Chapter V
Randomness, Chance, & Art

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ABSTRACT

Randomness is a slippery term that conveys different meanings in different disciplines. In mathematics, an individual number is random when there is an equal chance for it to be any number from a set of possible values. In computer science the term becomes more relative and numbers have varying degrees of pseudo-randomness. Information theory equates randomness with unpredictability and, at odds with other definitions, concludes that a higher level of randomness indicates a greater concentration of information; a message’s probable denseness of information is highest when the message is partially surprising and partially expected. There is no fixed definition for what randomness means in art, but analogies can be drawn to how the term is used in other fields. For example, information theory’s definition might suggest that artworks have the greatest impact when using a mixture of pattern and unpredictability.

INTRODUCTION

Randomness, if it exists at all, is a fragile state. This fragility isn’t intuitive to us; our day-to-day lives seem filled with disorder and unconnected events. The precarious nature of perfect order is more easily understood. We know that the nature of the universe is for things to break down, clutter, and fall apart. We have scientific laws (the law of entropy) and folk laws (Murphy’s law) to explain why order cannot be maintained for long. With that in mind, perhaps it is more understandable that order’s opposite—randomness—is similarly rare. Just as it is the nature of the universe for things to fall apart, it is also the nature of the universe for a cause to exist for every effect and for that effect to be determinable (at non-quantum levels). But a truly random event has no relation to its trigger; the effect should not be deducible from the cause.

Look again at the very first sentence of this introduction and note the caveat of if it exists at all. The existence of randomness and the ability of humans to observe it is an ongoing debate. Knuth (1981) said, “People who think about this topic almost invariably get into philosophical discussions...
about what the word ‘random’ means. In a sense, there is no such thing as a random number; for example, is 2 a random number?” (p. 2). The goal of the chapter is to give a deeper understanding of randomness, how it is generated in computer science, and how it can be used in art.

**BACKGROUND**

Random is often used colloquially to indicate arbitrariness or things unrelated: random acts of violence, random thoughts, random encounters. A number of fields such as computer science, statistics, and informational theory have more rigorous definitions of randomness. But each of these fields uses the term in a way that is slightly at odds with the others.

As a starting point, let’s establish what randomness means to a mathematician and, using that, build a working definition for what randomness might mean to an artist. In mathematics, an individual number is random when there is an equal chance for it to be any number from a set of possible values. When describing a sequence of numbers as random, we mean each number is statistically independent of the others; that the numbers in the series have no effect or relation to the others (Haahr, 2008). A random number or sequence is characterized as containing no meaningful information; if a number conveys some data (such as the result of a formula, a person’s phone number, or the number of times the letter ‘q’ appears in this chapter), then it is not random.

This trait of non-significance can be borrowed and used as a key characteristic of randomness in art. If an element in an artwork contains some meaningful information about the world around us, then the element isn’t truly random. Consider this recipe by Tristan Tzara (one of Dada’s founders) for writing poetry:

**To Make A Dadist Poem**

*Take a newspaper.*
*Take some scissors.*
*Choose from this paper an article the length you want to make your poem.*
*Cut out the article.*
*Next carefully cut out each of the words that make up this article and put them all in a bag.*
*Shake gently.*
*Next take out each cutting one after the other.*
*Copy conscientiously in the order in which they left the bag.*
*The poem will resemble you.*
*And there you are--an infinitely original author of charming sensibility, even though unappreciated by the vulgar herd.* (Brotchie, 1991, p. 36)

Would the resulting poem be random? Several aspects of this poetry generation process do seem analogous to our description of a random numerical sequence. However, the poem’s recipe (or algorithm) is not rigorously random by mathematical standards. To improve the randomness of the process, we’d first want to remove any duplicate words so that common words (such as “the”) wouldn’t have a greater frequency in the poem. Second, we’d want to make sure that the slips of paper have identical sizes (otherwise, the larger slips would tend to float to the top upon being shaken and would bias our results). Finally, we’d need to question our basic ability to sufficiently randomize the slips of paper by shaking a bag. Several early attempts to generate random numbers (for use in scientific simulations) used slips of paper in bowls and bags, but were not able to generate sufficient randomness (Hayes, 2001).

It isn’t necessarily important to resolve the aforementioned issues for a work of art. Statistically rigorous randomness may be crucial (though elusive) in computer science and mathematics, but it is usually more than is required for stochastic artworks. In fact, giving common words a greater probability may even be desired. Even if we did wish to adjust the poetry-generating algorithm...
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