same logic she used for sticking the rice on the dice in an attempt to load it (I explain that this doesn’t actually load the dice by an amount that makes a difference in the og doc) and increase her chances. Yumeko advocates strongly for trying your best to win, she demonstrates this a lot in her gambles, like how she uses her incredible memory to defeat Itsuki in Double Memory in one fell swoop. She also demonstrates a hatred of not trying your best to win, which is why she has a far more negative reaction to Midari compared to the characters that cheat to win, and why she resents Yumemi’s defeatist attitude in Active Station. And besides, explanations like luck and intuition are off the table since it’s stated to be an impressive skill, and it’s shown to require incredible focus and effort, and different people have different proficiency levels of it.