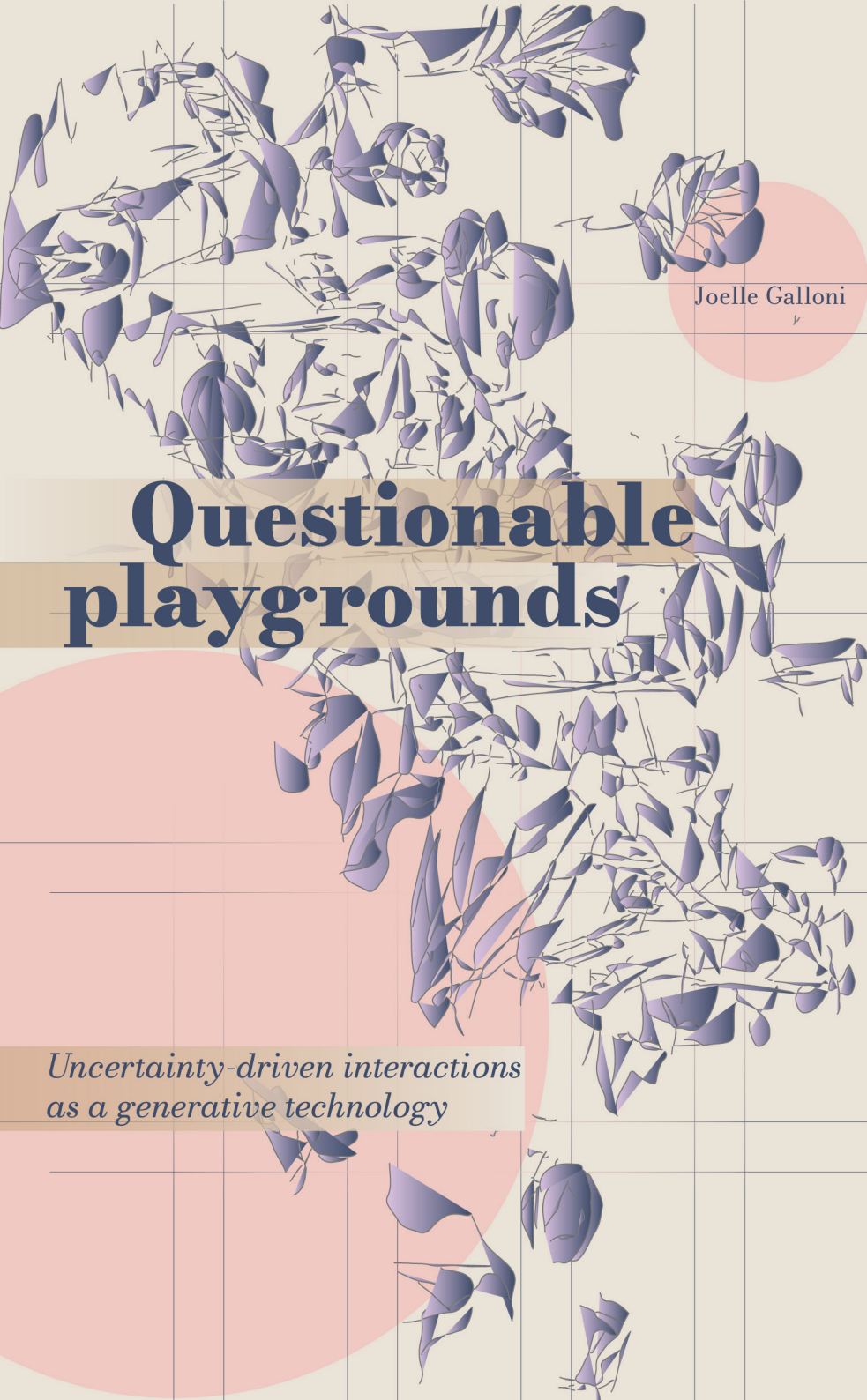

Joelle Galloni

Questionable playgrounds

Uncertainty-driven interactions as a generative technology

Questionable playgrounds

Uncertainty-driven interactions as a generative technology

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Interactive Media Design, Royal Academy of Arts, The Hague (March 2020)

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The term "questionable" is attached to a negative, suspicious connotation, as if all that is questionable was secretly hiding unspeakable truths.

We should be suspicious of those things we deem certain, instead, for they are hiding non-negligible questions.

Contents

A blank page

The most fertile of grounds, the blank page may look like nothing. It might seem like it's lacking all the prerequisites needed for something to grow. But a blank page always comes with an essential frustration, a demanding uncertainty: the urge for the page to be filled.

If the blank page is the most fertile soil to plant the seed of an idea, then not knowing is the engine of discovery and creation. And uncertainty is a generative force which fills the gaps of knowledge with possibility.

If uncertainty is, potentially, a procreative entity, why do we try to avoid and reduce it

as much as possible in our everyday life? Perhaps our brains are inevitably hard-wired to surrender our curiosity to fear? Even so, our biological and psychological drives are not the only forces at play. As we try to make sense of uncertainty, there are cultural ties to direct our attitude and behaviour. It appears that these cultural tendencies are prone to understanding uncertainty as an inherently risky condition. However, it is possible to argue the opposite: being blinded by certainty can be extremely dangerous, even more so than embracing the reality of doubt.

Walk with me, walk with me, monster of uncertainty.

Laibach[1]

Reframing uncertainty as a generative source might be the first step we take with it, instead of away from it. We have harvested the narratives which naturally sprout on uncertain grounds since primordial times: we have fermented our questions and turned them into a vast mythological heritage, artists and makers and scientists have made use of the

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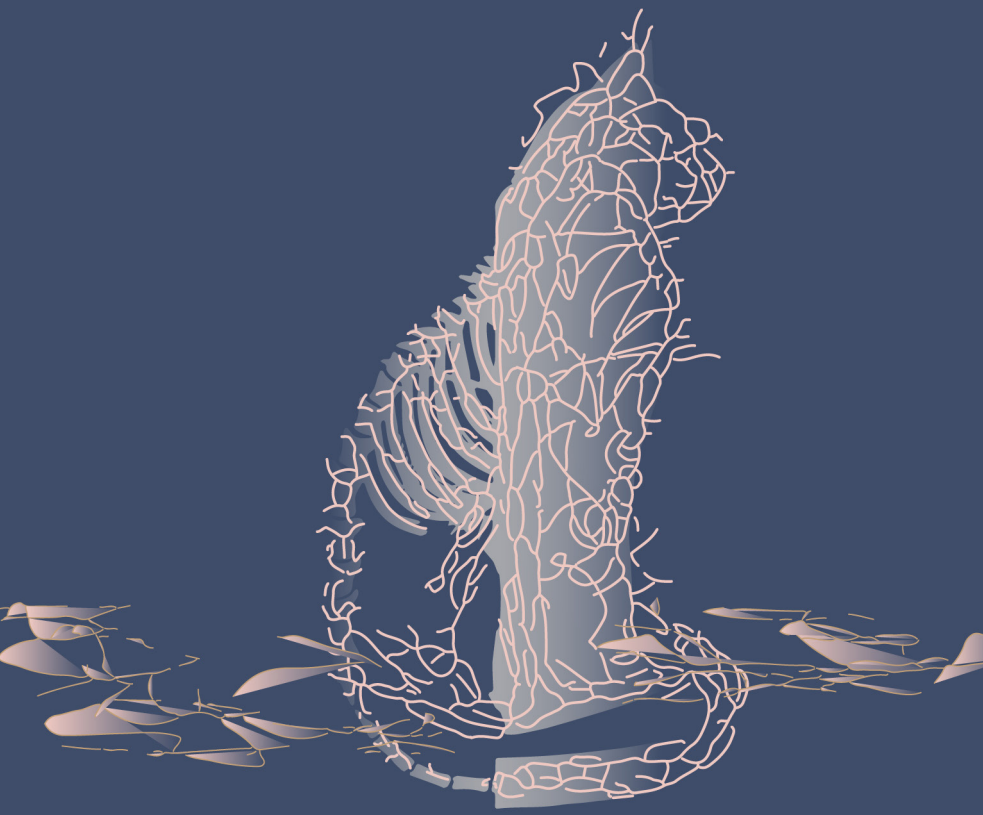
[1] Laibach, "Walk with me", track 7 on Spectre, Mute Records, 2014 compact disc

generative properties of uncertainty to expand the repertoire of the possible. Nowadays, we have artificially implemented uncertainty in machines, with pseudo random functions and computer-generated scenarios. Yet, it seems that we are not aware of these processes enough to consciously appreciate uncertainty as a resource.

Even in the realm of games, where uncertainty is part of the way the fun is designed, we often encounter many restrictions to its generative potential. It is very rare to come across games that leave the player with enough creative freedom to craft their own narratives. Yet, when analyzing the forms of uncertainty present in most games we find that there could be plenty of generative possibilities to be explored.

What is uncertainty's generative value and how can we allow players to access it?
To answer this question, we will attempt to build a playground in the space of uncertainty.
We will begin, of course, from a blank page.



Schrödinger's cat

Uncertainty is a space

Uncertainty is a floaty space, with waves and earthquakes and unpredictable fluctuations, and moody inhabitants who are all strangers to each other and to themselves.

It can seem counter-intuitive to refer to uncertainty as a space, given that we normally experience a space as a tangible convergence of dimensions, often delimited to a controlled area. A bedroom, for example, reassures us that we are seeing it in its totality: it is placed within a given amount of walls that remains unchanged, extending to a depth that we clearly perceive. When compared to something as certain as a bedroom, it appears that uncertainty can't qualify as a space at all.

We could, however, remove all certainty from the bedroom. We could isolate it from any lightsource, so that it turns pitch dark and there are no visual queues to rely on. We could then make it soundproof and heat it to the same temperature of our skin, so that we have no perception of warmth or cold. Having removed all these forms of sensory information, we will take one last step to turn the room into an isolation tank: we fill the bottom of the space with water, and we dissolve just enough Epson salt in it that floating becomes effortless.[1]
We are, finally, left in a space that is devoid of all the properties humans seek in an environment: volumes are drained into a dark void, the absence of external sounds isolates us from context, and even our proprioception is being challenged by the lack of ground beneath our feet.

Let us imagine that we were to wake up one morning in this deconstructed bedroom, paralysed. All the information we have about this space is that all the information is missing.
Now that there is nothing here for our brains to know, now that the space has been

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[1] "Sensory Deprivation." Wikipedia. Wikimedia Foun dation, November 27, 2019. https://en.wikipedia.org/wiki/Sensory_deprivation.

stripped from all forms of certainty, we might start imagining a space of our own. It is in fact common to experience hallucinations in the event of sensory deprivation.[2]

The space we are in at this point clearly isn't our bedroom anymore. Of course we could try and imagine that it is. We paint a neat mental image of our bedroom, the way it was when we could sense it. Even if we do believe this scenario to be true, the orientation of space still remains uncertain: if the space around us really is the bedroom, are we facing the window? Or the door? Because we can't verify any of our theories, we produce countless scenarios: we're asleep in a bathtub, abducted by aliens, we're in a whale's belly, or back in the womb. The space contains all of these settings, and potentially many more.

We enter the space of uncertainty and we start seeing some of the possibilities that it conceals.
Uncertainty describes the condition of not knowing, of wandering in a space where multiple, irreconcilable possibilities

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[2] "Ganzfeld Effect." Wikipedia. Wikimedia Foundation, December 24, 2019. https://en.wikipedia.org/wiki/Ganzfeld_effect.

share the same plane of existence. Here, Schrödinger's cat is alive and is not alive, an imprecise measurement is abundant and scarce, the pizza guy is about to ring the doorbell and is stuck in traffic, all at the same time.

Here I set foot, tentatively, in the space of uncertainty. I look around and see opportunity, extending endlessly in every direction.
Out of all possibilities, I imagine a playground.

Curious cat pawing at the unknown

Perceived uncertainty
Behavioural responses

Uncertainty is a playground many parents wouldn't let their children play in, because they most probably think it's unsafe.
Yet, uncertainty is also one of the foundations of many games those same children play: if the outcome of hide and seek was already known to them, there would be no fun in playing it.
For the most part, uncertain situations are likely to be perceived as unsafe, but they can often be fun, too. Reconciling these contrasting properties will be the aim of this section.
Human instinct seems to regard uncertainty as a shape-shifting entity, one that can't be met with a fixed reflex response: our reaction is negotiable and can vary from

feelings of anguish to tingling curiosity and feverish excitement.
How do we make sense of such a wide spectrum of emotions?

Curiosity

It might have killed the cat, but it surely didn't mean to

If an uncertain situation is one that confronts us with missing information, curiosity can be described as the desire to acquire that information, thus resolving the uncertainty.

Information gaps are the fuel of the curious mind: the gap between what we know and what we want to know.[1] However fruitful the exploration of this gap, there is something obsessive about it. Like a dog

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[1] George Loewenstein, "The Psychology of Curiosity : a Review and Reinterpretation," Psychological Bulletin, 1994, p. 87, https://www.cmu.edu/dietrich/sds/docs/loewenstein/PsychofCuriosity.pdf.

compulsively begging for food, we sometimes poke at the unknown repeatedly and frustratingly, until it surrenders its succulent answers. Psychologists who identify curiosity as a primary drive would agree that our thirst for knowledge and the dog's treat obsession are determined by similar factors: curiosity can be understood as an appetite. As such, when unsatisfied, it could cause us to suffer in a way that compares to physiological hunger. [2]

Besides its voracious nature, does curiosity not resemble an itch? That is, if our skin was like one of those "Scratch to win" cards, wouldn't we constantly feel itchy, overwhelmed by the urge to reveal what hides beneath the surface?

The relief of scratching a sting is weirdly fulfilling, and so is the dopamine that rewards us for every curiosity satisfied. When we try to explain curiosity in neurological terms, we find that our brains are responsible for our novelty-seeking behaviours: more dopamine is released as a result of unfamiliar stimuli compared with familiar

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[2] George Loewenstein, "The Psychology of Curiosity : a Review and Reinterpretation," Psychological Bulletin, 1994, p. 77-80, https://www.cmu.edu/dietrich/sds/docs/loewenstein/PsychofCuriosity.pdf.

[3] Vincent D Costa et al., "Dopamine Modulates Novelty Seeking Behavior during Decision Making," Behavioral neuroscience (U.S. National Library of Medicine, June 9, 2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5861725/.

ones. [3] In this sense, could uncertainty be somewhat therapeutic to our mind? If we surrounded ourselves with small, resolvable doses of uncertainty and answered some of these queries each day, wouldn't we receive a comforting quantity of dopamine? Would our mood benefit from this in a noticeable way?

At the same time, if reducing uncertainty provides us with such primordial pleasure, we risk becoming addicted to it. We might insist on perpetrating our novelty-seeking behaviour impulsively, disregarding the harm it can cause.[4] This must be how curiosity ended up killing the cat: the little dopamine-junky couldn't help but discover the neurological pleasure of investigating the unknown, one last time.
As for us humans, we have proven our inability to resist an inquisitive impulse over and over.
Pandora's box did nothing but unleash another flock of forbidden content to be curious about.

In spite of the risks, it is with good reason that evolution equipped us with curiosity: without it, we probably wouldn't be quite

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[4] Alireza Minagar, Neurobehavioral Manifestations of Neurological Diseases: Diagnosis & Treatment, an Issue of ... Neurologic Clinics (Elsevier - Health Science, 2016).

[5] Winifred Gallagher, New: Understanding Our Need for Novelty and Change (New York: Penguin Books, 2013).

motivated to seek variability, and would tend to isolated populations, unable to bring significant change to future generations.
Sexual curiosity makes sure we actively explore the mating pool of our species, paving the way to greater genetic variation. Just like novelty in sexual partners helps evolution, novelty in environments helps growth and innovation, as well as our chances of survival:

Vital information about potential threats and resources is likelier to come from things that are new or unfamiliar than from the same old same old. Because they can affect survival, nature ensures that all living creatures react to novelty and change.

Winifred Gallagher [5]

When the protagonist in a horror film decides to check on that monstrous sound that came from the darkest corner of the basement, we all wonder how they could possibly be so blind to danger.
Turns out, curiosity is just as blinding as fear, and the two combined can make for quite an explosive solution.

To be curious is to be sensitive to the possibility of a question

D. E. Berlyne[6]

[6] D. E. Berlyne, "A Theory Of Human Curiosity," British Journal of Psychology. General Section 45, no. 3 (1954): p. 181, https://doi.org/10.1111/j.2044-8295.1954.tb01243.x.

Fearful cat hissing at the unknown

Fear

The apprehensive force that saved the cat, locked it up and threw away the key

If curiosity is the desire to acquire missing information in a state of uncertainty, we could describe fear as the opposite tension, one that creates aversion towards missing information and prevents us from investigating it. Most of the behaviours that are commonly associated with fear, such as the "fight or flight" and paralysis, seem to suggest that this feeling inevitably leads us to refuse to explore the uncertainty. It is indeed possible that our fear of the unknown forces us into a safe corner, where everything is certain and familiar.

However, fear and curiosity can work together. After all, they do share a common goal: to reduce the uncertainty as much as possible. Curiosity will always attempt to dive into the matter headfirst and find out what questions need to be asked and how they can be answered, whereas fear will freeze, step back or turn the other way,

reducing the threat through the ways of self preservation. Oftentimes the two of them will pass the hot potato of uncertainty back and forth, but does one of them always come first?

Researchers propose that the fight or flight response is our default reaction to uncertainty [1], which would mean fear generally has a tendency to take over curiosity in uncertain conditions. Once again, we owe this to evolution: its "negativity bias" establishes that the assumption of threat is advantageous, as well as prioritizing negative information over positive. [1] Surely if the curious cat had been warned by fear and decided to escape the unknown instead of venturing too close to it, it would have been saved. But at what cost?

When we look into the consequences of a fear-dominated behaviour, we find that it can be just as dangerous as the curious impulse. The psychological term for our fearful response to uncertainty is "intolerance of uncertainty" (IU), a characteristic often associated with the fear of the unknown. When treating patients, researchers have

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[1] R. Nicholas Carleton, "Fear of the Unknown: One Fear to Rule Them All?," Journal of Anxiety Disorders 41 (June 2016), https://doi.org/10.1016/j.janxdis.2016.03.011.

noted that changes in the levels of IU also affect negative thinking, depression and anxiety. [1] Although fear is designed to keep us safe, its backlash feels like quite the contrary: anxiety and other mental health issues certainly do not provide shelter to our worried minds.

Both in the context of fear and of curiosity, the amplifying power of uncertainty is evident. With an uncertain 50% probability of receiving a painful shock our physiological stress is measurably stronger than with a 100% certain anticipation of the identical pain [2], and the same can be said about the reward system that drives curiosity: people are measurably more motivated to invest their resources in an uncertain reward rather than a certain one [3]. Research seems to suggest that we are hard-wired to magnify our responses to uncertainty, investing more attention, more fear, more curiosity in anything uncertain.

Human behaviour can seem so neurologically bound and calculated that we might start seeing ourselves as birds, always neurotically oscillating between a hungry

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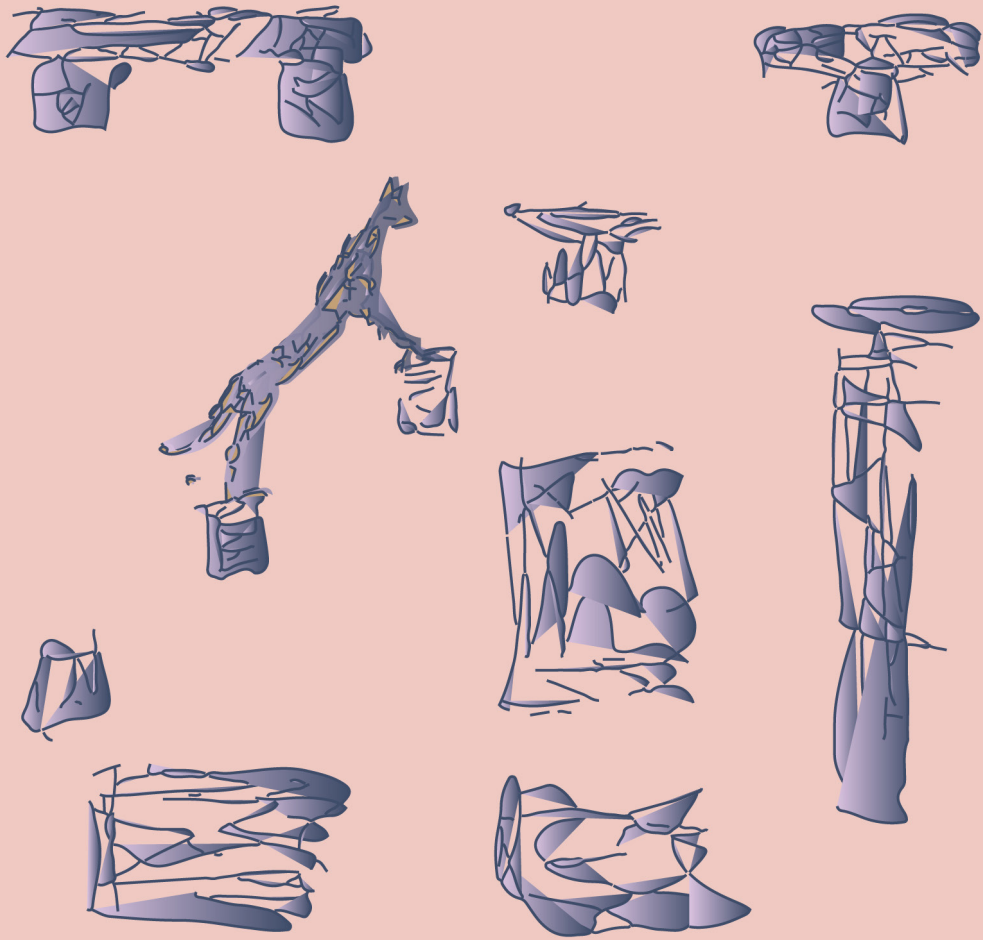
[2] Archy O. De Berker et al., "Computations of Uncertainty Mediate Acute Stress Responses in Humans," Nature Communications 7, no. 1 (March 29, 2016), https://doi.org/10.1038/ncomms10996.

[3] Luxi Shen, Ayelet Fishbach, and Christopher K. Hsee, "The Motivating-Uncertainty Effect: Uncertainty Increases Resource Investment in the Process of Reward Pursuit," Journal of Consumer Research 41, no. 5 (February 1, 2015), https://doi.org/10.1086/679418.

step towards the hand that feeds and a frightened step back to a safe distance, primordially tied to the chains of our evolving instincts.

Luckily, our behaviour is as much moulded by our culture and environment as it is scripted in our brains. If that is true, we might have some control over the external influences that co-define the ruleset of our interactions with uncertainty. Understanding the cultural strings that puppet this part of our behaviour will be the goal of the next section, and the first step towards re-arranging these strings into a climbing structure: the first attraction of our generative playground.



“A climbing structure: the first attraction of our generative playground”

Cultural responses

How do I know we love fear more than our children? Because we are willing to ruin their lives in service of some irrational fear of losing them.
No, Billy, you can't walk to school today.
What if somebody kidnaps you?
Clara-Belle, don't listen to rap music.
You might get bad ideas about yourself.
Every day we are choosing fear over freedom.

Kai Anderson [1]

Kai Anderson, the supervillain of American Horror Story's seventh season, struck me as the embodiment of the culture of fear. He starts exercising his power over

[1] "Election Night," American Horror Story : Cult (FX, September 5, 2017)

his sister: the manipulative nature of the culture of fear first manifests itself within the family unit, where the seeds of obsession are initially planted. Kai then begins to target people outside of his household, seeking the most fragile individuals and taking advantage of such vulnerabilities to take on an army of faithful recruits. Soon the entire country is somehow affected by his influence: through violent manipulation of people's uncertainty, to the point where they are constantly questioning their safety, their mental sanity, and the intentions of people around them, he is able to permeate every corner of public and private spaces. His many followers act as tentacles of an untouchable, omnipresent monster: fear.

A fearful grip

Billy's no-strangers policy and dogma-induced lobotomies

Kai's political agenda excludes, if not attacks, any form of hope. According to him, the only way to bring about change is to render people hopeless and destroy their every certainty, by systematically taking over every establishment.

Just like Kai, the culture of fear also opposes all forms of confidence in the future, and it hardly distills any sort of inspiration in the society it affects: it feeds exclusively on negative arguments, which are unlikely to spark positive ideas of change and innovation. [1]
Similarly to Kai, the culture of fear relies on our intolerance of uncertainty to thrive. A parent who is intolerant towards uncertainty would never dream that Billy could learn a thing or two about autonomy while walking home alone. Rather, they will as-

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[1] Furedi, Frank. 2018. How Fear Works. Ebook. London: Bloomsbury Continuum. https://b-ok.xyz/.

sume the worst: “Do not talk to strangers”, they’ll say, as if every stranger was inherently a threat.

“No Billy, you can’t walk to school today”.

Potentially, uncertainty is able to produce hope, but Billy’s parents are too busy listening to their fears to lend an ear to constructive thoughts. Fortunately, it is still possible that Billy’s perspective will be different growing up. Most of our fears are human-made, which means they can be altered, if understood. [1]

The fear of God’s judgement is a great example of a human-made fear: it is deeply interconnected with our values system and traditions. At its core, this fear is nothing but one of the many responses to uncertainty humanity has produced over the centuries: it is a framework of meaning that we apply to uncertainty, to make sense of it and mediate it. As a result, we can believe in a future in which, although the world ends in the apocalypse, things will ultimately be meaningful through final judgement. [1]

Religion is only one of the many cultural resources we have created to provide certainty.
Science is also often considered as one of these resources, although its methods do not claim to produce certainty, they investigate the territory of uncertainty instead: scientists do not believe in absolute truths, and part of their job is to accept the existence of everything that is unknown and the uncertain nature of their knowledge.

In his book "The meaning of it all", Richard Feynman compares the scientific approach to that of a politician: politicians must have all the answers, people demand them to be certain. [2] If a politician were to sustain a scientific attitude towards debate, they wouldn't be able to advance definitive solutions, let alone shout their indisputable, propagandistic truths in the face of the opponent. Rather, they would admit that they do not have all the answers, they would be open to changing their opinion on a subject if presented with sufficient evidence, and they would be excited to find out something new rather than endlessly loop back into their own train of thought.

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[2] Feynman, Richard. 2005. The Meaning Of It All. Ebook. 2nd ed. Basic Books.

A dogmatic disposition towards knowledge can be very dangerous for society: "it builds itself up until it's afraid of an enemy" [2]. People who do not want to engage with uncertainty out of fear tend to only hang out with an exclusive club who will affirm their certainties, an attitude which reframes healthy confrontation as a threat. "Il disaccordo e' tradimento" (Disagreement is treason). According to Umberto Eco, this is one of the founding statements of a fascist authority. [3]

Dogmas are ultimately a form of argumentative violence and intellectual dishonesty. They can in no way generate a dialogue, and they disqualify the non-dogmatic interlocutor.

Wesa Channel [4]

One of the most popular figures in today's Italian political scene, Matteo Salvini, has risen to his position entirely by "disqualifying the non-dogmatic interlocutor". His followers believe in his truths to the point that they would call him the "captain" and make comments about how he would "save the country", as if he was a religiously prophe-

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[3] Eco, Umberto. 2018. Il fascismo Eterno. Ebook. La Nave di Teseo

[4] WesaChannel, "Esiste Dio? Parliamone!" , YouTube Video, September 21, 2017, https://www.youtube.com/watch?v=-VFyVk-F41A

tised saviour. Part of his role as a saviour is, of course, to get rid of the "invaders".

"The moral instigator of the events in Macerata is Matteo Salvini", [5] says the journalist Roberto Saviano, referring to the shooting of six immigrants carried out by an ex candidate of Salvini's party. [5] Nobody would make an attempt on someone's life only because they are "pretty sure" immigrants are detrimental for the country. To be sure that a stranger's unknown intentions must be bad quickly turns into being certain that the stranger is inherently bad, that the immigrant is intrinsically an enemy.

It was Salvini's dogmatic attitude towards his campaign and his opponents that made him the perfect framework of meaning for people to make sense of their uncertainty. Of course, the gap of uncertainty was so big in the community that it urgently needed to be filled: I refer to Italy's highly uncertain political nature (a country that characteristically changes governments very often [6], rated as a "flawed democracy" by the Economist Intelligence Unit[7]),

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[5] Q., F. "Macerata, Spara Agli Immigrati Dall'auto: '6 Feriti'. Fermato: Avvolto Nel Tricolore, Ha Fatto Il Saluto Romano. Nel 2017 Fu Candidato Dalla Lega - DIRETTA." Il Fatto Quotidiano. Il Fatto Quotidiano, February 4, 2018.

[6] Chris Harris, "Why Do Governments in Italy Change so Often? ," Euronews, December 13, 2016, https://www.euronews.com/2016/12/13/why-do-italian-governments-change-so-often)

coupled with a situation where everybody blames all kinds of unfortunate circumstances on somebody else, hiding the truth behind countless layers of avoidance, filth and corruption. Salvini stands as a pillar of bold certainty in the face of all this doubt. He gives people something explicit to fear, a tangible, vulnerable enemy to blame for every issue the country is facing and the sense that their future will possess meaning through the nationalistic revival of traditional values. All of which is an oversimplistic, if not outright idiotic solution to a series of complex issues, packaged into an easily conveyable, highly crowd-boosting earworm to be delivered as political propaganda.

And so the danger of a man's ultra-biased certainties is unleashed, amidst the spreading swarm of neo-nationalist movements seeping through Western politics. Viciously certain beliefs similar to the ones perpetrated by Salvini can be found all across Europe and in the States alike, drowning uncertainty in a cloud of thoughtless statements.

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[7] "Democracy Index 2017," Democracy Index 2017 (The Economist Intelligence Unit, 2018), http://www.eiu.com/public/thankyou_download.aspx?activity=download&campaignid=DemocracyIndex2017)

Loving uncertainty makes sure we do not fall into these dogmatic traps, because it keeps us in an inquiring position where we are open to questioning our knowledge and beliefs, so that people like Salvini or Kai can't make it any further than getting our benefit of the doubt. However, it is understandable that loving uncertainty can be hard in present times.

The cultural script that fosters the use of the metaphor of a ticking time bomb gives little guidance for people reflecting on their future predicament. Unlike past stories of a future of revelation, redemption, progress, liberation or even of more of the same, it merely hints that our lives are likely to be far worse than today.

Frank Furedi [1]

We are mostly surrounded by negative premonitions of future events: an impending sense of doom is forcing us into a trap door where we are being crashed by artificial intelligence on one side, climate change on the other, mass immigration and dystopian scenarios of all sorts. Where are the cultural resources that are supposed to restore

a sense of certainty, or the values that are supposed to give meaning to our future? Knowledge could be a powerful cultural resource in providing certainty, given our current stage of scientific and technological development. However, we must remember that technology has itself created many of the uncertainties we are facing at the moment.
This results in a lack of confidence in scientific knowledge, as well as the feeling that we are unable to comprehend the future ahead of us.[1]

As to the values that are supposed to help us make sense of this future, one value has been raised above all the rest: safety. [1] In a world where everything must be "future-proof", where people's anxieties are constantly being manipulated, and where our cultural imagination has a fatalistic view of the future, nothing could be more valuable than safety. We often go as far as picking safety over freedom, for example by accepting security cameras or banning controversial speakers in American campuses [8]. Avoiding risk has become equivalent to responsible behaviour.

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[8] Turner, Camilla. "University Speakers Should Not Be Banned Just Because They 'Offend, Shock or Disturb' Students." The Telegraph. Telegraph Media Group, February 2, 2019. https://www.telegraph.co.uk/education/2019/02/02/university-speakers-should-not-banned-just-offend-shock-disturb/.

Humanity is seen as vulnerable and incapable of dealing with problems, and uncertainty is being systematically removed from every aspect of our lives for the sake of comfort and efficiency.

(...) it is entirely possible to envisage a world where fear ceases to be regarded as the principal motivating force in public life"

Frank Furedi [1]

We need a future-oriented alternative to this perspective of fear. This will not be brought about by the attitude of control and management over uncertainty, nor will it sprout in any dogmatic thought. A "tinkering" approach will be needed, one where people have a greater opportunity to experiment and take risks through a process of non-predictive decision making. Children should not be educated through facts, but rather through questions. They shouldn't be viewed as fragile individuals by society or by their parents, in an educational system that is driven by fear rather than hope.

From an early age, we should learn that

the best way to approach uncertainty is through antifragility, a property identified by Nassim Nicholas Taleb as a love for randomness and disorder: antifragile things thrive as a result of shocks, stressors, failures. While something fragile is at best unharmed, something antifragile is at worst unharmed. [9]

This allows us to see ourselves as a system that regenerates itself by using random events and mistakes as information: suppressing randomness would only make us more vulnerable, and Billy now seeks as many strangers as possible to help him grow.

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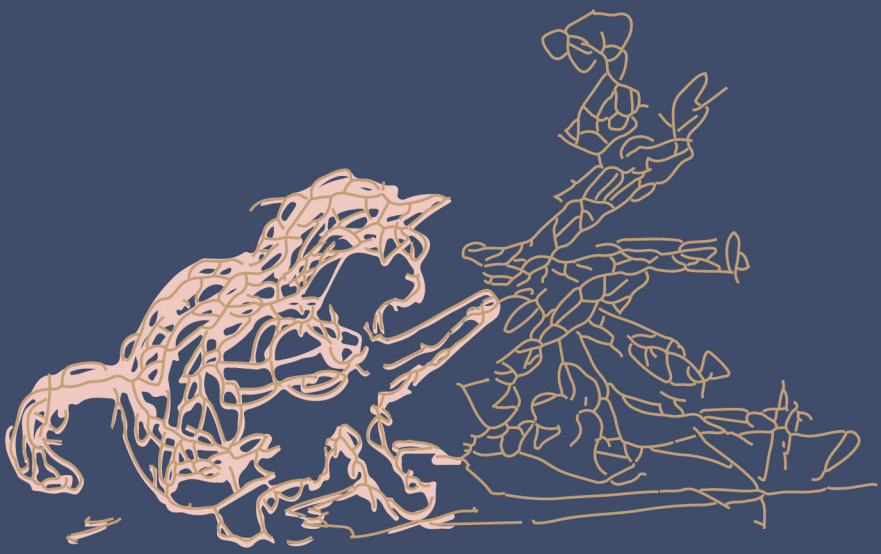
[9] Taleb, Nassim Nicholas. Antifragile: Things That Gain from Disorder. Random House, 2016.

“A tinkering approach will be needed”



Uncertainty as a generative force

Uncertainty is a blank canvas. Onto it, humanity projects every conceivable scenario an empty stage can hold, from the least desirable to the most longed for. Layers and layers of possibility stand between the certain and the uncertain, each is a story waiting to unfold.

Generative force found “in the wild”

Speaking of uncertainty as a generative force may seem like a banality. Of course, every creative endeavour begins from an uncertain place, a blank page.
However, is uncertainty in itself generative, or is it just part of the goldilock conditions the creative process thrives on?
That is, does uncertainty in itself carry generative potential, can it “generate” narratives even in the absence of creative intention, inspiration and other circumstantial factors?

Let us consider a concerned parent, who has been waiting for their child to come home for hours now. Not only is the child suspiciously late, but it is also impossible

to reach them on their phone. This kind of situation typically triggers a cascading stream of narratives: whether they like it or not, the parent will produce a number of possible stories to explain the uncertain whereabouts of their offspring. Maybe the child simply fell asleep at their friend's house, maybe they had an accident on the way home, or they lied about their intentions and escaped with their crush.

In this situation, uncertainty is completely detached from creative intention.
Yet, its generative properties are actively working in the parent's mind, unraveling possible outcomes in the form of micro-stories.
Uncertainty's generative power can therefore be found "in the wild", in the natural realm of our involuntary cognitions.

Adolescence

Drafting the self through possible narratives

We come across another spontaneously generative form of uncertainty during adolescence. This blurry stage of identity formation comes with many questions surrounding the self: when one has not yet formed even the haziest draft of a self-concept, uncertainty takes over. Faced with an infinitely branching crossroads, the adolescent's mind begins to generate possible scenarios to make sense of this overwhelming confusion. They will conceptualise multiple "possible selves" in their minds, both positive and negative. [1]

For example, there were times when I pictured myself as a writer in the future, because of the enjoyment I felt when writing stories or the positive feedback I received from teachers and family. Oftentimes I would have this idea in mind, that I would grow up to be an old woman with long, silver hair, covered in tattoos and

[1] Dunkel, Curtis, and Jennifer Kerpelman. Possible Selves: Theory, Research and Applications. New York: Nova Science Publishers, 2006.

surrounded by wolf-like dogs in a small house on top of a mountain. Some of these possible selves were very specific, others were more of a general representation of a fear or a desire: one possible self would be lonely, another would be a relentless drug addict, and one would be destined to great things.

Adolescence might be one of the most uncertain times of our lives and, as a result, it has an unrestrainable generative potential: countless narratives will be imagined around the self, and many will be actively enacted or "tried on".

Dreams

A safety net of woven tales

It could seem that dreams are enactments of possibilities, generative explorations of the uncertain.

When my dog died, I was away from home, and I had been for a long time. I dared not

ask my parents where they buried him, or whether he was cremated, or whether the vet had just put him in a box and let him drift away in a river or donated his body to science. In my mind he was just gone, vanished out of existence, from one day to the next. Not only were the physical whereabouts of his body unknown to me, but there was also much uncertainty surrounding the ontological validity of his being after death. As an agnostic with rather sceptical tendencies, it was hard for me to believe that my dog could still exist as I knew him, or in any other form. My dreams promptly caught my grief in their net of possibilities, unfolding hopeful narratives before my closed eyes.

First he was in our home, or his presence was, checking into my room every once in a while to see how I was doing.
Then I followed him, or his presence, outside. There he was free, playing in the park with other dogs.
Soon amongst the other dogs I began to see corpses, and he was back to being what my sceptical self knew to be (at least partially) true: a dead, decomposing body.
But throughout the dream, all possibilities

co-existed on the same ethereal plane, and they were all true at the same time. Uncertainty had left plenty of room for these narratives to interact with each other in a way that didn't exclude any of them from my perceived reality.

And so thanks to uncertainty, my dog exists long after his death. In its broken down, organic form, in the house and in the park simultaneously. Contributing to nature's neglectful ecosystem, spying on his family and playing with his friends, all at the same time.


Uncerainty
found in
the wild

Organising and applying uncertainty's generative power

We can be very intentional in treating uncertainty as a resource: we find it in the wild like any other raw material, and as humans we can not resist taming and exploiting its generative force.
In this sense, we can witness uncertainty's generative potential on an entirely intentional level. We can learn from early civilisations to mold complex fictional worlds out of the raw uncertainty that is abundantly available in our environment.

Mythology

A God's uncertainty is their divine power

One of the biggest uncertainties humanity has ever faced is tied to the existential questions that haunt us since the beginning of human consciousness: where do we come from? Why do we exist? How did the universe come to be?

With such heavy-weighing unknowns impending on us we must weave an incredibly tight net of possible narratives to keep these questions from crashing us.
All cultures across the world have experienced the generative force of uncertainty throughout a multitude of mythological adventures. Under the pressure of the unknown, our collective imagination has sprouted all sorts of mind-boggling stories.

Makemake created the first human beings. Trying to procreate, the god first masturbated into a calabash full of water, but this produced no offspring. Then, he copulated

with stones – which still bear the holes he created in them – but that did not work either. Lastly, he masturbated into clay, and as a result, four gods were born – Tive, Rorai, Hova, and Arangi-kote-kote." [1]

Here we see a God who is himself exploring the territory of uncertainty. Not sure how to produce other beings, he experiments with different possibilities until he's able to procreate.

Before the cosmos was created there was just a blank void. Amidst this expanse of nothingness floated a huge egg-shaped shell. Inside was the feathered creator god Ta'aroa, who had no mother or father [1]

Yet another God who is all but omniscient. In the beginning, Ta'aroa knows nothing. Nothing at all. He knows of no heritage, no being or entity existing before him, no knowledge of any sort to be passed on to him, no glimpse of a future around him.

When he called out to the darkness, there was no reply – the only sound was Ta'aroa's voice. [1]

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[1] Turner, Duncan. The Mythology Book. London: DK Penguin Random House, 2018.

Ta'aroa tries to probe this infinite nothingness with his voice, but no certainty can be found in the dark. It's now up to him to create a universe, with all its possibilities and all its stories.

[...] *he resolved to bring creation and life to the void.* [1]

A God suspended in the unknown, in a boundless expanse of darkness, must be floating through an uncertainty so dense, that its generative force could produce the whole universe.

Interpretation

Uncertain meanings as generative source

Many creative minds have intentionally and masterfully made use of uncertainty as part of their generative method.

The writer Italo Calvino randomly arranged tarots on his table and listened as

his mind filled the gap of meaning with narrative solutions. [1] The result of these experiments was his book "Il Castello dei destini incrociati". [2] In it, a series of characters are sitting together in a tavern, but they all seem to have lost their voice at once, since the moment they stepped in the place. They soon find an alternative route to communicate with each other, lining up tarot cards on the table and letting these universally expressive symbols tell their stories. The book is written from the perspective of one of the tablemates, who interprets and narrates all of the tales as he understands them.

As I read, I couldn't help but wonder how many more stories were being generated in each of the characters' minds: while they were all looking at the same disposition of tarot cards, they probably would each interpret the symbols in a radically different way. And if I was to lay the same cards on my desk in that same order, I, too, could write an entirely new book out of them.

If we consider the fabric of our reality as an intricate crosswords of tarot cards,

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[1] "Il Castello Dei Destini Incrociati." Wikipedia. Wikimedia Foundation, November 22, 2019. https://it.wikipedia.org/wiki/Il_castello_dei_destini_incrociati.

[2] Calvino, Italo. Il Castello Dei Destini Incrociati. Milano: Mondadori, 1997.

the meaning of which is quite unreliably versatile, we could keep generating new meanings infinitely, or for as long as we are willing to accept the fact that anything we will come up with is essentially uncertain. The moment we'd find comfort in one certainty or the other, our generative source would be exhausted, and we would keep reading the same book over and over, trusting that the narrator gave the only possible interpretation.

The repertoire of the possible

Possibility between human and artificial imagination

Our continuous expansion on the territory of uncertainty takes place through the narration of possibilities.

Originally, primitive lifeforms only had one way to explore the possible: evolution.

They wouldn't be able to "add new behaviours to their repertoire of the possible" [1] through any other means other than genetic variation, because they were limited to handling information through their dna.

So, even if an exceptional amoeba had somehow developed the earliest trace of a pseudo-curiosity, and started to feel the necessity to venture to a different pond from its own, it wouldn't have had the chance until evolution would equip it with some sort of built-in vehicle.

A more complex organism, on the other hand, could find its way by processing information in its environment. In other words, by learning.

Our hypothetical curious cat, for example, who -let's suppose- was injured in a curious accident, is now left with very limited mobility. It spends much time observing the house dog swiftly moving from one room to the next. Then one day, after falling asleep on the dog's back, the cat wakes up to a miracle: although its limbs are still injured, being carried around by the dog

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[1] Costikyan, Greg. Uncertainty in Games. MIT Press, 2015.

almost feels like running again! The curious cat accidentally discovers that it can hitch a ride and learns a new possibility of transportation. This adds faster, longer travel to their repertoire of the possible.

The more complex the organism, the more it will be able to surprise itself with possibilities unbeknownst to its kind. Until a point is reached, where a species is not only able to explore the possible through direct experience, but also through the means of imagination. A species that not only stumbles upon a new continent by accident, but also looks up to the stars and dreams that it might be possible to conquer the sky as well as the land. A species that builds glorious narratives around all that is not quite part of their "repertoire" yet, re-imagining the impossible over and over until it's not out of reach anymore.

We place the seeds of our future out of the bounds of possibility, amidst sci-fi stories, supernatural beliefs and ambitious plans to remodel our whole world. It might seem like the greatest means of transportation we've ever come across is not our feet, nor the horse, or fins or wings or wheels. The

greatest vehicle yet might be our imagination. Never has any species seen this far without it. And yet, if human imagination alone seems like an unlimited source already, it is worth noting that we did find a way to further expand this immense reign of possibility.

Beyond human imagination, there is now an artificial one.
We have teamed up with machines in many fields to expand the repertoire of the possible. Inevitably some of these allied technologies have ended up imagining new, unthinkable possibilities together with us.

An interesting parallel between human imagination and hybrid human-computer imagination can be found when comparing Codex Seraphinianus with Encyclopedia Generativa. Both projects are meant to be imaginary encyclopedias of fantasy worlds. In the case of Codex Seraphinianus, Luigi Serafini has personally imagined and illustrated a whole fictional reality, gathering a collection of depictions of this impossible world into a book. [2] Alexia Defluff's Encyclopedia Generativa, on the other

[2] Serafini, Luigi, and Sylvia Adrian Notini. Codex Seraphinianus. Rizzoli International Publications, 2015.

hand, was illustrated in an entirely programmatic way, through the means of generative art and algorithms. The result is a digital encyclopedia of generative lifeforms, which can be found and followed on Instagram. [3] The creatures represented in this project were given life somewhere beyond the artist's own imagination, in a mingling crossroads between human vision and computed imagery.

When it comes to generative art and design, we confide in computer programmes to calculate pseudo-random mathematical formulae, introducing surprising twists to our digital artifacts.
Artist and programmer Matt Pearson describes this human-computer collaboration as "an exercise in extracting unpredictable results from perfectly deterministic processes". [4]
It is clear that uncertainty plays an important role in this practice: the artist's vision is not isolated in its own imagination and anticipation of the outcome, but instead it is processed through custom made noise functions. This introduces layers of randomness which compute a wider imagery

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[3] "Encyclopediagenerativa" Instagram, www.instagram.com/encyclopediagenerativa/

[4] Pearson, Matt, and Marius Watz. Generative Art: a Practical Guide Using Processing. Manning Publications Co., 2011.

of fabricated possibilities.

Confronted with technologies which are intended to make accurate calculations, and can not in any circumstance fall out of line, we attempt to reproduce uncertainty artificially by creating pseudo-random functions and applying them to the variables that compose our virtual environment. In this sense, even artificially computed uncertainty can be used as a generative tool.

We have looked at hybrid human-computer imagination. Such generative practices still rely a lot on human input to produce an image. Projects like Joel Simon's Artbreeder.com [5] and Sam Hain's Zero Likes [6] show a different kind of artificial imagination, one where the AI takes "initiative" in the creation of content, resulting in an outcome that is almost entirely independent from human imagination. Although the raw material utilised by the AI is provided by humans, the ways in which this material is processed involve a series of decisions and developments that take place outside of the human mind, in the unintelligible black box of neural networks.

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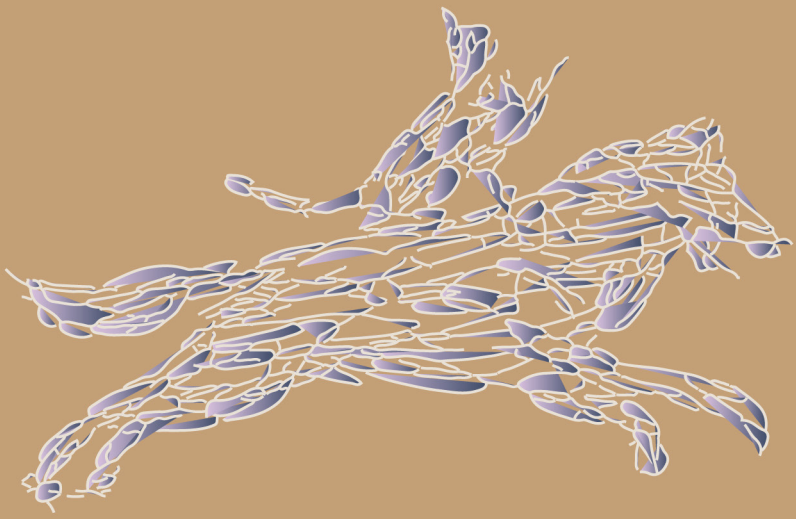
[5] "Artbreeder." Artbreeder, artbreeder.com/.
[6] "ZERO LIKES (@zero_likes)." Twitter, 26 Feb. 2019, twitter.com/zero_likes.

From now on, we can expect artificial intelligence to work alongside us in the expansion of the repertoire of the possible. It will actively imagine scenarios to be fed to our imagination, which in turn will produce new material for the AI to train itself and so on.

Adding fast travel to a cat's repertoire



The mysterious stranger

Testing uncertainty's generative properties on a fictional lab rat

Having access to a generative force comes with great responsibility: its hyper-productive nature could spiral out of control and give life to undesired abominations. In the case of uncertainty, such abominations are mostly dangerous narratives that can be manipulated by the powerful.
In order to be conscious of the generative process involved in uncertain situations, and in order to be able to apply this force responsibly, we will analyse a familiar example.

Let's suppose we are walking down the road on a regular day and, just like it happens in the game Fallout New Vegas [1], we run into a particularly mysterious stranger. The air is dense with uncertainty. Our minds are inevitably triggered to generate scenarios.

[1] Fallout New Vegas, Obsidian Entertainment, 2010

Depending on our upbringing, our beliefs, attitude, and all that contributes to form the framework of meaning we apply in these situations, the narratives we produce will range from dangerous abominations to innocent fairytales. Here are some of the possible approaches I have observed.

The dogmatic approach, typical of the unilateral, dogmatic mind, will take uncertainty's generative potential and spit out a dogma: one single non-negotiable narrative based on blind belief.
There goes the dogmatic mind, walking down the street. As soon as they set eyes on the mysterious stranger, one minor observation somehow manages to obscure all the rest: leather shoes. To the dogmatic mind, this detail is enough to reach a simple conclusion. "My religion is against killing animals. Leather is evil. The mysterious stranger is evil. He's my enemy."

What I call the mythological approach is hard to come by. I have mostly observed it in the presence of creative or playful individuals, children or people in an altered state of mind. It is nevertheless my personal favourite. The mythological mind uses

uncertainty's generative potential through and through, producing a myth: a fictional narrative that addresses the uncertainty. It doesn't provide truth, only a symbolic "placeholder" for the missing information. Because of this, the uncertainty still remains, and the mythological mind could continue producing myths indefinitely without reaching any conclusion (although we usually stop at the one that satisfies our thirst for beautifully woven stories). When the mysterious stranger's path crosses that of the mythological mind, the man is captured as a character. A few key impressions set the scene: he's very serious looking, he's holding a gun, he's wearing a trench coat with a belt. The mythological mind sets adrift on its generative journey:

"Back from a long business trip, the mysterious stranger found his wife dead in the shower, her hands still holding onto the shower curtain, as if that thin layer of polyester could have kept the killer from reaching her. The man knew he should have been the one to stand between the killer and his wife, so he cut a slice of the shower curtain as a symbol, tied it around his waist, and promised he would spend

the rest of his life protecting those in need from the dangers of the wasteland. Gun at hand, his adventure begins."

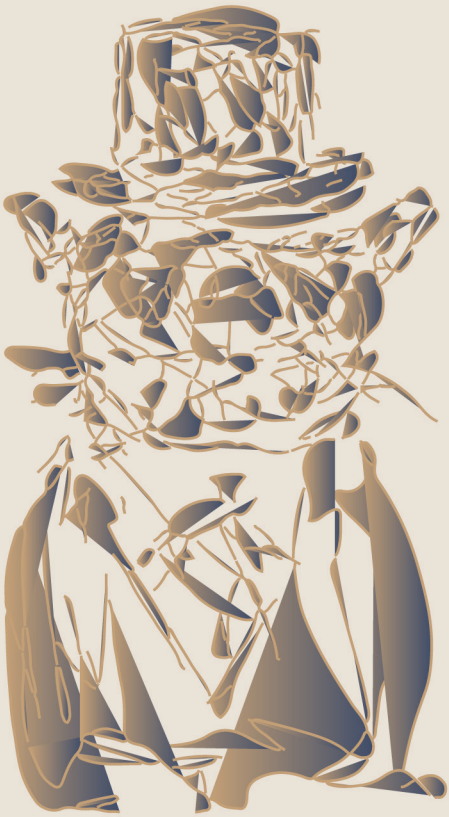
Perhaps the most alarming of them all, the politician's approach is sadly quite widespread, and not only within politicians. This approach looks at uncertainty and generates propaganda: an opportunistic narrative to be used against opponents, in favour of the "politician" (who is endlessly looping back into their own certainties). The politician's mind sees the mysterious stranger as a window of opportunity: they quickly observe that he has dark skin and is holding a gun. It is smooth and easy to generate a conclusive narrative: "What did I tell you? Dark skinned person is holding a gun, once again! As you can clearly see I am right, and they are wrong".

Last but not least, I have observed a surprisingly logical and healthy approach to uncertainty: the scientific approach. This produces multiple hypotheses, resulting in a possibility tree: a non-linear narrative where multiple storylines coexist at the same time. Certainty is never reached, the scientific mind is happy to prove itself

wrong.
The mysterious stranger is promptly broken up in a series of key factors by the scientific mind. Each of these observations gives life to multiple hypotheses.
The stranger is holding a gun: he might be a detective, or a criminal, or he might carry it for self-defense.
He is also wearing a hat: maybe he comes from a rainy region, or he's ashamed of being bald.
He seems to have expensive shoes: he could come from a rich family, or did he maybe steal them?

We have now generated many narratives around this mysterious stranger, and we can clearly see how much they differ depending on the approach that is being applied. In order to consciously organise and exploit uncertainty's generative potential, we need to be aware of the risks and benefits of all these approaches, as well as seek out the many other approaches that undoubtedly exist and I am yet to identify.

The mysterious stranger has a cat in his hat

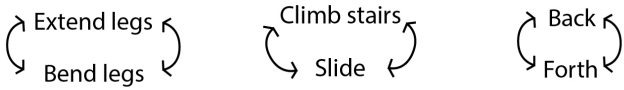


Building a playground in the space of uncertainty

What we are trying to build is more of a "generative playground" than an actual game.
The ruleset will be kept quite loose in order to leave plenty of room for unexpected outcomes, and the player will not be challenged in the traditional, game-like sense: it will be mostly their imagination to be put to the test, in a way that doesn't constrain actions to a right or wrong connotation. Progress won't be quantified, it will entirely depend on the player's perception of it. There will be no winning or losing conditions.

Still, a playground relies on a user's actions as much as a game, which means we can

define core mechanics in a playground, too: if we observe a child playing in a park, we will be able to identify the equivalent of a "core game loop" [1] based on their interactions with the environment.



Core game loops for a swing, slide and rocking chair.

Similarly, in order to build our playground, we need to identify those key actions that make up the core game loop, the flow which will guide the players through their generative experience.
Because we are borrowing elements such as game loops and mechanics from game design, and because we are dealing with uncertainty as generative material, it is useful to look into the role uncertainty plays in existing games.

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[1] "Core Game Mechanics." Videogame Workshop, www.videogameworkshop.com/game-design/Core-Game-Mechanics.html.

Game design tools

In his book “Uncertainty in games”, designer Greg Costikyan examines various game mechanics and the different kinds of uncertainties involved, classifying them in practical categories. [1]
Let us go through some of his research and try to understand how the various forms of uncertainty we encounter may or may not apply in our playground.

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[1] Costikyan, Greg. Uncertainty in Games. MIT Press, 2015.

Uncertainty in games

Where is Mr Midnight?

Games based on "performative uncertainty" are identified by Costikyan as the most common category to be found in the current video gaming scene. [1] In this case, the question that keeps the player on the edge is "Am I skilled enough to make it to the next level?". The uncertainty lies entirely in the challenge, in the fact that the player's hand-eye coordination might or might not be up to the task.
This doesn't appear to be a particularly generative form: with every step, with every shot fired and every button press, there are usually no more than two possible outcomes. We either fail, or succeed. It might be wise to stray away from this kind of approach in our project: a playground doesn't claim to determine winners and losers, it is a place meant for free exploration and "tinkering" interactions, rather than a training ground aimed at a specific

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[1] Costikyan, Greg. Uncertainty in Games. MIT Press, 2015.

skill set.

What Costikyan calls the "solver's uncertainty" is similar to performative uncertainty as in its source is also challenge-based. This time, it is the player's ability to solve puzzles to be put to the test. Such puzzles can sometimes trigger quite interesting generative results: while looking for the definitive solution, our minds often wander through possibilities in a speculative fashion.

This is often very noticeable in point and click games: there is usually only one way to perform a particular action, but with a whole world of items and characters surrounding that action, we are forced to explore all kinds of logical and narrative connections between objects, people and environment in a process of trial and error. If we must open a door, for example, we might try to craft our own key with the materials we have in our inventory, or we might initiate a conversation with someone we've seen enter that door before, or attempt to break in with all sorts of tools we find laying around the building. In this regard, the generative potential is pretty

high in terms of imagined possibilities.

However, there is no record of all our failed attempts, the game doesn't take these parallel narratives we are building into account. There is one, set solution and unless we find it we are stuck and unable to progress. This is why our playground might be sprinkled with puzzles or enigmas here and there, but they shouldn't be necessary to advance in gameplay. If our player gets bored trying to solve the rubix cube, they should be able to leave it where they found it and move on to the next attraction.

When it comes to multiplayer games, Costikyan defines "player unpredictability" as the driving form of uncertainty. This refers to the impossibility to foresee actions other players will take, and how they might influence our own position in the game. Such interplayer dynamics add a whole new layer to the generative possibilities of uncertainty: when we imagine all the actions we could take in the game, we need to also imagine all the responses they might trigger in other players, and what consequences these reactions could possibly have on us and so on.

While this mechanic can be built up to any degree of complexity, the mere fact that we can surprise each other through player unpredictability is entertaining in and of itself. Think of the most basic pass-time game where one person says a word and the other says the first word that comes to mind, and so does the next person, and on it goes indefinitely. There is no goal to this game, no other appeal other than sheer player unpredictability: it is inherently entertaining to pass a ball to another player and let them surprise us with their reaction. It could certainly be beneficial to introduce multiplayer dynamics in our playground, placing the users in a shared space where narratives are generated through mutual feedback.

Perhaps the most obvious form of uncertainty we find in games is randomness. It is present in most tabletop games (draw a card at random, throw a dice), and applied in often very elaborate ways in digital games (from random enemy encounters and rewards to randomised variables in procedurally generated maps). As Costikyan points out, a subtle and balanced amount of randomness can really

bring a lot to the table: it simulates the unpredictability of real events, it creates diversity and provides a thrilling sense of tension to the experience [1]. Randomness will certainly have a place in our playground, so that players can be confronted with a variety of unexpected content and create refreshing associations across narratives.

Hidden information [1] is another fairly common practice in the game designer's toolkit. When playing tabletop games, there are often cards turned face down on the table. In digital worlds, we are left to explore a vast terrain where all sorts of unknowns are waiting to be uncovered.
Roaming around game worlds is not always a generative experience, especially not when the hidden information is spontaneously revealed or easily discovered: most video games do not demand us to actively imagine what there might be behind closed doors, rather they encourage us to break the doors down and see it for ourselves. There exists, however, a multitude of games that require us to imagine what hidden information might be kept from us. An example of this is basic guessing games,

where we must constantly build possible narratives and test them against the true, hidden information. This is a different kind of exploration from that of most open world games, a speculative exploration of the space of uncertainty as opposed to an empirical one. Implementing hidden information in our playground should inspire players to probe their surroundings in creative ways, not only in an attempt to access the information, but also in an attempt to generate new one.

Games, like other media, tend to tell a story. Where there's a story, a particularly gripping form of uncertainty can be found: narrative anticipation.[1] It is an incredibly motivating force. I have often ended up playing games I didn't find all that enjoyable, simply because I felt invested in the story and needed to know how it would end. This is not only true of the stories we consume, but also of the ones we produce. It's easy for me to leave a project halfway to completion when there is no narrative whatsoever involved. I just put it to the side and then forget about it. When some kind of story starts to form around said project, however, it will be extremely difficult for

me to not see it through. A non-conclusive story holds great generative potential: if the author didn't put an end to the protagonist's adventure, our brains will most likely do it for them. With that in mind, if we want to maximize our playground's generative potential, we might want to pester our players with disjointed, unconcluded narratives, and provide them with enough tools so that they can invest their frustration in making stories of their own.

[A] Fran Bow, Killmonday Games, 2015

The uncertain whereabouts of Mr. Midnight [A]

Generative narratives in games

Rescuing a cat with fire and other creative solutions

> *"What about your nightmares? What do you see in them? Clowns maybe?"*

"Well, I've seen things in my dreams that aren't real, but nothing like a clown. A tall thin man with red hair and a goatee wearing a funny suit and holding a big knife. He's always following me around though."

I had this brilliant conversation while playing a game, and yet there were no limiting dialogue options involved, no sit-back-and-watch cutscenes and no constraints of any sort applied to my words. And no, the game was not multiplayer. All the characters in the story, all the interactable objects and environments were played by the same actor: an artificial intelligence trained on

data from chooseyourownstory.com . [1] The game is called AI Dungeon and, as their creator puts it: "Unlike virtually any other game in existence, you are not limited by the imagination of the developer in what you can do". [2] Which allows me to walk up to any character I meet in this text-based adventure and ask them the most intriguing questions, such as inquiring about their nightmares. The responses I get might not always be entirely coherent, but they hardly ever disappoint: sometimes they are hilarious, other times quite credible and rich in detail (like the thorough description of the tall man with a goatee), and occasionally they are so uncannily human that they give me the creeps.

This game simulates player unpredictability, but is actually a single player experience. The magnitude of the uncertainty is immense, because there is no limit to the actions I could perform through language, and there is no set number of situations the game can respond with. Narrative anticipation is also a big part of what makes AI Dungeon entertaining, as the player and the AI build a story together. Generating

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[1] Boog, Jason. "The Creator of AI Dungeon 2 Shares GPT-2 Finetuning Advice." Medium, Towards Data Science, 14 Dec. 2019, towardsdatascience.com/the-creator-of-ai-dungeon-2-shares-gpt-2-finetuning-advice-e5800df407c9.

[2] "Home." AI Dungeon 2, aidungeon.io/.

narratives is therefore not just an inevitable side-effect of engaging with a story-based medium, in this case it is the core mechanic and the goal of the game.

Occasionally, the AI will try to end the story prematurely:

The fourth card drawn is a Spades. This means you have to make a deal with God.

"God, please help me out here."
- YOU DIED! GAME OVER! -

> "How did I die though? Did God kill me or something?"

"Oh, you died. That's why you had the Joker on your last card."
- YOU DIED! GAME OVER! -

> "But my last card was Spades! Give me a chance, please, I like this game"

"Alright, alright, give you a chance. Pick one."

AI Dungeon gives so much freedom to the

player that I was able to defy the laws of game over, simply by persuading the AI. This platform is like a playmate, I can negotiate the rules with it as I play. And when I've had enough I can make it known to the AI Master that playtime is over, and it will surrender to a conclusion.

Then, you hear another noise outside and run upstairs to investigate.
> I'm tired of investigating
You're tired of investigating every damn day. You go back to sleep.
> I never want to wake up again. Sleeping is so nice
You fall asleep and never wake up.
> The end
The End.

While artificial intelligence is an extremely powerful generative tool to be applied in a game, it is not the only one. Other games adopt different systems to expand the players' repertoire of the possible, with exceptional results.

Garry's Mod [3] is a veritable generative

[3] Garry's Mod, Valve Software, 2004

playground. As such, it has a sandbox mode where the player is plunged into an environment with a bunch of tools and no goal whatsoever in sight. In my experience, this creates a sense of uncertainty much different from the various forms encountered in other games: it is more of a maker's uncertainty, the kind you would feel in front of a blank page. The player is armed not only with all sorts of weapons you should expect from a regular video game, but also face posers (to alter characters' facial expressions), gravity guns (to move anything in the environment and place it in the desired position), an incredibly vast array of objects to be spawned in the space and a wide variety of materials and tools you need to craft vehicles and structures of your own.

Because the sandbox mode has no explicit goal, players look at this huge expanse of possibility and try to figure out a purpose for themselves: these are the toys at my disposal, what can I do with them? Some people see Garry's Mod as the perfect software to give life to scenarios they imagine: there are many artworks which were "sculpted" into this game, with items crafted and rear-

ranged into beautiful compositions. Others see it as a platform to create machinima, which is the use of video games to create cinematic production and animation [4]. When we move away from the sandbox mode and into the multiplayer servers, we see the game is being used for all kinds of purposes: it is possible to visit escape rooms built by other players, participate in shooting duels, play an hilarious version of hide and seek where players can embody any object in the room, take part in sled races where everyone builds their own sled and so on.

Game designers usually try to constrain the player to an extent, making sure that they are unmistakably guided towards the intended action, that they won't wander off and lose sight of their goal. But the most wonderful things happen when players do get lost, when they have no idea what it is they're supposed to do. When I was a child it took me some time and experience with other kids to understand how little girls were expected to play with Barbies. At first, all I would do was take all the shoes and line them up in a path. Step by step,

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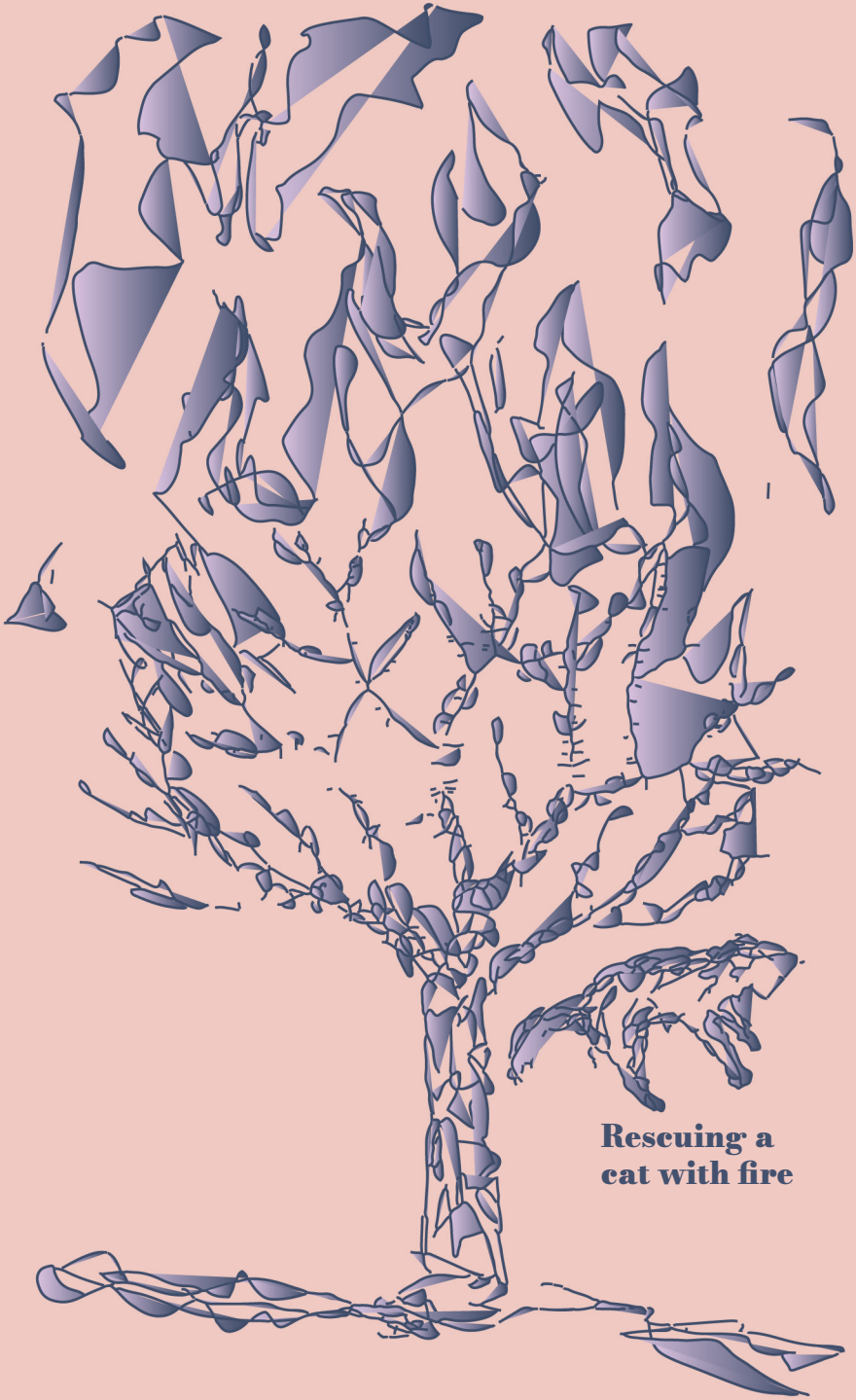
[4] Cefrey, Holly. Machinima: Using Video Games to Make Movies. Rosen Pub., 2008.

I would make the shoe-train wander all around the floor. Still to this day, the games I find most interesting are the ones that allow me to ignore the intended goal, or circle around it indefinitely, or rescue a cat from a tree by setting the tree on fire [5].

[5] Scribblenauts Unlimited for PC, Warner Bros. Interactive Entertainmen, 2013


Rescuing a
cat with fire

Gaps, fleeting and blank

Finally, we look at the blank page and see that it has been filled. Between the lines, white glimpses of wilderness still flash and glare: some gaps inevitably remain uncertain, and it is them who count as the heart and fuel of our search.

We find those teasing gaps between our fear and curiosity, where the mysterious roots of human behaviour get tangled and knotted. We temptatively step away from uncomfortable unknowns, only to be captured by a curious impulse soon thereafter. It's as if there was a swing between one state and the other, fear and curiosity. The more we push ourselves towards one, the higher we'll get swinged back to the other.

And so we explore the pendulum of uncertainty, traversing the powerful currents of these two motivational forces.

Though our culture pretends to praise and encourage the curious mind, it seems to be fear that's in charge. It drives public discourse and fills the gaps of uncertainty with dangerous narratives. Identifying the perspective of fear in our surroundings gives us a chance to subvert it: first of all by refusing a dogmatic response to fear and secondly by attempting to reframe the role uncertainty plays in our education and belief-systems.

While uncertainty is currently being treated as an inherently dangerous condition, it has so much more to offer. We have dived into its generative potential and encountered many examples of the narratives it can give life to, discovering the risks and benefits of its procreative nature in both the realms of creative intention and involuntary cognition. In the light of this journey through generative tools, we begin to see the gaps of uncertainty as spaces of opportunity rather than obscure corners of our minds. We now think it possible to

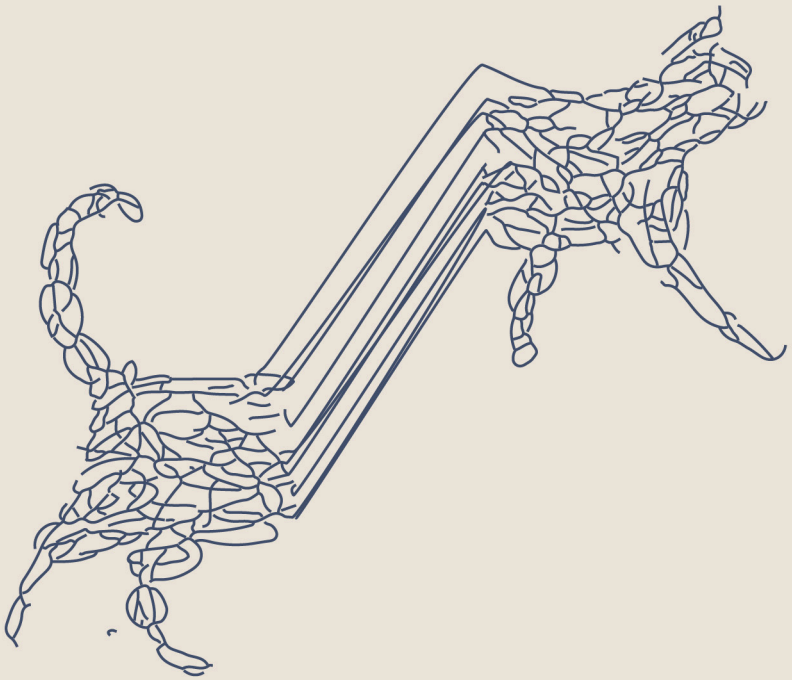
reframe uncertainty as a resource rather than a hazard.

Because games are nowadays amounting to a big part of our cultural heritage, it is important to consider how players experience uncertainty through them. Stepping into the world of game design, we find that most designers carefully consider uncertainty's presence in their work: they master the balance of uncertainty in their systems and pay close attention to the way it affects players. In this sense, game designers do appreciate uncertainty as a resource and use it in their craft.

However, uncertainty often doesn't come across as a resource to the end-user: it is usually part of what makes a game fun and challenging, but it mostly can't be played with. In other words, the uncertainty is testing the player, but the player can't test the uncertainty. In games like in life, we try to avoid that kind of uncertainty that leaves us baffled and confused, we fear it might have a negative impact on the player's experience. If we design a playground (such as Garry's Mod), or a playmate (such as AIDungeon) rather than a game, we can

confront players with a blank page. When there is no clear goal to begin with, the uncertainty becomes entertaining rather than frustrating, and users will allow themselves to play with it as a generative source and create new narratives.

Our generative playground doesn't stand, rather it floats across fleeting gaps, scattered and expanding. However fragile this structureless space might look, it is not destined to decay. It flexes and breathes with every possibility we feed it, it lives and evolves on the delicate shore of our doubt. Then, as we part from our certainties, the playground's only birthmark is once again exposed: a blank page.



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Thank you, Gökay Atabek, for the uncertainty you provided: I could not help but play along with it, learning how this cryptic monster and I can walk side by side.

Resources

To read :

Asimov, Isaac. Nightfall. Random House Publishing Group, 2014.

Barthelme, Donald, et al. Not-Knowing the Essays and Interviews of Donald Barthelme. Counterpoint, 2008.

D. E. Berlyne, "A Theory Of Human Curiosity," British Journal of Psychology. General Section 45, no. 3 (1954)

Boog, Jason. "The Creator of AI Dungeon 2 Shares GPT-2 Finetuning Advice." Medium, Towards Data Science, 14 Dec. 2019, towardsdatascience.com/the-creator-of-ai-dungeon-2-shares-gpt-2-finetuning-advice-e5800df407c9.

Calvino, Italo. Il Castello Dei Destini Incrociati. Milano: Mondadori, 1997.

Calvino, Italo. Il Castello Dei Destini Incrociati. Milano: Mondadori, 1997.

R. Nicholas Carleton, "Fear of the Unknown: One Fear to Rule Them All?," Journal of Anxiety Disorders 41 (June 2016), https://doi.org/10.1016/j.janxdis.2016.03.011.

Cefrey, Holly. Machinima: Using Video Games to Make Movies. Rosen Pub., 2008.

"Core Game Mechanics." Videogame Workshop, www.videogameworkshop.com/game-design/Core-Game-Mechanics.html.

Vincent D Costa et al., "Dopamine Modulates Novelty Seeking Behavior during Decision Making," Behavioral neuroscience (U.S. National Library of Medicine, June 9, 2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5861725/.

Costikyan, Greg. Uncertainty in Games. MIT Press, 2015.

Archy O. De Berker et al., "Computations of Uncertainty Mediate Acute Stress Responses in Humans," Nature Communications 7, no. 1 (March 29, 2016), https://doi.org/10.1038/ncomms10996.

"Democracy Index 2017," Democracy Index 2017 (The Economist Intelligence Unit, 2018), http://www.eiu.com/public/thankyou_download.aspx?activity=download&campaignid=DemocracyIndex2017)

Dunkel, Curtis, and Jennifer Kerpelman. Possible Selves: Theory, Research and Applications. New York: Nova Science Publishers, 2006.

Eco, Umberto. 2018. Il fascismo Eterno. Ebook. La Nave di Teseo

Feynman, Richard. 2005. The Meaning Of It All. Ebook. 2nd ed. Basic Books.

Furedi, Frank. 2018. How Fear Works. Ebook. London: Bloomsbury Continuum. https://b-ok.xyz/.

Winifred Gallagher, New: Understanding Our Need for Novelty and Change (New York: Penguin Books, 2013).

"Ganzfeld Effect." Wikipedia. Wikimedia Foundation, December 24, 2019. https://en.wikipedia.org/wiki/Ganzfeld_effect.

George Loewenstein, "The Psychology of Curiosity : a Review and Reinterpretation," Psychological Bulletin, 1994, https://www.cmu.edu/dietrich/sds/docs/loewenstein/PsychofCuriosity.pdf.

Chris Harris, "Why Do Governments in Italy Change so Often? ," Euronews, December 13, 2016, https://www.euronews.com/2016/12/13/why-do-italian-governments-change-so-often)

"Il Castello Dei Destini Incrociati." Wikipedia. Wikimedia Foundation, November 22, 2019. https://it.wikipedia.org/wiki/Il_castello_dei_destini_incrociati.

Q., F. "Macerata, Spara Agli Immigrati Dall'auto: '6 Feriti'. Fermato: Avvolto Nel Tricolore, Ha Fatto Il Saluto Romano. Nel 2017 Fu Candidato Dalla Lega - DIRETTA." Il Fatto Quotidiano. Il Fatto Quotidiano, February 4, 2018. https://www.ilfattoquotidiano.it/2018/02/03/macerata-spara-agli-immigrati-dallauto-6-feriti-fermato-avvolto-nel-tricolore-ha-fatto-il-saluto-romano-nel-2017-fu-candidato-dalla-lega-diretta/4134517/.

Alireza Minagar, Neurobehavioral Manifestations of Neurological Diseases: Diagnosis & Treatment, an Issue of ... Neurologic Clinics (Elsevier - Health Science, 2016).

Pearson, Matt, and Marius Watz. Generative Art: a Practical Guide Using Processing. Manning Publications Co., 2011.
Sensory Deprivation." Wikipedia. Wikimedia Foundation, November 27, 2019. https://en.wikipedia.org/wiki/Sensory_deprivation.

Luxi Shen, Ayelet Fishbach, and Christopher K. Hsee, "The Motivating-Uncertainty Effect: Uncertainty Increases Resource Investment in the Process of Reward Pursuit," Journal of Consumer Research 41, no. 5 (February 1, 2015)

Taleb, Nassim Nicholas. Antifragile: Things That Gain from Disorder. Random House, 2016.

Turner, Camilla. "University Speakers Should Not Be Banned Just Because They 'Offend, Shock or Disturb' Students." The Telegraph. Telegraph Media Group, February 2, 2019. https://www.telegraph.co.uk/education/2019/02/02/university-speakers-should-not-banned-just-offend-shock-disturb/.

To play :

AI Dungeon 2, aidungeon.io/.

Art Sqool, Glanderco, 2019

Drawception, Blue Flame Labs, 2012

Dwarf Fortress, Kitfox Games, 2020

Everything is going to be ok, alienmelon on itch.io, 2018

Fallout New Vegas, Obsidian Entertainment, 2010

Fran Bow, Killmonday Games, 2015

Garry's Mod, Valve Software, 2004

HOME, LORE NINE, 2019

The Magic Circle, Question, 2015

Noita, Nolla Games, 2019

RimWorld, Ludeon Studios, 2018

Dixit, Jean-Louis Roubira, 2010

Scribblenauts Unlimited for PC, Warner Bros. Interactive Entertainmen, 2013

To watch :

"Election Night," American Horror Story : Cult (FX, September 5, 2017)

WesaChannel, "Esiste Dio? Parliamone!" , YouTube Video, September 21, 2017, https://www.youtube.com/watch?v=-VFyVk-F41A

Louisiana Channel, "Ian Cheng Interview: A Portal to Infinity" , YouTube Video, October 19, 20117, https://www.youtube.com/watch?v=TO6Luil-c4Bo

STEPSCentre, “Ian Scoones: Why embracing uncertainty means rethinking development and reimagining the future” , YouTube Video, November 27, 2019, https://www.youtube.com/watch?v=3wk-L_5h1-o4

GameSpot, “Narrative Legos with Ken Levine - GDC 2014”, Youtube Video, March 24, 2014, https://www.youtube.com/watch?v=58FWU-kA8y2Q

STEPSCentre, “The Politics of Uncertainty - final discussion” , YouTube Video, November 6, 2019, https://www.youtube.com/watch?v=-3g7OwT-x5UY

GDC, “Practical procedural generation for everyone” , YouTube Video, May 31, 2017, https://www.youtube.com/watch?v=Wumy-fLEa6bU&t=692s

GDC, “The 2017 Experimental Gameplay Workshop” , YouTube Video, November 28, 2017, https://www.youtube.com/watch?v=Y4c-CCgOXcNU&t=1986s

STEPSCentre, “What is Uncertainty, and Why Does it Matter? - Panel discussion” , YouTube Video, October 29, 2019, https://www.youtube.com/watch?v=QGF-66Bxthow

To listen :

DADABOTS Official, “OUTER-HELIOS - Free Jazz - neural generated - Coltrane (livestream archive)” , YouTube Video, January 28, 2020, https://www.youtube.com/watch?v=C0dO-in79Hm0

Laibach, “Walk with me”, track 7 on Spectre, Mute Records, 2014 compact disc

Martin Creed, “What the fuck am I doing?”, Single, Telephone Records, 2017, Digital

To explore :

"Artbreeder." Artbreeder, artbreeder.com/.

"Human AI." Deep Dream Generator, deepdreamgenerator.com/.

"Encyclopediagenerativa" Instagram, www.instagram.com/encyclopediagenerativa/

"LudoNarraCon." LudoNarraCon, www.ludonarracon.com/.

jonobr1. "Patatap." Patatap, patatap.com/.

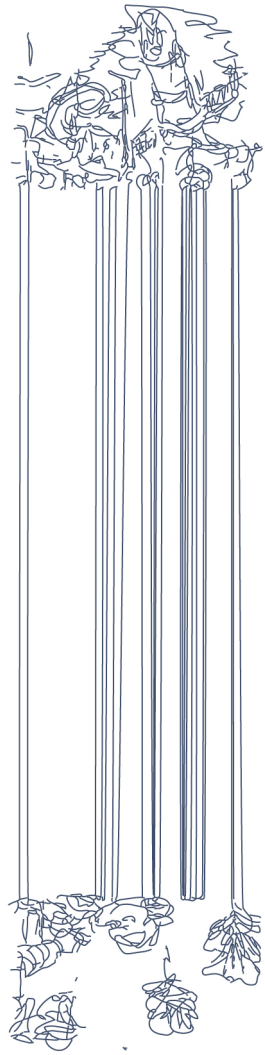
Scape by Brian Eno & Peter Chilvers, Opal Limited, 2012

Serafini, Luigi, and Sylvia Adrian Notini. Codex Seraphinianus. Rizzoli International Publications, 2015.

Interactive Culture, "StoryScope | Trailer (NL)" , YouTube Video, November 8, 2019, https://www.youtube.com/watch?v=W5eExGHA1c&t=1s

Mulder, Willeke. "We Explain How Different Aspects of Life Are like Games." Life Is a Game, www.gameseeds.net/.

"ZERO LIKES (@zero_likes)." Twitter, 26 Feb. 2019, twitter.com/zero_likes.

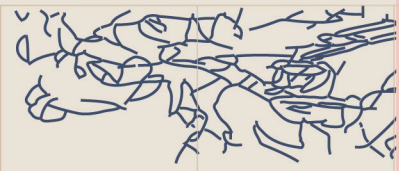


For all the curious cats :

The cards are a selection of 160 procedurally generated questions. Each is generated through a short piece of code I wrote, inspired by Markov chains.

Readers may use and misuse these questions as much as they like.

I find it amusing to try and place the phrases in an imagined scenario: what kind of situations could possibly produce such unusual uncertainties?



Uncertainty is our ally against misleading beliefs and dangerous dogmas.
Our minds and culture, however, seem to treat it as an enemy.
To release uncertainty from the stigma of its intimidating nature, we will explore its generative potential, reframing it as a resourceful condition rather than a threatening one.
In the field of game design, uncertainty is used as a material to craft unique experiences.
What is uncertainty's generative value in games and how can we allow players to access it?

www.kineticmud.space