Novel Techniques for Random Number Generation: Toddler Behavioral Sampling

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Abstract

Random number generation is the backbone of any type of simulation. Due to the limitation of mechanical devices' deterministic systems, pseudo-random number generators are helpful but aren't truly random. They aren't as random as something quite as unpredictable as background radiation, electrical noise or even the behavior of a toddler. In the name of scientific inquiry, a puritanical view of the term 'randomness,' and most importantly an excuse to let me look after my kid during the workday without paying for an expensive daycare; this paper aims to develop and evaluate the use of sampling Toddler's to generate a random sequences of numbers. The three methodologies are developed involving sampling whether a toddler will eat something, another measuring their artistic capability, and the most useful method involving a contraption utilizing a dome shaped cage, a toddler, and a cat that does not want to be played with. Each of the methods are shown to be truly random enough to justify bringing my kid to work.

Keywords: Random Number Generation, Math, Toddlers, Motherhood, Statistics, Dinosaur Themed Parties

1. Introduction

In the history of computer science, random numbers have been historically generated using casinos, measuring radiation, electrical noise, books, or silly things like picking a number and then squaring the middle digits of that number. These methods are either deterministic, subject to card counting, or require expensive hardware you can't afford because your research organization blew all of its overhead budget on sick time during a global pandemic.

In order to make the laboratory environment more family friendly to young mothers and allow for women to not have to choose between having babies and advancing their scientific careers, the toddler sampling method aims to be an extremely cheap and effective method for generating random numbers for mothers. A recent psychological study has shown that there is not a creature more random than a human toddler [1]. In between the developing brain, animal desires, and an endless amount of external stimuli, it is amazing that no one has begun sampling toddler behavior as a random number generator before. A recent study has even shown that confused messaging from children's television programing on Netflix Kids has even increased the randomness of toddler behavior making them even more wildly erratic and unpredictability linear with screen time [2].

2. Background

Many have argued whether the outcome of a human's life is more of a result of nature or nurture. While this may have psychological ramifications, studies have shown that between the ages of one and three, there is no amount of nature or nurture that can predict or affect a child's behavior [3]. This is what makes toddlers the perfect type of non-deterministic system for generating random numbers in high end computer simulations.

In one landmark study attempting to measure the amount of information derived from the mood behavior in toddler temper tantrums, [4] managed to apply the Kolmogorov-Smirnov test on quantified toddler mood data in order to prove that their behavior contained no correlated information with the outside world. Unfortunately in [4], while the behavior was truly random, it was unfortunately found to not be random after applying a simple Shapiro-Wilks test. This was in large part due to the propensity for toddlers to be completely content for upwards of thirty minutes while devolving into a maximum entropy state at the drop of a hat. It was obvious that Toddlers were completely unpredictable but showed no method of using that unpredictability for science.

3. Toddler Random Number Generation Techniques

Of the many random behaviors of toddlers, three were chosen which appeared to be reliably sampleable and universally random and unpredictable across all toddler demographics. The three chosen were the edibility binomial generation, the fingerpaint interpretability seed, and finally the Cat Dome.

3.1 Object Edibility Binomial Number Generation

While there are plenty of methods for generating continuous random numbers through toddler behavior, one method to generate a binomial random variable is to determine whether or not they will eat something. Whether it's actual food, or inanimate objects, the probability p of a toddler eating that object usually converges to a probability of about 0.1 to 0.9 depending on the object.

It is important to determine the objects in which toddlers are likely to chew and attempt to ingest. Several objects were found to create reproducibly random binomial variables in the edibility test. These objects include; cheerios, gummy bears, and goldfish at a $p > 0.8$, my keys, legos, buttons, and rocks at $0.2 < p < 0.8$ and broccoli and peas at $p < 0.2$.

A previous version of this experiment was attempted by sampling the likeliness of a toddler to manage to get a cheerio or a goldfish in their mouth and not on the floor or their lap. Unfortunately, this experiment was shown to be impossible to measure as too many cheerios and goldfish disappeared in between the cracks in their car seats. [5]

3.2 Finger Paint to Random Number Seed

The next random number generation technique tested was developed when my mother in law continued to collect finger paintings from my child Ethan. No matter how abstract and meaningless the finger paintings were, she still wanted the paintings. To prove this I asked Ethan to paint the number 8, which he does know, to which he replied 'The gween one ur the happy one?' He soon painted something that made absolutely no sense. I processed it using the opencv tool box handwriting interpreter and realized that every time I re-ran the tool, it generated a different number.

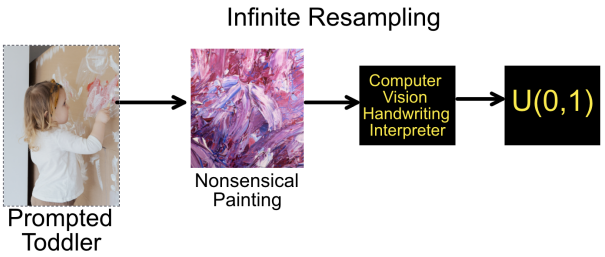

Figure 2: The Fingerpaint to Random Number process

By letting these children draw nonsense in finger paints, we discovered a method to randomly seed our computer vision tool boxes as shown in figure 1.

3.3 The Cat Dome

Finally, the most efficient method to create a series of random numbers using toddlers is the completely novel and never dreamed of before Cat Dome. Utilizing a domed cage covered in mesh, we place an energetic toddler and a middle aged cat that does not want to be played with. For toddler safety reasons, the cat's claws are covered in kitten mittens. A highly sampled IMU is placed on the cat and the data is recorded in a 50Gb SD card. The configuration is shown in figure 2.

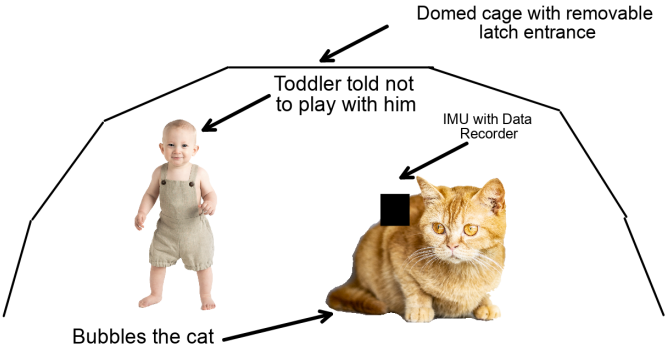

Figure 2: The Cat Dome

Once the toddler attempts to play with and hug the cat which was just trying to take a nap, the acceleration movements of the cat are so wild and unpredictable, it forms a normal distribution once zero'd and normalized to N(0,1) after three seconds of data is collected.

4. Simulation Environment

After contacting my mothering facebook group, 23 toddlers were tested over Elisa's birthday party last Saturday. Every child was of toddler age and became a subject to measure the characteristics of each random process. In between each test, the children's moods were stabilized by making the party dinosaur themed which also kept their energy level up for higher variance.

The party was littered with edible versions of the objects discussed in section 3.1. Next we took a normal amount of videos capturing every angle of the party in HD footage as is tradition which tracked everything that the toddlers ate when an object was picked up as is tradition. A finger painting station was constructed and manned by one mother who gave each child a randomly seeded prompt to paint. Those seeds were generated by a lesser random number generator. Finally every child was given three one minute rounds inside of the Cat Dome.

5. Results and Discussion

Each method was shown to be reliably random with no information according to a KS test across 19/23 of the toddlers. Four of the toddlers did not perform erratically enough to collect reliable data because three found 'The dino mownstars scawy' and hid underneath a table that day. One preferred a princess themed party and would not stop screaming; this outlier was removed and put into time out for the remainder of the party. Their data was removed from the study all together.

5.1 Object Edibility Binomial Number Generation

Similar to the study shown in [5], sampling what foods toddlers put into their mouths is a difficult task which may require a more detailed measurement scheme. There was plenty of debate over which items were ingested and whether it counted if the object was inserted into their noses or ears. Because of this variability, the results remained fairly uncertain and generally dubious.

As predicted, the Cheerios, Goldfish, and gummy bears were eaten at rates at around $p > 0.8$ with the exception of goldfish which may have just been highly variable due to the amount that slipped out of the bowls and were tossed around or dropped at a much higher rate. The gummy bears were the most reliable, but this is in part due to the fact that it was a balmy 83 degrees and they were sticky enough that it wasn't likely to be dropped.

Though measurement variability was highest in the rocks, the toddlers managed to eat things they weren't supposed to fairly reliably around $p = 0.4$. Unfortunately, with no parent making any airplane noises, only Robert ate any peas or broccoli and we never heard the end of it from his parents. Thankfully for the study, we learned that Robert also stuck the most rocks up his nose.

Table 1: Edibility Probability table

Object	Items held	Items Eaten	~p
Cheerios	437	382+/-40	0.87
Goldfish	544	348+/-100	0.77
Gummy Bears	512	477+/-10	0.93
Keys	123	54+/-4	0.43
Buttons	76	30+/-3	0.39
Rocks	194	80+/-30	0.41
Peas	352	10+/-1	0.028
Broccoli	284	22+/-3	0.077

5.2 Finger Paint to Random Number Seed

From the 19 children who were still enjoying the party, 194 different nonsensical finger paintings were digitally recorded. Each drawing was re-analyzed through a handwriting recognition computer vision tool limiting the outcomes to the numerical digits 0-9. The random digits generated are shown in figure 3.

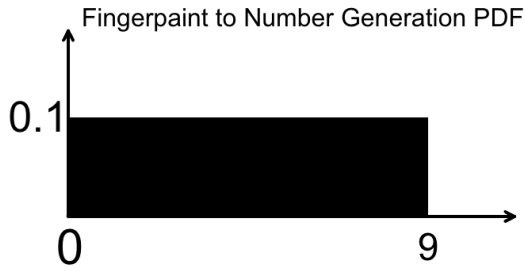

Figure 3: Fingerpaint seed to U(0,9) Distribution Results

As shown in Figure 3, after several million resamplings of the children's artwork, the distribution formed a perfect U(0,9) distribution. This once and for all proves that these kids' artwork is absolutely nonsensical. While this new method of seeding a computer vision library is better than any other alternative, the results are too good to be true which may draw too much criticism. Many have pointed out that it looks like the graph was fabricated by two arrows and a rectangle. More follow on studies will be needed to corroborate these findings.

5.3 The Cat Dome

The 57 minutes of data from the cat dome, was shown to be remarkably random and chaotic. The distribution of X-Y-Z acceleration movements from the cat are shown in figure 4 after being normalized to a N(0,1) distribution.

This method has shown to be capable of generating plenty of truly random movement. Each three second increment of the data managed to pass the Shapiro-Wilk Test 100% of the time showing normal data even without accounting for the force of gravity in the IMU because Bubbles the cat just moved that way. Unfortunately, the variance of the data was not Wide Sense Stationary and showed a correlation in time when the data set was limited to under half a second. If the index of the Cat dome data is sampled from at least ten seconds of data using randomly generated indexes from the fingerpaint random number seeds, we did manage to create a purely toddler generated N(0,1).

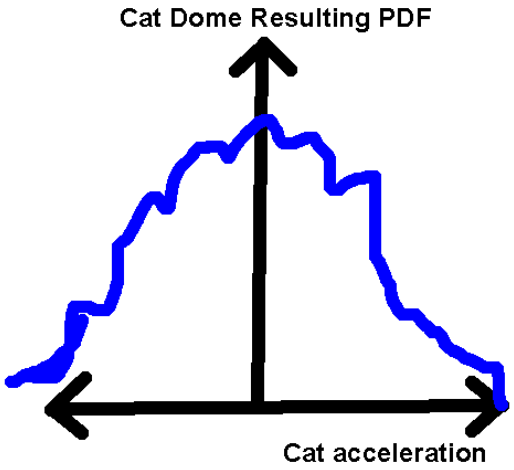

Figure 4: Cat Dome Normal Distribution Results

6. Conclusion

You can in fact sample random data using toddlers. However, the amount of effort used to create these data sets is far greater than measuring background radiation with a geiger counter. While being truly random compared to a seeded computer generated pseudo-random number, the toddler based data is much more fun and as mentioned prior, creates an excuse to bring my kids into the lab until they're old enough for preschool.

7. Conflicts of Interest

This is the only possible way of giving my son Ethan 20 years of technical experience so that he can qualify for a reasonable STEM job after he graduates in 2042. Additionally, if I can get his name as co-author on some upcoming papers while he's still acting randomly enough, I'll be more likely to get him into a decent grad school or more miraculously that preschool with the gifted kids program.

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