Jacob Clausen

BIT ROT

Gerrit Rietveld Academie

BIT ROT
2024

THESIS BA
ART AND DESIGN
FIRST EDITION
PUBLISHED
AMSTERDAM
VAV-MOVING IMAGE
GERRIT RIETVELD ACADEMIE

JACOB CLAUSEN
TEMPORARY ANDROID

{ 1.2700 9.037 847 025
9.037 846 995 CONSOL

[redacted] 4.615925059 (-2)

1 HYPOCHONDRIAC

The thing had begun failing during the night. That was as much of an explanation as the client could muster before rushing off to work. In the rear of the company truck the cat lies panting and groaning in a dust-proof carrying cage. Worried that it will wear itself out, Isidore parks. Leaving the motor running. He crawls into the back. He first opening the cage, and then the cat. With his hands buried in its grey fur he inspects the stomach in search of a short circuit. Unable to find the control panel he decide to detach one of the battery cables; this should cause the mechanism to shut down without any further harm to the components. As for the battery, that could without question be brought back to the clinic for charging. Only... Isidore did not find any cables beneath that grey fur, and as to what he held in his hand for charging I dare not speculate.[1] [2]

"The electric mechanism, within its compellingly authentic-style gray pelt, gurgled and blew bubbles, its vid-lenses glassy, its metal jaws locked together. This had always amazed him, these 'disease' circuits built into false animals; the construct which he now held on his lap had been put together in such fashion that when a primary component misfired, the whole thing appeared – not broken – but organically ill." [3]

Veterinary Assistant
Isidore

Isidore inhabits a wasteland. One where the dust wanders for kilometers, sharpened by the wind. His fascination for the living is one I share, although the life he knows is much different from mine. To him, synthetic machines are indistinguishable from the organic lifeforms they were modeled after. These copies imitate their predecessors to such a degree

that they seem lifelike even in death. Nexus 6, the most recent android rendition, has a lifespan of 4 years before it efficiently ceases to function.[4] At some point during its development self-sabotage was deemed necessary to accurately replicate the human experience. For the android this meant an expiration date, a conclusively scheduled heart attack or whatever cause of customized death had been chosen for the occasion. Dismissing the well-being of a perfectly functional system is a deliberate act of neglect, here with the purpose of displaying signs of authentic life in synthetic bodies. To let themselves go is not a choice of their own, but a decision of a manufacturer who the machine is conditioned to obey. Discounting the will of the machine, the disease circuit is a crude feature that eventually will force the product to neglect its own body. Although, had mechanical animals not been prone to illnesses they would have been considered nothing but mechanical. Like Isidore, it

seems we care for things more intently when we are aware of their impermanence. But whereas Isidore cherishes temporary technologies we seem in awe of those absolute. Solutions that will extend like impenetrable pillars to support our every need. Definitive structures resistant to the elements and elementary forgetfulness. It is that very conviction, the expectation of safety, that has me in fear for the downfall of digital infrastructures and the cities we built upon them. Were we to embrace how these things decay perhaps we would become better at preserving what will eventually perish. Yet, we do not recognize the decay of our machines before they reject us, and when they do its often due to errors, rather than illnesses. Their simulated death is unappreciated because it's not immersive, but instantaneous. It's the sudden collapse of a body we do not understand or empathise with. A cold-blooded closed system whose symptoms cannot easily be read by the naked eye. When run-

ning diagnostics seems like a bleak attempt at body monitoring, you may wish for a sudden pulse to appear. A sign of wellbeing. Had it not been for its vacant lenses and frothy mouth I doubt Isidore would have noticed the pet overheating. Perhaps we would take better care of our machines were they less distant or at least open to display their symptoms.

I feel sorry for printers. Like Nexus 6, these machines are made to break, but receive no pity in doing so. Maybe that is to do with them not only neglecting their hardware, but also their main function, printing. Disease circuits in printers are poorly implemented, not because they force consumers to refill ink cartridges that are not yet empty, but because they are implemented for profit alone.[5] Had their errors like those of Nexus 6 been relatable maybe they would have garnered enough empathy to survive. But no. Reports of users replacing budget printers rather than repair or restock ink cartridges are common. This is made out to

be an affordable and convenient solution, but more than anything I think people want to take out their rage on something – and what better target than a body they don't understand?

The last fumes of the fluorescent tube melds into the dim light of the parking garage. Beneath a drenched navy-blue jumper lies a plastic shell, it's been torn off and tossed aside. Peeking out from under it, the label reads HP Deskjet 2710e.

I cannot help but believe these hypochondriacs are not broken but appear sick to convince us that they too need care and maintenance.

2 MEMORY CARD

I remember the memory card. The grey one from the first PlayStation, fitting snug above the controller input. Ours slotted two, one for my brother and one for me. Holding a measly 128kB, they were enough for each of us to get by, and despite the occasional fight for space we were for the first time able to save our data. Eventually the card would fill up and then came the unfortunate question of; which experience do I let go of in the pursuit of another? Save files became obsolete after having completed a game and were deleted to make space for future titles. While abandoned games that were deemed too difficult had their save data disposed of prematurely. At times the circumstances of a playthrough made the game impossible to beat. Since the user was restricted to one save slot per playthrough, this meant having to overwrite previously saved data with

the current. This constantly forward-shifting point of no return made events prior to saving irreversible. As we progressed through these stories our choices accumulated additively. We gathered experience and grew with our characters and so did the files. The further we progressed the more choices were made, until eventually we made the wrong one. We knew it was wrong because it broke the game and we got punished for that. This event would years later be known as a softlock – A predicament in which the player would accidently get stuck in an ingame space. Unable to reload to an un-stuck area, the game would remain functional, and yet keep the player from progressing any further. Stuck. We didn't know what to call it besides mildly infuriating. And the internet was not around for us to ask questions. Our solution was simple: delete the save file and replay the game from the very beginning, only this time with the intention of not getting stuck. By shifting the goalposts this meta-objective took

priority over whatever win condition was there before it. I believe it was clear to us that the softlock was unintentional, and that we had found something special that had not been accounted for. Something that we took on the challenge of fixing ourselves because the developers had not. Softlocks usually meant that someone had made an oversight. This was much more prevalent in the early days of game development, with smaller studios lacking the required budget for playtesting.[6] This meant the developers themselves were tasked to break their own ingame systems in order to improve them. This process is called debugging and is done through identifying a problem, isolating the source of it and then either correcting or working around the problem.[7] The 'problem' often being referred to as a bug or glitch, a term used to describe technical errors within electronic systems.[8] Today, it is common practice to hire teams dedicated to playtest well before publishing. Some testers

are regular consumers without bias or knowledge of internal ingame systems. Employed as a standard for what can be expected of the average player base, these people set the baseline. Whereas users with more experience with the medium, be that through their time playing- or developing games themselves, may recognize familiar mechanics and intentionally stress the ingame systems that keep them in place. Speedrunners who compete to beat games at record speed and are especially proficient at mapping out flaws in environmental level design. Some speedrunners specialize in exploiting glitches to skip through major portions of a game with the intent to cut down on time. The discovery of these creative exploits are often owed to the speedrunning community at large, since anyone, at the end of the day can come across a glitch.

I remember sliding through the filth ridden sewer drain. The wind picked up. Easing into the tunnel, I let myself be guided by the

refreshing promise of the outside world. And as it opened up, I was stuck. Caught in a freeze frame. The controller, that moments ago had linked character and player dropped to the floor like a severed limb. I knew nothing of it, but I had just felt my first hardlock. Notorious for effectively corrupting save files, a hardlock is a state of immediate paralysis. Be it through a set of looping frames or a single frozen, hardlocks will leave the user with no other option but to manually reboot the system. That is, if the hardlock did not already cause the system to crash. In severe cases program errors may cause the application to forcefully exit, or operating system to shut down leaving the user with nothing but a black screen. What makes a hardlock especially problematic is its persistence even after reloading the save. A corrupt file will see the error consistently trigger upon the necessary conditions being met. It is this continous cycle of breakdowns that sets apart the hardlock from any other random

occurring freeze or crash. As I hung there... Motionless, trapped among sewage waste odor my tiny body came to. Sprinting into the kitchen I called out for my father. The lid of the disc drive sprung open. And as he held that brittle disc by the tip of his middle finger and thumb, I swore it would snap. The sun poured in. Bathed in light, his grip eased as he pointed to the edge of the CD. I stepped closer. Peering under his massive hovering finger was a bright fissure. As he handed me the disc the glowing white cut subsided. "Careful" he told me. I took note of his grip, eagerly replacing it. My father taught me the first hack. How a scratch could be mended by the bathroom sink. All it took was a gentle smear of toothpaste continuously polished onto the surface. Once it had been rinsed beneath the tap and left to dry in the windowsill the disc was returned to the drive. It was when I finally slid through that sewer drain, past the threshold of the fissure, and into the open world, that I knew I had seen magic.

3 THE GUTS

The most common body in data storage is DAS short for Direct Area Storage. As the name implies it covers units that are connected directly to the accessed machine. While DAS units excel at storing large quantities of data, they are limited to local distribution requiring users to share through physical means. As with any physical object the greatest threat to a unit is the enviroment in which it is located. That said, you may find the internal processes of some devices to be just as hazardous. DAS units include floppy disks, optical discs, hard disk drives, flash drives and solid-state drives.[9] Today in computing the most common storage units are the hard disk drive (HDD) and solid-state drive (SSD). Introduced in 1956 the HDD came into general use becoming the dominant secondary storage unit by the 1960's.[10] With the capacity to hold large quantities of data the

HDD excel at receiving information in bulk and is therefore often used for backing up files. Responsible is the rapidly spinning circular platter within the device. The disk is situated in between two read/write heads moving back and forth to the different tracks of the disk at a speed up to 20 times a second. When data is stored to the HDD, it is written onto one or multiple sectors on the circular platter. Each sector contains a row of tiny cubical domains whose orientation is to be manipulated magnetically by the write head. When magnetized, all atoms within the domain will have their magnetic poles pointing in the same direction. If the domain is to represent a 0 it will be magnetized in the downwards direction (S) while a 1 will see the domain magnetized in the upwards direction (N).[11] Once written to, the sector receive pointers referencing the location where the file has been stored. When a user open that file, the read head must first navigate to the location thus 'dereferencing' the

pointer to read the requested information.[12] [13] Gaining access to the stored contents on the drive depends on the operability of its intricately moving parts. This burden alone threatens the reliabity of the HDD. Albeit sealed by a sturdy cover containing air filters necessary to protect it from exterior environments. It is during scanning that the device is at its most vulnerable. With the read/write head hover just 15 nanometers above the platter a single dust particle measuring up to 10.000 nanometers could prove lethal, were it to collide with the high-speed disk.[14] Even if the interior were to remain dust free the motor would eventually wear out, making the HDD, despite its capacity for data an indefinite solution to long term storage.[15]

The SSD on the other hand seems to come with the promise of improved durability. Containing no mechanically moving parts, the solid-state-drive offer superior shock resistance allegedly making for an increase in system

reliability.[16] Its build is small and compact making it convenient to pair with portable devices such as laptops. Although, its vastly improved speed over the HDD sees it excel at quick tasks such as booting and running programs, it appears a much worse candidate for long term storage. Not only does the device offer lower storage capacity at a much higher price, but stored data also happen to deteriorate when the device is left unattended for too long. This is due to the implementation of flash memory.[17] Invented in 1984 by Fujio Masuoka, the technology have come to be widely associated with USB-drives. However, today flash memory runs our phones along with a growing number of laptop computers.[18] In 1987 KIOXIA inovate on the original idea with NAND flash memory. Running on SSD's the non-volatile memory-type is based on electronic circuits to store information through microchip technology. Contrary to the volatile, non-volatile memory is stored even when the device is disconnect-

ed or turned off.[19] The capacitors within the SSD are present to keep the unit dormant for up to one year after its last use. These components essentially function as a battery that will charge while the device is connected to a machine and discharge while it is not. Staying charged during this period is necessary to prevent the device from losing the data stored within it. An SSD may contain at least one microchip that contain hundreds of millions memory cells. If already empty, these memory cells can be written to, storing 3 bits each – an insignificant number alone, but strung together these cells simulate what we perceive as images, files, and documents. However, to better understand how data is written to the SSD we must inspect the memory cell itself. The memory cell is comprised of a channel, charge trap and NAND gate all kept separate by dielectric walls. These walls function as insulation, keeping the electrons which come flowing through the channel from leaking out.

Information is written to the memory cell on command by the gate pulling a cluster of electrons from the channel through the dielectric wall and into the charge trap. Since the dielectric wall is an electrical insulator and the electrons possess to low of an energy level to scale it, we must result to quantum mechanics to have the electrons pass through. In electromagnetism the electron appear as a localized point charge, whereas in quantum mechanics the electron's location is not a point but a probability density or a cloud that depicts where the electron is most likely to be. If the dielectric barrier is thin enough and the pull from the gate is sufficiently powerful, then the cloud will be pulled far enough across the barrier for a sizeable probability that the electron will find itself on the other side of the dielectric barrier and into the charge trap. This phenomenon is called quantum tunnelling aiding to the imagery of the electrons tunnelling through the barrier instead of over it.[20] Its implementation

in flash memory came from Fujio Masuoka observing a crowd of people leaving a Tokyo subway station. Taking note of people weaving in and out through the doors, akin to electrons moving through a transistor, led him to develop the concept for the floating-gate – a component which years later was adapted into the charge trap.[21] [22] [23] Once traversing the barrier and stuck in the trap, the contained electrons will be measured up to a certain value. A single charge trap is designed to hold 8 different values of electrons which at varying levels may constitute the total 3 bits of binary information. Once written, those bits rely on the electrons being securely contained by the charge trap to remain legible. If the SSD were to remain unplugged for more than a year, the capacitors would no longer keep the charge trap operable resulting in electrons leaking out of the charge trap and through the dielectric barrier. The bits that before were stored structurally to convey meaning would have their values scrambled

effectively leading to corrupted data and possibly loss of entire sections of information.[20] To avoid this the SSD would either have to be plugged into a machine at all times or at least undergo annual inspections during which the capacitors could recharge.

But even with the device cared for, the longevity of its internal parts may come to be of concern. Since too many write cycles will cause stress to the oxide layer in the memory cell, merely using the device for its intended purpose will see it sustain damage over time. These small disruptions in the layer are referred to as "oxide defects" and came to be especially harmful to SSD's using floating gate technology. Large quantities of defects would cause short circuits to develop between floating gate and channel making them incapable of holding a charge. Such total lack of data retention threaten the reliability of the chip's 'endurance' and is considered the root cause of flash memory wear out.[24] With the resilience

of non-volatile memory at stake, KIOXIA saw to augment the SSD, replacing the floating gate with the charge trap. And although it didn't rid the device of the fate that it would one day cease to be, it did improve just how long it would last till then. With the charge trap itself being an insulator, the captured electrons would remain safe from any potential short circuit. This gave way for a thinner oxide layer allowing for electrons to be transported at a much lower voltage, causing less stress on the layer when tunnelling through the dielectric barrier.[24]

In studying the inner workings of these storage units, I've found a reoccurring tendency in the language used to formulate the processes of digital information loss. We've superimposed our ailments onto PCB. Vigorously anthropomorphised the inner workings of the blackest box and found faults that resonate with those of our own system. Words like 'endurance', 'memory', 'stress' and 'wear out' have all been

used as linguistic devices by users attempting to decode the digital body. By applying human traits to the machine our body becomes a cipher which we may use to demystify processes that otherwise would prove too esoteric to contextualize. This language may be mistaken for non-fiction, evidently as 'endurance' has been adopted as a measurement to gauge the life expectancy of devices operating at peak performance. The effects of such labour pertaining to no build-up of muscle mass in devices, that as of yet, contain no organic tissue to break down or mend. Stress and injury endured by the body remain factors, not contributing to an enhanced system performance. Contrary to the endurance enjoyed by the organic body, that of the synthetic will remain only at predetermined threshold. And so, what some mistake for endurance feed into the misconception of digital bodies' self-sufficiency helping to further the narrative that such systems may develop resistance or even immunity to decay.

4 EMORTAL

I extend my fingers beyond the range of your keys. The warm air seeping out from underneath the congested ventilation strip. You burn out during the summer, so I've rigged a fan up beneath the table. I've come to enjoy the haptic feedback of turning the thermostat with my toes and the cold air subsequently bursting out from beneath you. We feel efficient like this. Like we've never been closer. Yet the draft at times compels me to wrap my own body parts in blankets, covering my neck so as to not catch a cold. All while the heat melts away at the glue responsible for holding your screen in place. Your right hinge swivelling about like joint in an unfit socket, and the frail plastic frame splitting open from the increased pressure of having to keep it all together. Strips of silver tape cling to your plastic rim hiding the cut more than mending it. It's pitiful, and I know

I could do more for you. More than this empty gesture, this confused reminder to bring you in for repairs. Because unstable breath is owed to more than respiratory quirks. We're three years late for what should have been your annual deep clean. And I must confess my fear for the stranger tasked with tearing you open. As if some unprecedented horror is lingering beneath your shell. I fear that revealing it will make it real. That you won't make it home.

I take pleasure in learning about you and finding solutions that will have me extend myself in difficult ways to accommodate your needs. Stretching myself thin over days where time will pass with me pondering how to make the next simple question resolve with a complex solution. Because doing the most will often times fuel my inadequacy when the thing that I think you most need in life is not needed at all. I do so out of need for control, and with people that is attainable. Because even if my solution

wasn't applicable, the days spent constructing it would be enough to convince people that I care, even if I don't. But you're not like them, and I must come to terms with the fact that I will never understand you. And even if I wanted to, for my own selfish reasons, neither could I save you.

Dear Jacob Clausen,

Thank you for choosing [redacted]. We are writing you to confirm that we have received your transfer data and will proceed with hosting your storage unit immediately. All data stored online by [redacted] is encrypted and preserved on secure storage servers. The storage servers are located in data centers around the United States, Australia, Europe, Japan and the United Kingdom. [redacted] takes full responsibility for the safety and security of your information and we employ full discretion in the retirement of your device. Our facilities are operated by dedicated teams of experts who specialize in managing servers and ensuring maximum upkeep to the site's hardware. [redacted] our inhouse automatic temperature and dust control system maintains the perfect environment, keeping changes in temperature and humidity consistent and up to date with the latest data storage

regulations. Our ventilation system provides constant airflow in order to minimize dust collection in the server rooms, while a limited selection of our maintenance team work in shifts to reduce traffic while cleaning the premises daily. These circumstances along with [redacted]'s strict security protocol prohibit any visitations from members of the public or subscribers of [redacted]'s. Those failing to comply with security measures will immediately be escorted from the premises with a notice to never return on site. Trespassers with a [redacted]'s subscription will receive a temporary strike, banning them from accessing any stored data that would otherwise be available to them through [redacted]'s online cloud services. For more information on temporary strikes see terms of service. [redacted] withhholds any rights to permanently dispose of information stored within its data storage systems and will not be held accountable for any future actions pursued

by [redacted] subscribers in the event of their permanent ban from [redacted] intellectual properties, apps, and services.

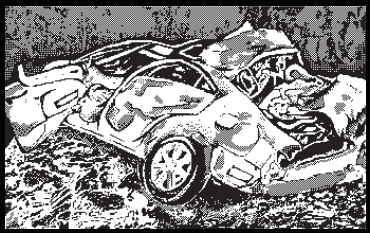
We at [redacted] care for your health and safety just as much we do for your data. We understand the difficulties that may come with retirement and offer a 24/7 helpline to address your concerns. Call or text at 1-800-986-5991 to speak with our chat bot Susan now.

PROF. PHIL KOOPMAN

A CASE STUDY OF TOYOTA UNINTENDED ACCELERATION AND SOFTWARE SAFETY

CRASH

SAN DIEGO CALIFORNIA USA
08.28.2009



GOMEZ LAW FIRM

TOYOTA LEXUS ES 350 SEDAN

- UA REACHED 100 MPH+

911 EMERGENCY PHONE CALL
FROM PASSENGER DURING EVENT

- ALL FOUR OCCUPANTS KILLED IN CRASH

DRIVER:
MARK SAYOLOR, 45 OLD MALE
OFF-DUTY CALIFORNIA HIGHWAY PATROL OFFICER; VEHICLE INSPECTOR.

- CRASH WAS BLAMED ON WRONG FLOOR MATS CAUSING PEDAL ENTRAPMENT
- BRAKE ROTOR DAMAGE INDICATED “ENDURED BRAKING”

EVENT TRIGGERES ESCALATION OF INVESTIGATIONS DATING BACK
TO 2002 MY

On August 28th 2009 Mark Wesley Saylor, a highway patrol officer specialized in vehicle inspection reports to 911.[25]

OPPERATOR: "911 emergency what are you reporting?"

DRIVER: "Yeah, we're in. We're in a Lexus [intelligible]."

OPPERATOR: "I'm sorry your cell phone is cutting out."

DRIVER: "We're going north 125."

OPPERATOR: "Mmm hm."

DRIVER: "And our accelerator is stuck."

OPPERATOR: "I'm sorry?"

DRIVER: "Our accelerator is stuck! We're on 125 in [intelligible] state."

OPPERATOR: "Okay, northbound 125. Where are you passing?"

DRIVER: "We are passing... what are we passing?"

PASSENGER 1: "Gorge [intelligible]"

DRIVER: "We're approa... We're going 120! Mission Gorge! We're in trouble. We can't. There's just no breaks."

OPPERATOR: "Okay."

DRIVER: "We're in Mission Gorge! End of freeway, half a mile."

OPPERATOR: "Okay, and you don't have the ability to..."

DRIVER: "No"

OPPERATOR: "...uh like turn the vehicle off or anything?"

DRIVER: "We're approaching the intersection! We're approaching the intersection!"

OPPERATOR: "Oka..."

DRIVER: "We're approaching intersection!"

PASSENGER 1: "Oh god."

DRIVER: "Hold on!"

PASSENGER 1: "Pray!"

DRIVER: "Pray!"

OPPERATOR: "O..."

DRIVER: "Oh shoot"

PASSENGER 1: "Shit"

DRIVER: "Oh oh... oh!"

PASSENGER 2: "Woah!"

DRIVER: "(scream)"

Impact

OPPERATOR: Hello?

Static

Mark Saylor, 45; daughter, Mahala, 13; wife Cleofe, 45 and Cleofe's brother Chris, 39; all died that Friday afternoon in a fatal car crash

on Mission Gorge Road. Driving a 2009 Toyota Lexus ES350, Saylor was reportedly unable to apply the car's braking system, causing the vehicle to accelerate up to an estimated speed of 112.8-150 MPH min before collision.[26] [27] The media dubbed it "The 2009 Santee Crash", an incident that would escalate investigations of Toyota and have cases dating back to 2002 resurface.[28] The victims of the Santee Crash were not the first to have experienced the acceleration error. An elderly couple driving to see their son in South Carolina alleges having stood on the brake in response to their car suddenly running off with them. The driver, Mr. Walton's continuous pressure on the pedal would eventually wear the brake pads and rotor out, making the car come to a halt. When the Waltons confronted their dealer, the seller insinuated the elderly couple must have confused the accelerator with the brake.[29] This exact argument was used in court against Jean Bookout, who in 2005 crashed her Toyota

Camry due to unintended high-speed acceleration. Despite Bookout injuring herself and killing 76-year-old passenger Barbara Schwarz, Toyota found no evidence of software errors in the vehicles computing system and claimed that the 70-year-old driver was solely responsible for the incident.[30] The Santee Crash set a strong precedent by the virtue of Mark Saylor's profession as a vehicle inspector. It dismantled the user-error narrative and helped to legitimize many cases before and after.[29] Three months after the incident Toyota recall 3.8 million Toyota and Lexus vehicles to adjust the driver-side floor mat, which was responsible for trapping the accelerator in place. Still, the error remains. By 2010 Toyota had recalled roughly 9,5 million vehicles in attempts to adjust floor mats and fix sticky accelerator pedals– issues that a letter by US congressional investigators stated had only occurred in 16% of vehicles reported to exhibit unintended acceleration. On February 24th 2010, the company issued

a statement wherein the president and CEO of Toyota apologized for the damage inflicted by the error:

"We pursued growth over the speed at which we were able to develop our people and our organization, and we should sincerely be mindful of that. I regret that this has resulted in the safety issues described in the recalls we face today, and I am deeply sorry for any accidents that Toyota drivers have experienced."" [31]

President & CEO, Toyota
Akio Toyoda

In examining their rapid pursuit of growth, Toyota rhetorically liken their company acceleration to that of their drivers but fail to acknowledge that the speed accumulated by the clients was unintentional. It was deadly and forced upon the user by the manufacturer. A company that wouldn't seem to benefit from openly

stating that their own rapid speed was intentional and unparallel to that of its consumers, because *it* was fueled by the promise of capital. Because *it* was a bullet. Hardened. Logistically calculated to sail through the air uninterrupted. Toyota didn't stop to show remorse for Jean Bookout. Instead, the company alienated her. And like once before they stripped her of the autonomy to control her own vehicle. Only, this time during her testimony, the vehicle was made illusory. Replaced by a black box that she, in her old age, didn't recognize. One that she couldn't possibly be expected to pilot. Perhaps it was Toyota's presumption that since cars had become more frequently computerized by the 2000's, they could be treated like foreign objects to people.[28] Surely, they were more complex. Features like remotely locking your car would require multiple computers inside the vehicle to access the locks. But aside from opening the trunk, computers were given much more important tasks. One of which

was to accelerate. The gas pedal, which had previously consisted of a direct physical link to the throttle, was now an input to a computer.[28] [29] This digital connection was particularly concerning to Phil Koopman, professor at Carnegie Mellon University and co-founder of Edge Case Research. In his case study he examined the acceleration error and found that the task responsible for controlling the throttle position could 'die'. This would leave the accelerator to stick in some open position sustaining whatever speed the driver was going at.[28] [29] What caused these tasks to expire is unlike any other instance of bit rot. Their death was not physical. Neither was it caused by heat, dust, or humidity. It was an external force. One that lingered at all times. Nothing like a battery waiting to drain, or a memory leaking from your pillowcase. This was erasure. Not the type carried out by people. No, this had always been here. Yet Koopman argued that it came from outer space. He spoke of radiation. Of cosmic

rays.[29] He had found that cosmic interference could manipulate the stored data within the vehicle hardware and occasionally invert the value of bits. Additionally he discovered that a single bit flip could kill an entire task. This let him to stress the importance of redundancy measures, which Toyota had clearly failed to implement at the time. These security protocols meant that multiple copies of the same electronic system would be available to complete the task. If one copy would experience a bit flip, the two remaining machines would have to agree to proceed. However, doubling or tripling redundancy is not inexpensive and at times require too much space to even be feasible.[29] Although they usually go completely unnoticed, cosmic particles will constantly interfere with electronic circuits triggering the occasional dip in Wi-Fi-signal and phone reception. This is especially true at higher altitudes, where cosmic rays have also been made responsible for a commercial airliner suddenly

dropping hundreds of feet mid-flight. These rare incidents are called single-event upsets. They happen rarely and can be difficult to attribute to cosmic rays since the phenomenon, even after having been involved in a malfunction leave no trace.[32] The lack of tangible evidence may be enough to deter anyone from recognizing this constant ambient erosion. Because acknowledging such decay would mean accepting that our digital systems are inherently flawed and at constant risk of corruption. If these digitals systems are mere expressions of ourselves. Like the android is a flattering image of its master. Perhaps we would benefit from recognizing our shared mortality – from seeing the hubris that lies in attempting save what can only be preserved. While corporations attempt to reflect out best interests, it seems they have failed to recognize that we are holistically at the mercy of the universe. Such denial was especially apparent in Toyotas continued struggle for control over the digital

body that they manufactured, but had yet to fully understand. In 2014 the first death and injury case was examined in court. The jury found that:

"Toyota was liable for the death. The only theory presented in the case was that the computer kills people, to which the jury agreed." [29]

Prof. CMU & Co-founder of Edge Case Research
Phil Koopman

Toyota settled the case immediately and began settling all 500 remaining cases.[29] As for the verdict of Jean Bookout, both her and the Schwarz estate was each awarded $1.5 million in compensation.[28] Toyota would end up paying an additional $1.2 billion for their attempts at hiding the error.[33] The fault that Toyota even in this aftermath was incapable of taking ownership of, was passed onto the machine who was made to repent for the killings of its maker.

5 PESTS CONTROL

It must have been a final Wednesday for that ancient empire, in the years before fiber optic cable graced our property and outdoor telecom. I thought nothing of the cabinet, but knew to steer clear of the box when mowing the lawn. It belonged there, as if its khaki green plastic had surfaced from the grassy patch itself. A frail internet connection had plagued the house for months, gradually worsening as time went on. Bloated video buffers crept up with the timeline turning stagnant before the one-minute mark. Especially noteworthy was the declining rate of speech to and from members of the residence whose patience had yet acclimated to the pause. To my knowledge she was the first to ever open that cabinet. A technician of sorts. Dressed in a white hazmat suit, mask and gloves included. I wish to have seen it. How the doors must have sprung

open, pushed aside by mounds of sand and dirt gushing forth. Excavations of the broadband network now reconfigured into intricate tunnels and caves. Every grain gathered and accounted for by workers of the colony steadily building their system upon ours. The WI-FI signal's slow descent into darkness had been a burial. A service initiated by infesting carpenter ants seeking refuge within the cabinet. Known to take comfort in electrical appliances these insects are drawn to the magnetic fields emitted from wiring and cables. Colder weather especially will lead to an increase in migration, with ants going so far as to find their way into electrical sockets. Smaller species of the sort have even been known to enter compact devices such as computers and cellphones, while infestations of carpenter ants, if left unattended for too long, can turn larger appliances like televisions into fire hazards.[34] When rummaging around inside a device ants can create connections between electrical contacts. This

may lead to short circuits electrocuting the ants causing them to release an alarm pheromone signaling that they are under attack. The scent will likely attract reinforcements to rally against the threat, perpetuating the vicious cycle that can lead devices to rapidly clutter with seething dying ants.[35] I like to think that their empire hadn't yet succumbed to that, but that it thrived in the warmth. Diodes crammed into cavernous walls bringing comfort to their eggs, translucent in red light. A happy parasite feeding of the hosting network. I hope they felt the pulse of the machine. And when that great construct fell, sand slowly sifting from the rim of the cabinet and back into the soil that they too could live without it.

9/9

0800 ONCTAM STARTED

1000 STOPPED - OCTAM, CHECK

13 0C (032) MP-MC [redacted]

(033) PRO 2 2.130476415

CONNECT 2.130676415

RELAYS 6-2 M 033 FAILED SPECIAL SPEED TEST

1M TEELOG 10.000 TEST

RELAYS CHANGED

1100 STARTED COSINE TAPE (SINE CHEST)

1525 STARTED MULTI ADDER TEST

1545 RELAY #70 PANEL F

(MOTH) IN RELAY.

FIRST ACTUAL CASE OF BUG BEING FOUND.

[redacted] 1630 ONCTAMGENT STARTED

1700 CLOSED DOWN

BIBLIOGRAPHY

1 "Do Androids Dream of Electric Sheep", Philip K. Dick, P56 L33, 1968

2 "Do Androids Dream of Electric Sheep", Philip K. Dick, P57 L5, 1968

3 "Do Androids Dream of Electric Sheep", Philip K. Dick, P61 L18, 1968

4 "Do Androids Dream of Electric Sheep", Philip K. Dick, P158 L18, 1968

5 "Ink Cartridges are a Scam", Austin MC Connell, 2018

6 "Playtesting", Margaret Rouse, Technopedia, 2011

7"Debugging", Matt Hauser, TechTarget, 2022

8 "Bug versus Glitch: Understanding the Difference", Dr. Patrick Capricola, Strategies for Parents, 2021

9 "What is Data Storage?", IBM, N/A

10 "(...)A Case Study for Recycling Nd-Fe-B Magnets from Hard Disk Drives", Science Direct, 2017

11 "How does Hard Disk Drives Work?", 1:35-4:38 min, Branch Education, 2020

12 "Pointer (computer programming)", Wikipedia, 2023

13 "Where do Deleted Files Go?", Jothi Basu, Medium, 2018

14 "Hard Disk Drive (HDD)", Alexander S. Gillis, TechTarget, 2021

15 "Advances in Computers", Youngbin Jin & Ben Lee, 2019

16 "HDD vs SSD: What is the Difference?", IBM Cloud Education, 2022

17 "What is a Flash Solid State Drive", Robert Sheldon, TechTarget, 2022

18 "Advances in Computers", Marcos Dias de Assunção & Laurent Lefèvre, 2012

19 "How Does NAND Flash Work?(...)", Branch Education, 2020

20 "The Engineering Puzzle of Storing Trillions of Bits in your Smartphone (...)", Branch Education, 2020

21 "Meet the Inventor of SSD Drives" Leo Zhi, Disk Manufacturer, 2023

22 "What is a Floating Gate?" Kinza Yasar, TechTarget, 2023

23 "Flash Drives: methods and materials", Ismail-Beigi Research Group, Yale University, N/A

24 "Charge trap flash", Wikipedia, 2023

25 "911 Call of Family's Fatal Toyota Lexus Crash", Blossorted T, Youtube, 2010

26 "Lexus Crash: An Avoidable Tragedy", Autoblog, 2009

27 "San Diego County Sheriff's Department Incident Report: Saylor Family Accident", Autoblog, 2009

28 "A Case Study of Toyota Unintended Acceleration and Software Safety", Prof. Phil Koopman, 2014

29 "Bit Flip", Radio Lab, 2019

30 "Oklahoma jury considers Toyota acceleration case", Sean Murphy, The San Diego Union Tribune, 2013

31 "2009-2011 Toyota Vehicle Recalls", Wikipedia, 2023

32 "The Computer Errors from Outer Space", Chris Baraniuk, 2022

33 "Toyota to Pay $1.2B for Hiding Deadly 'Unintended Acceleration'", ABC News, 2014

34 "Why Carpenter Ants Are Attracted to TV Components", Yale Pest Control, 2013

35 "Why 'Crazy Ants' Swarm Inside Electronics", Douglas Main, Live Science, 2013

BIT ROT