Beyond the brush: exploring the intersection of art and technology in Hetamoé's pen-plotted paintings

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Introduction

In this article, I present a series of paintings produced using a pen plotter, which is part of the artistic work developed during my PhD and continued in my current project, *PLOT AGAINST. A painting-based research project into the pen plotter and other peripheral devices in the cyborgian imagination* (DOI 10.54499/2021.00832.CEECIND/CP1706/CT0001). This ongoing investigation focuses on the aesthetics, politics and material-semiotic valences of peripheral devices in contemporary art and theory, using a computer-controlled pen plotter – a technology often considered obsolete – as a starting point. It aligns with the broader scope of my work, as I have long been interested in cyborgian partnerships, incorporating experiences with computers, printers and other devices into my artistic practice (another notable example being the graphic novel *Einstein, Eddington, and The Eclipse: Travel Impressions*, first published in 2019). More indirectly, and without wanting to delve too deeply into an auto-ethnographical perspective, I believe my fascination with the machinical stems – rather than from "hard" technical or scientific aspects – from an emotional and imaginative engagement with machines, with their artistic, nostalgic or representational qualities. One shaped by an early engagement with the raw creativity of computer games from the 1980s and 1990s, and perhaps even more so by Japanese manga, anime, fantasy and sci-fi, which had just started being regularly broadcast on European television stations during my childhood, and which have become integral to both my creative practice and academic research. Of course, the connection between robots and anime/manga has become a given or something of a trope, as (for numerous reasons extensively studied over the past two decades) these mediums often delve into the interplay between humans and machines with less apprehension, or at least with a greater sense of playfulness and openness to sensuality, than is typically seen in Western narratives; as scholar Sharalyn Orbaugh puts it, after all, Japanese children's earliest encounters with robots are often through friendly characters like Doraemon, rather than menacing figures like Darth Vader.[1] In hindsight, having Androids 17 and 18 from *Dragon Ball Z* as the epitome of "cool" during my preteen years in 90s Portugal has probably left an indelible mark on my sensibilities to this day.

1 Sharalyn Orbaugh, "Sex and the Single Cyborg: Japanese Popular Culture Experiments in Subjectivity," in: Christopher Bolton, Istvan Csicsery-Ronay, and 巽, 孝之 (eds.), *Robot Ghosts and Wired Dreams: Japanese Science Fiction from Origins to Anime*. Minneapolis: University of Minnesota Press 2007, p. 174.

My current project, *PLOT AGAINST*, aims to bring together all of these interests while probing into questions about identity, authorship and the continuous cycle of technological advancement and obsolescence, and the series of works addressed in the following pages play a significant role in achieving this goal. However, as the project encompasses additional theoretical components exploring the aesthetics and affects of the cyborgian, machinic and prosthetic imagination in art and popular culture, the present text is intended, primarily, as a more contained discussion of the custom methodology I developed for creating the pen-plotted paintings, as well as of how this process seeks to challenge the boundaries of the technological medium. The type of research involved in writing academically about the creation of one's artistic work has long been a staple of practice-based research (PBR) in the visual arts, as well as in the arts in general, and this approach is recognised for its value – not only practical, but intellectual and educational – in offering insights into the creative process, methodologies and conceptual frameworks that underpin artistic works.[2] Therefore, my text will compile a series of original tacit and empirical insights gained through the hands-on creation of the work, interwoven with critical reflections on how this knowledge contributes to the project's "cyborgian partnership", in a kind of reflexive account of the development of the paintings and the plotting process. I will complement this description with a brief exploration of the origins and resurgence of the pen plotter, as well as of the artistic possibilities it presents by demonstrating how my own work, while rooted in the tradition of art created with this tool, takes a distinctive approach that (to the best of my knowledge) represents a novel application of the technology and, as a result, contributes to the advancement of knowledge.

A historical overview of pen plotters

Pen plotters are vector graphics devices that use a pen – or a similar tool – to draw on paper. Unlike raster printers, which create images through a grid of dots, pen plotters

2 Michael Biggs and Henrik Karlsson (ed.), *The Routledge Companion to Research in the Arts*. London: Routledge 2012; Linda Candy, "Research and Creative Practice", in: Linda Candy and Ernest Edmonds (eds.), *Interacting: Art, Research and the Creative Practitioner*. Faringdon: Libri Publishing 2012, pp. 33–59; Richard D. Hickman, *Research in Art and Design Education: Issues and Exemplars*. Bristol: Intellect 2008; Shaun McNiff (ed.), *Art As Research: Opportunities and Challenges*. Bristol: Intellect 2013; Hazel Smith and Roger Dean, *Practice-Led Research, Research-Led Practice in the Creative Arts*. Edinburgh: Edinburgh University Press 2009, https://doi.org/10.1515/9780748636303 [accessed: 28.11.2024].

excel at creating line art, including text, but are slow to operate due to the pen's mechanical movement; while they struggle with producing solid areas of colour, they are able to create the effect of gradation by drawing multiple parallel lines one close to another.[3] The plotter technique can be traced back to the 18th century, with the creation of one of the first modern seismographs by an Italian geologist, mathematician and physicist Andrea Bina, who used a pendulum and a pointer to produce line tracings in the sand to register seismic activities.[4] This early form of plotting laid the foundation for the subsequent developments of the analogue XY writers and, eventually, of the digital plotters that gained popularity as a printing tool in the 1960s, but fell out of favour with the advancements in technology that happened throughout the subsequent decades.[5] Indeed, pen plotters were most popular when computer memory was expensive and processing power limited, since they offered an economical way to produce large-scale drawings and high-resolution vector-based artwork.[6] However, they have since become outdated, quickly replaced by large-format inkjet and toner printers that provided more efficient and versatile graphic output.[7]

While the technical and industrial applications of the pen plotter decreased, their artistic potential emerged as artists began to view these devices as tools that bridged the analogue and digital realms; namely, the advent of the Information Age and the Digital Revolution made art increasingly cyborgian by incorporating computers into the repertoire of tools and techniques available to creators. Among the notable pioneers of this medium, Vera Molnar (1924–2023) stands out for her exploration of algorithmic design in generative and computational art, using the pen plotter as a tool of execution.[8] Similarly, Frieder Nake (b. 1938), another of the earliest artists to adopt pen plotters, produced intricate, mathematically driven artworks in the 1960s.[9] Georg Nees (1926–2016) and Manfred Mohr (b. 1938), both key figures in the field, also used pen

3 "Pen Plotter, History", *Macro Enter*, https://www.macroenter.com/blog/pen-plotter-history/.

4 Duncan Geere, "Pen Plotters Are the Perfect Tool for Data Storytelling", *Medium* (19.05.2020), https://medium.com/nightingale/pen-plotters-are-the-perfect-tool-for-data-storytelling-b05c71ceadd5.

5 *ibidem.*

6 "Pen Plotter, History", *op.cit.*

7 *ibidem.*

8 Richard Whiddington, "A New Show in Paris Celebrates Vera Molnár's Pioneering Generative Art," *Artnet News* (10.05.2024), https://news.artnet.com/art-world/in-pictures-vera-molnar-pompidou-2446604.

9 Carole Spearin McCauley, *Computers and Creativity*. New York: Praeger 1974, p. 66.

plotters to create geometric designs and abstract structures.[10] Building on these historical examples of pioneering artists, younger creators like Andreas Gysin (b. 1975) have also explored the potential of the pen plotter in their works.

Although they have never experienced a widespread comeback, recently pen plotters have been an object of a niche revival of interest within certain creative communities and the culture of do-it-yourself makers, active on social media platforms such as Instagram and Reddit.[11] Within these groups, enthusiasts and artists embraced this tool for its retro charm and the unique aesthetic qualities combining features of a hand-drawn work with a mechanical process that results in intricate line drawings and vector-based designs. The availability of open-source software and DIY kits has also made pen plotters more accessible, which helped to consolidate the small but dedicated community of enthusiasts.[12]

Notes on the process

The paintings that are the main subject of this article, and which were produced with the pen plotter, made their debut during my doctoral exhibition in November 2020. Figure 1 showcases two of the larger artworks, each measuring approximately 140 x 140 cm. Additionally, due to spatial constraints in the exhibition room, a series of six paintings, each sized at 50 x 70 cm, was arranged in a panel-like configuration.

These pen-plotted paintings were the result of months of hands-on experimentation with a commercially available pen plotter, during which I developed and perfected a custom methodology to materialise vivid and complex digital images, using Japanese archival ink pens on Bristol paper. I chose to use archival pens for a few reasons. First, because of how long the works take to execute, I wanted to ensure they are durable. Second, the specific brand of pen I selected has a unique materiality – when layers of ink overlap, the colours become very solid and vibrant, almost like the colours of a screen; this resonance between the paper and the screen interested me greatly. Finally, while the limited colour palette available for these pens might seem like a limitation,

10 Miloš Todorović, "AI and Heritage: A Discussion on Rethinking Heritage in a Digital World," *Uluslararası Kültürel ve Sosyal Araştırmalar Dergisi* 10, no. 1 (June 28, 2024), p. 5, https://doi.org/10.46442/intjcss.1397403.

11 Duncan Geere, *op.cit.*

12 Una Tao, "Best 5 Open Source Pen Plotters for Makers: Unleash Your Creativity", *UUNATEK* (14.07.2023), https://uunatek.com/best-5-open-source-pen-plotters-for-makers-unleash-your-creativity/.

I saw it as a way to give the works a unified base aesthetic and coherence, while still enabling sufficient variation in their combinations. The Bristol paper, with its brilliant white hue, transformed the backdrop into a distinct material presence, almost like a colour in its own right. In Figure 3, I present two details, extracted from the larger-scale paintings, which provide a closer view onto the works' complexity.

Figure 1. The two larger pen-plotted paintings (140 x 140 cm) produced for t he doctoral exhibition.

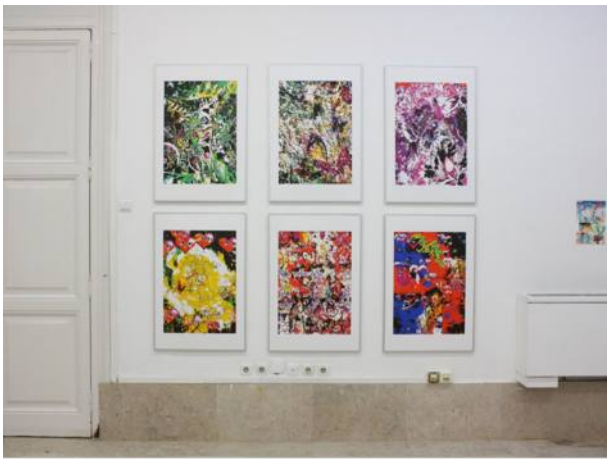

Figure 2. The series of six 70 x 50 cm pen-plotted paintings produced for the doctoral exhibition.

Figure 3. Details of the larger pen-plotted paintings.

In this part, I will go into more detail on some of the challenges I encountered. My process for these paintings began (and always begins) with the creation of digital collages out of assembled digital and photographic materials, which were then used as the basis for what would be plotted. These digital collages were carefully divided into separate layers of colour – in total, seven colours plus the white of the paper – and then converted into crosshatching vectors to create solid patches of colour. For visual reference, Figure 4 provides a glimpse of the pen plotter in action, bringing one of the paintings to life, while Figure 5 highlights a detail from one of the artworks, where the texture of cross-hatching becomes evident in the colour patches.

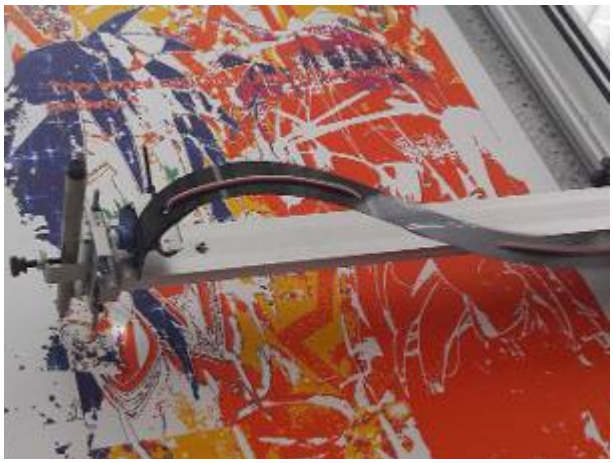

Figure 4 The pen-plotter's mechanical arm, equipped with a pen, is in action.

Figure 5 Detail of the cross-hatching.

A major challenge was to make large, solid patches of colour using a pen plotter whose designated function is to draw simple, singular lines. For this reason, as it was stated earlier, the creation of such multilayered paintings demanded printing each colour layer individually. As I delved further into the process, I also quickly realised the need to establish an organisational system and adapt to several unforeseen circumstances that arose along the way.

One of them was discovering how important it was to know the characteristics of the pens I worked with. For instance, I began dividing the pens by their weight in grams, which was a way of estimating how much ink was left in them and, thus, anticipating when a pen may run out. Furthermore, I observed that yellow pigment tends to dry up faster than others inside the pen, which increased the likelihood of yellow layers failing. In consequence, starting with yellow made sense not only because it is a lighter colour that can easily get smudged by other colours, but also because it helped to avoid leaving this more “risky” layer until the very end. Additionally, I learned to listen to the subtle nuances of the noise produced by the servo motors responsible for moving the pen up and down, so I could discern when they were nearing the end of their lifespan, allowing me to take proactive measures, such as replacing them.

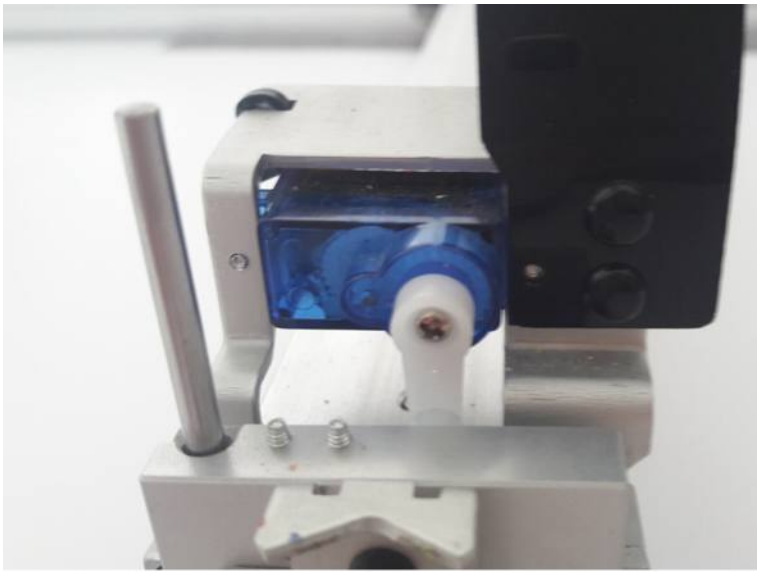

Figure 6. The servo motor governing the pen's vertical motion during printing is a component susceptible to accelerated wear under intensive pen plotter usage.

Environmental factors also played a significant role in the precision and quality of the printing process. I observed that variations in humidity levels could affect the outcome, causing the paper to subtly expand or contract, which leads to deviations as the pen plots on a surface that, despite appearing static to the human eye, is actually shifting and reacting to its surroundings. Moreover, the pen plotter exhibited variations in precision across different areas of its drawing surface – for instance, the pen plotter is more precise near the motor and closer to its base, gradually losing accuracy as it moves further away – which introduces yet another factor to consider in this already complex process. To illustrate some of the technical issues, in Figure 7, I provide a video sequence (available via the link) extracted from a brief video demonstration that showcases the work of the pen plotter, including the sounds it generates and whose aurality carries a charm of its own. In contrast, the video sequence in Figure 8 (available via the link) captures the plotter malfunctioning due to a catastrophic accident in which one of the cables broke; later, the affected element was patched up to fix the problem.

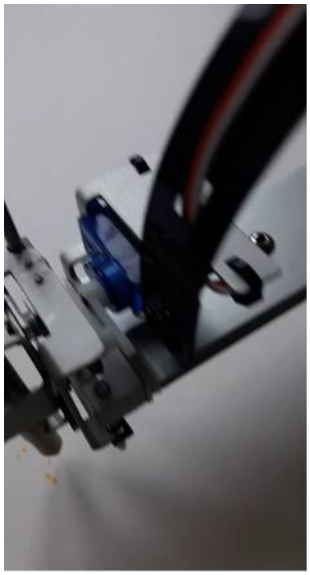

Figure 7. Sequence of frames illustrating the normal pen-plotter's motion, available via the link https://drive.google.com/file/d/1WrdpC7U1sbZWjt6Dtu4HQ8gTJzQRIUrn/view?usp=sharing.

Figure 8. The pen plotter with a ruptured cable, available via the link https://drive.google.com/file/d/17nLXtSYDdrj3WhjdDBxQmoUo2lk73LfL/view?usp=sharing.

The point of reporting all these details and unexpected accidents is not only to record them as a reference for myself and others who might find them useful but also to illustrate how I realised the importance of constant engagement with the machine. Contrary to my initial expectations, leaving the pen plotter unsupervised to draw was not a viable approach. Instead, I found myself continuously monitoring and attending to the machine's operation, looking for solutions to any issues that arose. As it turned out, drawing with a pen plotter entails more than passive execution and a cursory glance of supervision from the human "in charge". The pen plotter, through its mechanical and computerised mediation, creates a partnership where human intuition blends with mechanical precision in a dynamic feedback loop that not only extends but transforms the operator's rhythms, routines and ways of working. An anecdotal example is that during the more than two months I spent living in a studio to prepare for my PhD exhibition – printing nonstop – my biorhythms became uncannily synchronised with the printer's timings: I ate, stepped out of the studio for grocery shopping or brief outdoor activities, and slept according to the intervals needed to start new layers or change pens, and would wake in the dead of night to switch a pen or adjust a motor to avoid wasting precious time. Due to this immersion, returning to "normal" life after completing the paintings felt like a readjustment to a reality I had left behind to inhabit an alternative plane. And, as all this took place during the COVID pandemic, which had already disrupted everyone's routines, the sense of disconnection was heightened for me, as what I was primarily experiencing was a withdrawal from the time spent with my pen plotter, which had become such a central part of my daily life.

On another note, the idea that accidents and mistakes can become integral to the creative process is far from new and will be familiar to most creators and practitioners (not just artists, I would argue). Such moments of unpredictability often expand the meanings of the final work and potentially – hopefully – enhance its emotional resonance. For example, in Figure 9, some unintended lines appeared when the servo motor lost power mid-print. These accidental lines were intentionally retained in the final artwork to accentuate a sense of glitch-like motion in the composition. To be sure, the purposeful exploration of such accidents and mistakes was one of my first ideas when I started working with the pen plotter, a concept I also applied in the comic *Violent Delights*, which I will briefly discuss further below.

Figure 9. Example of accidental line in a pen-plotted painting.

One aspect I find of particular interest in the finalised artworks is how the ostensibly flat surfaces of these pen-plotted paintings disguise the labour-intensive nature of their creation. Each painting comprises hundreds of metres of lines, drawn over dozens of hours, necessitating more than a week of continuous machine operation for larger formats. So, unlike the emphasis on the linear found in more traditional pen-plotted drawings, the lines in my works are “concealed” as colour patches, rendering their temporality and lengths imperceptible at first glance, which is a distinctive characteristic of them. Naturally, painting as a medium always has this spatial and temporal dimension inscribed in its surfaces, but with the pen plotter, these can be measured down to the second and millimetre, even more so with software that reports the length and duration of each vector path.

This pictorial use I make of the pen plotter is a characteristic that sharply sets it apart from the artistic use of the pen plotter for mathematical or geometrical drawings (admittedly what the technology is supposedly better suited for) as outlined in the historical overview and its associated artists, which, though I find them beautiful to look at, do not personally align with my interest in rendering digital images of a completely different kind. My interests in machines, particularly the pen plotter, are, by contrast, more closely aligned with what is termed the post-digital, a topic I will explore in the

following section through closely related concepts such as Glitch Feminism, digital folklore, "sparkle-vomit" and other interconnected ideas tied to the "internetification" and globalisation of our societies. If we define post-digital as "a state in which the disruption brought about by digital information technology has already occurred and, as such, represents a crisis of the cybernetic notion of 'system' which neither 'digital' nor 'post-digital' – two terms ultimately rooted in systems theory – is able to leave behind, nor even adequately describe",[13] then we are talking about an aesthetic sensibility that blurs the line between digital and analogue, embracing imperfection, materiality and the fusion of digital tools and cultures with traditional, tactile art forms.

In this context, it is also worth mentioning that, despite the flat surfaces of the pen-plotted paintings, I have observed that viewers are invariably drawn to engage with them up close (Figure 10). Based on insights I have gathered from informal conversations with various viewers, this can be attributed to either the visual complexity of the artworks themselves and a curiosity regarding the technique, or a desire to explore the intricacies once the gimmick is unveiled. The notion of the "gimmick" and its capacity to pique spectators' curiosity – quite literally drawing them into the artworks – is another compelling feature of the pen-plotting technique; in fact, the prominent cultural theorist Sianne Ngai has dedicated her latest book, *Theory of the Gimmick: Aesthetic Judgment and Capitalist Form* (Harvard University Press 2020), to this theme, in which, in keeping with her broader critical project, she underscores the significance of the "the irritating yet strangely attractive gimmick"[14] as a frequently overlooked yet fundamental category within contemporary aesthetics. While a comprehensive exploration of the relationship of the pen plotter with the gimmick falls outside the scope of this article, this is an avenue I intend to explore at a later time, all the more so because pen-plotted paintings use the gimmicky process creation as an anchor in which a genuine intermedial dissolution is opened and takes place. By embracing the fundamental unit of drawing, the line and employing the classical technique of cross-hatching, it blurs the boundaries between the pictorial and the graphic, the analogue and the digital, the precision of the machine and the proverbial artist's touch.

13 David M. Berry and Michael Dieter, "Thinking Postdigital Aesthetics: Art, Computation and Design," in: Michael Dieter and David M. Berry (eds.), *Postdigital Aesthetics: Art, Computation And Design*. New York: Palgrave Macmillan 2015, p. 7.

14 Sianne Ngai, *Theory of the Gimmick: Aesthetic Judgment and Capitalist Form*. Cambridge (MA): Harvard University Press 2020, p. 1. https://doi.org/10.4159/9780674245365.

Figure 10. Example of spectator looking closely into one of the pen-plotted paintings.

Themes and composition

Thematically, the pen-plotted paintings focus on the intersections of the glitch – i.e., a small, often temporary malfunction in a system that produces errors and unexpected result – with the aesthetics of digital folklore and the internet. In the context of digital aesthetics, the term "glitch" often takes on a metaphorical meaning, referring to the kind of "digital culture that goes against the grain of efficiency and ergonomics, and embraces the reserves that reside in noise, error and glitch."[15] For instance, the contemporary movement and ideology of Glitch Feminism, coined in 2013 by Legacy Russel, draws inspiration from the glitch in technology to challenge conventional ideas of perfection and disrupt established systems of gender and identity.[16] In turn, the concept of "digital folklore", as defined by Olia Lialina and Dragan Espenschied, refers to "the customs, traditions and elements of visual, textual and audio culture that emerged

15 Peter Krapp, *Noise Channels: Glitch and Error in Digital Culture*. Minneapolis: University of Minnesota Press 2011, ix.

16 Legacy Russell, "On #GLITCHFEMINISM and The Glitch Feminism Manifesto. By Legacy Russell", *Res (*17.10.2017), http://beingres.org/2017/10/17/legacy-russell/.

from users' engagement with personal computer applications during the last decade of the 20th and the first decade of the 21st century".[17] While not all technological glitches fit within digital folklore – and, likewise, not all aspects of digital folklore align seamlessly with the tenets of glitch feminism – these notions are interconnected, sharing a few areas on which they overlap. Indeed, a great deal of digital folklore engages with the traditionally female-coded aesthetics of the cute and the pretty and, therefore, has often been purposefully harnessed as a form of guerrilla tactics by cyberfeminist artists.

The shift in the portrayal of automatons from obedient servants – like Hephaestus's mechanical creations in Greek mythology, Heron of Alexandria's self-operating devices in *Automata* (probably 1st or 2nd century AD) and Leonardo da Vinci's courtly automatons of the 15th century[18] – to "glitchy" figures (e.g., tragic or defiant) in 19th-century literature reflects anxieties driven by philosophical, industrial and cultural changes. Descartes' mechanistic philosophy and the Industrial Revolution blurred the line between human and machine, raising fears of losing control over creations and being rendered obsolete.[19] Romanticism, with its warnings against hubris, cast automatons as symbols of overreaching ambition, as seen in Mary Shelley's *Frankenstein*, where the Monster's rebellion stems from "a science unconcerned with its consequences".[20] For their part, gendered narratives that portray artificial female figures, such as Olympia in *The Sandman* and Hadaly in *L'Ève Future*, further explored societal unease, depicting idealised companions designed to fulfil our desires, yet whose relationships with humans (notably, men) are inevitably fated to end in disaster.[21] Moreover, as the Gothic and science fiction genres evolved, their stories used automatons to embody the uncanny, warning of the ethical and existential risks of technological advancements and the fragility of human dominance. For instance, as early as 1872, the writer Samu-

17 Olia Lialina and Dragan Espenschied, "Do You Believe in Users?", in: *Digital Folklore*. Stuttgart: Merz & Solitude 2009, pp. 9–10.

18 Ana Matilde Sousa and Maria Paula Diogo, "Será que a Hatsune Miku sonha com ovelhas eléctricas? Vocaloides, agentes inteligentes e pós-humanidade", in: Atilio Butturi Junior, Davide Scarso, and José Luís Câmara Leme (eds.), *Antropoceno, Biopolítica e Pós-Humano*. São Paulo: Pontes Editores 2020, pp. 234–35.

19 Ethan Stephenson, "Automata in the Victorian Imagination: Fictional Responses to Industrialization, Technology, and Human Perfectibility", PhD thesis from Southern Illinois University 2020, p. 1, https://opensiuc.lib.siu.edu/dissertations/1860.

20 Mark Coeckelbergh, *New Romantic Cyborgs: Romanticism, Information Technology, and the End of the Machine*. Cambridge (MA): The MIT Press 2017, p. 47, https://www.jstor.org/stable/j.ctt1mtz81z.2017

21 Stephenson, *op.cit.,* p. 1; Sousa and Diogo, *op.cit.,* pp. 234–35.

el Butler, in his satirical novel about the fictional land of *Erewhon* (1872), introduced the rebellion of machines as an apocalyptic scenario.[22] In the postmodern age, however, "cyborg theory" emerged as lens for exploring the broader integration of humans and machines, with thinkers like Donna Haraway (*A Cyborg Manifesto*, 1985) and N. Katherine Hayles (*How We Became Posthuman*, 1999), among many others, redefining the cyborg as a symbol of technological hybridity, challenging traditional boundaries of identity and the nature-culture divide.

My pen-plotted paintings align with this latter vision of the cyborgian partnership, drawing from Haraway's focus on resistance, adaptability and fluidity, which naturally extends into the principles of Glitch Feminism. Nevertheless, I am also interested in exploring the more "Ngai-esque" crevices of this relationship – those hooks and nooks, and the contradictions, of "compromised forms… extravagantly impoverished, simultaneously overperforming and underperforming",[23] as I believe that, in the oppressive mediascape of contemporary capitalism, liberation cannot be achieved by simply rejecting such forms in pursuit of an imagined purity. Hence, the compositions of the pen-plotted paintings embody playful and glitchy amalgamations of cute, fantasy and pop aesthetics, as well as incorporate elements of Japanese anime and manga, for which, as previously mentioned, I hold a particular appreciation; these have all consistently permeated my artistic expressions and remain my main cultural references. Most of the characters featured in the paintings are appropriated from contexts that are either girl-oriented, such as magical girl shows, or heavily "girlified", such as those involving Japanese idols (*aidoru*),[24] videogames like dating sims (called "girl games") or visual novels,[25] or the *moé* genre of manga and anime, characterised by a kind of cuteness heavily associated with otaku ("nerd" or "geek") culture. Some characters are taken from popular series and may be recognisable to viewers; however, such recognition is not essential, as my intent is to evoke the ideas outlined earlier in this paragraph, even without relying on these specific references.

22 Sousa and Diogo, *op.cit.,* p. 236.

23 Ngai, *op.cit.,* p. 1.

24 An idol is a highly curated public figure, often in music, acting or entertainment, who embodies idealised traits and serves as a cultural icon, particularly in industries such as Japanese and Korean pop, where they are celebrated for their talent, appearance and carefully managed personas.

25 Dating sims and visual novels are video game genres focused on narrative-driven gameplay, where players make choices to develop relationships or progress through interactive stories, often blending romance, character-driven plots and stylised anime-inspired visuals.

In addition to these characters, composing the pen-plotted paintings entails blending various other elements, such as hearts, butterflies, doodle, glitter and so on. For example, I often extract elements from photographs of glitter or other decorative appliques floating in water or viscous liquids, which, after manipulation, appear to hover over the main image or disrupt it like dust or visual noise. Here, the reference more explicitly connects to the realm of feminised "digital folklore" mentioned earlier, inspired by the famous (and infamous) website Blingee, which reigned supreme in early 21st-century internet by enabling users to adorn digital images and turn them into sparkly, animated GIFs. I have written elsewhere about the cultural, aesthetic and philosophical dimensions of Blingee and its excesses of glitter, cuteness and kitsch, in the article "Of Sparkle-Vomit and Base Materialism: Field Notes on Blingee GIFs",[26] to which I would redirect any curious reader. The case in point, however, is that "sparkle-vomit" aesthetics and the amateur production methods of Blingee challenge digital modernist ideals of refinement, while its nostalgic, girly culture subverts, often masculinised, notions of high art. In my paintings, the visual elements that recreate or are appropriated from old Blingee GIFs are occasionally complemented by words or excerpts of texts. Even in the absence of explicit textual components within the visual compositions, the titles often play a reinforcing role by utilising sentimental words or phrases, i.e., that appeal to nostalgia, tenderness or are overly emotional; for example, one of the larger paintings is titled *Then, on awakening, these magic memories faded into the sombre reality*, and some of the smaller ones have names such as *Pretty guardian* or *Academy rose*. By mobilising and articulating these different visual and textual resources, I seek to push the pen-plotted paintings towards an imaginative realm where traditional values of high and low art – as well as other binaries and their hierarchies, such as human versus machine or reality versus fantasy – are purposefully blurred, allowing for alternative possibilities and interpretations to arise.

The restricted palette of seven colours contributes to this effect, permitting countless variations derived from a primitive chromatic scheme, evoking the pen-plotting technologies of the 1960s, as well as the brutalist innocence of early computer graphics. Figures 11 and 12 present a selection of smaller-scale paintings featured in the doctoral exhibition. These works, measuring 30 x 20 cm and 17 x 12 cm, exemplify the thematic, compositional and chromatic considerations that have been discussed earlier.

26 Ana Matilde Sousa, "Of Sparkle-Vomit and Base Materialism: Field Notes on Blingee GIFs", in: *Proceedings of the 9th Conference on Computation, Communication, Aesthetics & X* (xCoAx, Porto: i2ADS, 2021), pp. 391–410, https://2021.xcoax.org/data/pdf/xCoAx2021-Sousa.pdf.

Figure 11. Series of 30 x 20 cm pen-plotted paintings.

Figure 12. Series of 17 x 12 cm pen-plotted paintings.

Moreover, it is important to mention that some paintings include physical "dirty matter",[27] such as photographs of trash on the street, graffiti on the walls or various painted leftovers collected in my studio, which I digitally incorporated into the compositions that were about to be plotted. In Figure 13, one can observe the coexistence of a large brushstroke of paint on the left and the digital brushstrokes done in MS Paint 3D on the right. In another other example, presented in Figure 14, I used photographs of dirty sheets of paper and paint splatters from my studio to make the digital collages that got plotted into the final work. The idea of having this analogue, actual traces of a paintbrush reproduced minutely and painstakingly by a machine which, unlike the human hand, can only materialise them through a rigid, mechanical XY system, appealed to me for how it subverted our expectations of how artistic tools and mediums are meant to function.

Figure 13. Detail of pen-plotted painting combining digital strokes made in MS Paint 3D with brush strokes made with ink. These physical brush strokes were scanned and integrated into the digital composition.

27 Jussi Parikka, "New Materialism as Media Theory: Medianatures and Dirty Matter", in: *Communication and Critical/Cultural Studies* 9, no. 1 (March 2012), pp. 95–100, https://doi.org/10.1080/14791420.2011.626252.

Figure 14. *Then, on awakening, these magic memories faded into the somber reality, of 2020*. Archival ink pens on acid-free Bristol paper, frame and plexiglass, 140 x 100 cm.

In addition to the pen-plotting method discussed here, I will briefly touch on other ways I have explored and hope to explore in the future using the pen plotter for my artworks. One of the directions that I am eager to pursue involves using the pen plotter in a manner more aligned with its original purpose, primarily for drawing lines; I intend to blend this approach with the use of physical mediums such as acrylic paint, either applied with a brush attached to the pen plotter or through the use of acrylic markers. Figures 15 and 16 show an artwork created using this hybrid technique.

Figure 15. *Man-made monstrosities*, 2020. Acrylic markers and spray-on foam-core with artist's frame, 100 x 70 cm.

Figure 16. Detail of *Man-made monstrosities*.

Another path that I have been exploring in my studio – although I have not yet showcased any of these artworks publicly – involves creating collages using various sheets of pen-plotted paintings, by layering these sheets to create overlaps. Using this technique, I started creating compositions inspired by the concept of windows in computer GUI interfaces and the sense of *mise-en-abyme* they evoke, as well as the phenomenological experience of working in graphic programs such as Photoshop, where multiple windows often coexist and overlap, and distinct spaces or planes within the workspace. Figure 17 provides a photographic record of one such experiment.

Figure 17. Experiments with combing and overlapping different pen-plotted paintings.

Besides exploring painting techniques, I am also interested in taking pen-plotted paintings into the expanded field of installations and, as a member of the MASSACRE artistic collective, I conceptualised an artwork of this kind for our exhibition *Loot Box* at the gallery of the FCT-NOVA library, held in 2020. This was a ground piece titled *En plein air (after Zelda)*, in which I used the pen plotter to recreate pixelated sprites from the classic video game *The Legend of Zelda* from the 1980s. The pen-plotted sheets were then assembled into a ground piece/installation that evolved and changed its shape modularly over time.[28] The exhibition catalogue, published by MASSACRE, includes a detailed text discussing the concept, making and key characteristics of this artwork.

28 For more information about this piece, please visit the following link: https://www.heta.moe/loot-box/.

Figure 18. *En plein air (after Zelda)*, 2020. Archival ink markers on Bristol paper mounted on foamcore, model trees, grass mats, trolleys and toy signs, laser prints on fluorescent cardboard, on black foamcore bases. Variable dimensions.

Finally, one of my most successful experiments with the pen-plotter is the 28-page comic book titled *Violet Delights*, which I created for the mini-kuš collection by the Latvian art comics publisher Kuš. During its creation, I employed the pen plotter to draw vector graphics, while simultaneously intervening with pigment markers and physically manipulating the paper to create analogue glitches. Figures 19 and 20 show the book's cover, which was one of the smaller-scale paintings in my post-doctoral exhibition, and an excerpt from the book, featuring the protagonist from the anime *Sailor Moon*. This comic was also the subject of a presentation at the 2024 Comics Studies Society conference, titled "Comics Out of Joint: The Use of Glitch Aesthetics in Hetamoé's *Violent Delights*". In this presentation, which I am currently developing into a full-length paper, I focused on glitches rooted in the pen-plotter's machinic process yet generated through non-digital means, encompassing glitches created with pen and paint on paper, as well as narrative glitches arising from the overlapping, remixing and collapsing of cultural, temporal and aesthetic dimensions.

Figure 19. *Mini kuš!* #87 “Violent Delights” (cover).

Figure 20. *Mini kuš!* #87 “Violent Delights” (excerpt of the inside).

Concluding remarks

In this article, I have described in some detail the artistic journey – so far – resulting from my “cyborgian partnership” with a pen plotter, focusing on aspects such as style, process and the themes I explore in my work. I have delved into how these pen-plotted paintings fit in between traditional and digital art, exploring and teasing the connection between humans and machines in the context of posthumanism, glitch aesthetics and

cyberfeminism. In the latter part of the article, I have also discussed potential future directions and opportunities for exploring additional techniques using the pen plotter for painting, as well as its application in other mediums such as comics and installations.

Ultimately, by pushing the boundaries of the pen plotter's capabilities, these artworks seek to transcend the limitations imposed by obsolescence. They bridge diverse cultural, temporal and aesthetic scales – standing out within the tradition of pen-plotter art for their shift from the linear to the pictorial, and from the geometric and abstract to an aesthetic that not only incorporates numerous figurative elements and characters but also aligns with a post-digital sensibility, engaging closely with the aesthetics of the internet, including digital folklore and "sparkle-vomit" styles, and the globalised imaginaries of anime and manga. To conclude, I want to express that participating in the POR-POL NET project, including one of its exhibitions at Saco Azul Gallery in Porto, the colloquium at Faculdade de Letras da Universidade de Lisboa and now this publication, has been not only a pleasure but a highly productive experience. The exchange of ideas during these events has been invaluable and will undoubtedly greatly influence my ongoing project and its various aspects.

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