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Review Article

BEYOND THE GRID: TRON & TRON LEGACY AND THE BLURRING LINES BETWEEN DIGITAL AND PHYSICAL REALITIES

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SİSTEMİN ÖTESİNDE: *TRON* & *TRON EFSANESİ* VE DİJİTAL İLE FİZİKSEL GERÇEKLİKLER ARASINDAKİ BULANIKLAŞAN SINIRLAR

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ABSTRACT: The *Tron* series with its captivating portrayal of a world focuses on the ethical questions arising from increasingly digitalized lives. It challenges the perception of reality consciousness and the boundaries, between the virtual realms. This article explores the themes in *Tron* concentrating on how both Tron (1982) and *Tron: Legacy* (2010) showcase the merging lines between physical realities. By analysing these films using scientific concepts like Nick Bostrom's simulation hypothesis, Jean Baudrillard's idea of hyperreality and Rizwan Virk's exploration of simulated worlds the article intends to filter how the *Tron* universe symbolizes people's evolving interaction with technology. The examination draws connections between the films' depiction of a frontier and modern advancements in AI virtual reality and potential digital consciousness. Additionally, it places the *Tron* storyline within conversations, about reality's nature, consciousness and the ethical considerations surrounding creating intelligent digital beings. Through blending an analysis of movies and a decent exploration, this paper makes a case for how the *Tron* series not just mirrors present tech advancements but also foresees upcoming hurdles and potentials in our world that is becoming more digitalized. In essence, taking an odyssey through *Tron*'s domain offers a basis for pondering the deep inquiries about life, awareness and our connection, with the technological structures we invent.

Keywords: Digital Reality, Simulation Hypothesis, Hyperreality, Artificial Intelligence, Technological Ehics

ÖZ: *Tron serisi, büyüleyici bir dünya tasviriyle, giderek dijitalleşen yaşamlardan kaynaklanan etik soruları ele almaktadır. Gerçeklik algısını, bilinci ve sanal âlemler arasındaki sınırları sorgulamaktadır. Bu makale, hem Tron (1982) hem de Tron Efsanesi (2010) filmlerinin fiziksel gerçeklikler arasındaki birleşen çizgileri nasıl gösterdiğine odaklanarak Tron'daki temaları incelemektedir. Nick Bostrom'un simülasyon hipotezi, Jean Baudrillard'ın hipergerçeklik fikri ve Rizwan Virk'in simüle edilmiş dünyalar üzerine incelemeleri gibi bilimsel kavramları kullanarak bu filmleri analiz eden makale, Tron evreninin insanların teknolojiyle gelişen etkileşimini nasıl sembolize ettiğini süzmeyi amaçlamaktadır. Bu inceleme, filmlerin bir sınır betimlemesi ile yapay zekâ, sanal gerçeklik ve potansiyel dijital bilinç alanındaki modern gelişmeler arasında bağlantılar kurmaktadır. Ayrıca, Tron hikâyesini gerçekliğin doğası, bilinç ve akıllı dijital varlıklar yaratmanın etrafındaki etik düşünceler hakkındaki tartışmalar içine yerleştirmektedir. Film analizi ve derinlemesine bir araştırmayı harmanlayarak, bu makale Tron serisinin sadece mevcut teknolojik gelişmeleri yansıtmakla kalmayıp, giderek dijitalleşen dünyamızdaki*

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yaklaşan zorlukları ve potansiyelleri de öngördüğünü savunmaktadır. Özünde, Tron'un alanından geçen bir yolculuk, yaşam, farkındalık ve icat ettiğimiz teknolojik yapılarla olan bağlantımız hakkındaki derin sorgulamaları düşünmek için bir temel sunmaktadır.

Anahtar Kelimeler: *Dijital Gerçeklik, Simülasyon Hipotezi, Hipergerçeklik, Yapay Zekâ, Teknoloji Etiği*

Introduction

Humanity has indeed reached a barrier that evokes memories of dystopian science fiction films and novels. Endless conflicts, recurring tragedies, and societal apathy have become prevalent due to the pervasive influence of late capitalism. The frequent occurrence of tragedies and pains has become commonplace. The majority of individuals do not engage with videos that exceed a duration of a few minutes. Moreover, we have reached the threshold of a grid where everything is tracked through the digital world. The real question to ask here, and really to stop and think about, is where we will come after all this. Eventually, science has begun to swiftly resolve the majority of issues by utilising artificial intelligence. Highly efficient programs capable of outperforming humans in a wide range of tasks, such as composing music in seconds (e.g., suno ai), generating movie scenes from phrases (Runway), and writing code (ChatGPT), are extensively utilised. These programs facilitate the translation of mental simulations into external manifestations. In recent times, there has been a production of cyborg models integrated with artificial intelligence, as well as a study of AI and comparable transhuman models for human use (URL-1). The pertinent inquiry at hand is whether the inverse can be accomplished in the realm of information and objects that undergo a conversion from digital to physical form. Can the human mind or body be transported to the digital realm? Scientists have confirmed that the answer is “yes.” Kurzweil predicts that by 2045, technology will achieve a level of intelligence that surpasses that of the human brain, resulting in the emergence of a highly advanced form of artificial intelligence called the singularity. According to Kurzweil,

> The Singularity will represent the culmination of the merger of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots. There will be no distinction, post-Singularity, between human and machine or between physical and virtual reality. If you wonder what will remain unequivocally human in such a world, it's simply this quality: ours is the species that inherently seeks to extend its physical and mental reach beyond current limitations. The Singularity will allow us to transcend these limitations of our biological bodies and brains. We will gain power over our fates. Our mortality will be in our own hands. We will be able to live as long as we want (a subtly different statement from saying we will live forever). We will fully understand human thinking and will vastly

> extend and expand its reach. By the end of this century, the nonbiological portion of our intelligence will be trillions of trillions of times more powerful than unaided human intelligence. (Kurzweil, 2005: 9)

The merging of humans and machines appears inevitable at some point. With technology increasingly permeating aspects of our lives the line, between the physical realms is becoming more blurred. The films *Tron* from 1982 and its sequel *Tron: Legacy* from 2010 symbolize this phenomenon depicting a world where the boundaries between reality and simulation are not just unclear but completely obliterated. This transformation represents a significant evolution in transmedia storytelling, as Harvey observes: "…in 2010 *Tron: Legacy* was released, a sequel to the 1982 film *Tron* (1982) starring Jeff Bridges and directed by Steven Lisberger. *Tron: Legacy* (2010) was intended as a transmedial project from the outset" (Harvey, 2013: 119). The concept of a bridging the gap between tangible worlds goes beyond mere science fiction prompting deep philosophical contemplations on the essence of reality. That is to say, the *Tron* franchise, which began with the 1982 film followed by its sequel Tron: Legacy paints a picture of a universe where distinctions between physical and digital realms cease to exist. These movies serve as allegories for advancements in the realm. In the *Tron* film Kevin Flynn—a programmer—finds himself transported into a computer systems digital domain. Here computer programs take on human forms. Engaged in conflicts, with potentially life threatening consequences (Lisberger, 1982). The film represented a technological milestone in cinema history. As Kirsner (2008: 62) details: "Tron would rely on more computer-generated imagery than any of its predecessors: about fifteen minutes of the movie involved computer environments, characters, and props designed by four digital effects firms using the fastest computers they could get their hands on" (Kirsner, 2008: 62). However, this pioneering use of digital technology was not immediately embraced by the film industry. Despite its technical innovations, "Academy voters viewed using computers to create the effects as 'cheating,' and not true artistry" (Kirsner, 2008: 62).

The concept closely relates to Virk's *Simulation Hypothesis* from 2019 proposing that our existence might actually be a computer-generated simulation. In a manner *Tron* (1982) introduces the notion of transferring the body into a digital realm through a process of digital transformation, within the grid. This goes beyond attempts at mind uploading as Kevin Flynn bridges the gap, between the physical worlds by teleporting himself into the Grid using a digitizing laser that transfers both his mind and body into the system as a unified entity. This concept of a digital frontier, as depicted in the *Tron* (1982), functions as a potent analogy for the increasing influence of technology on our daily existence. In his work on the technological singularity, Kurzweil (2005) foresees a near future where artificial intelligence would transcend human intelligence, leading to a fundamental transformation in our interaction with technology. On the other hand, the

Grid in *Tron: Legacy*, a more intricate and advanced iteration of the virtual realm seen in the original movie, might be interpreted as a portrayal of the futuristic environment that emerges after the singularity (Kosinski, 2010). It is uncertain whether it would be possible in the future to teleport or upload the human body into a computerised system using a laser cannon. However, the films *Tron* and *Tron: Legacy* present this concept in a definitive manner. The actions taken in the digital realm might have repercussions that impact the physical realm. Visual representations, fictional figures, or concepts generated in the realm of digital technology have the potential to profoundly alter the physical reality beyond the digital realm. Put simply, a single tweet made in the digital realm has the potential to ignite a global conflict of catastrophic proportions in the physical world. Therefore, it is possible that the forecasts made by the *Tron* series may well have been truly accurate. On the other hand, such concept of a portal between digital and physical realms isn't merely the stuff of science fiction since it reflects deeper philosophical questions about the nature of reality itself. *Tron: Legacy* depicts a future where the digital realm is not merely a depiction of data, but rather a whole and tangible cosmos. The main character of the film, Sam Flynn, physically immerses himself into the digital realm, causing the distinction between user and program, and between physical body and computer code, to become indistinct. In fact, Flynn's immersion has a decent and sensible equivalent in modern technology. The notion of a physical and inhabitable digital place exemplifies an increasing engagement in virtual environments facilitated by technologies such as virtual reality (VR) and augmented reality (AR). Similarly, the movie's account of the transition between digital and physical domains aligns with contemporary technological progress. VR headsets enable users to immerse themselves in completely rendered 3D settings, while AR superimposes digital information over the real world.[1] Although not yet as flawless as the gateway depicted in *Tron: Legacy*, these technologies are advancing mankind towards a future where the digital and physical realms reconcile and interact in progressively intricate manners. The *Tron* series not only explores philosophical questions but also represents a significant technological milestone in cinema history. As Hoberman notes, "*Tron* (1982), the first sustained exercise in computer-generated imagery, was a movie whose costly special effects and mediocre box-office returns would be credited with (or blamed for) delaying CGI-based cinema for a decade" (Hoberman, 2012: 7). The intertwining of the digital world with the real world distorts the perception of reality and creates a grotesque perception of what is real and what is digital. This brings with it the suspicion that the life we live in may increasingly be a simulation or part of a holographic reality. To better analyse the possible distinction of reality and allegedly co-existing digital reality (or simulation), this study aims to employ a multi-faceted methodological approach to analyze the *Tron*

[1] For more information (URL-2).

films, specifically *Tron* (1982) and *Tron: Legacy* (2010), and their implications for a deeper understanding of digital reality. Therefore, the primary method will be textual analysis, focusing on the narrative, visual, and thematic elements of *Tron* (1982) and *Tron: Legacy* (2010). Furthermore, the text complements this analysis with philosophical inquiry, utilizing established theories in digital philosophy, simulation theory, and AI ethics to interpret the content of the films. Finally, the article utilizes comparative analysis, contrasting the *Tron* universe with other conceptualizations of digital reality in both academic literature and popular culture. This interdisciplinary approach permits for a complete exploration of how the *Tron* franchise reflects and anticipates real-world technological and philosophical developments.

Simulation as a Theory and Science Fiction

The idea of our reality being a simulation is not new. It has roots in ancient philosophical concepts and has been explored extensively in modern philosophy, science fiction, and even scientific theory. That is to say, the notion of inhabiting a simulated reality can be traced back to ancient philosophical concepts, however the contemporary articulation of this hypothesis is rather recent. The 'simulation hypothesis,' presented by philosopher Nick Bostrom in 2003, is one of the earliest contemporary hypotheses indicating that our existence might be a product of a simulated reality. An instance of living in a simulation that has been in presence for a long time is Plato's cave allegory. Even if a person or some people trapped inside a cave were able to get out, it would make no difference whether they could understand what they saw or explain it. It is a futile action as everyone perceives only the anonymity of the cave and the shadows cast within that obscurity (Plato, ca. 375 BCE/1974). Plato offers a remarkably exquisite portrayal of this occurrence, which can be seen as the ancient concept of *The Matrix*. The Matrix is a system in which people who live connected to machines are connected only to the inactive Matrix system without actually existing in the real world. In a similar manner, Descartes in his *Meditations on First Philosophy* says that "I will suppose therefore that not God, who is supremely good and the source of truth, but rather some malicious demon of the utmost power and cunning has employed all his energies in order to deceive me" (Descartes, 1641/1984: 15). Here in this quotation, it can be argued that this evil force could be somewhat an equation of an AI simulated world. Descartes goes even further by stating that senses are sometimes misleading and thus not truthful: "All that I have, up to this moment, accepted as possessed of the highest truth and certainty, I received either from or through the senses. I observed, however, that these sometimes misled us" (Descartes, 1641/1984: 12). It is evident from these statements that philosophers have long speculated and articulated the possibility of simulating the universe from ancient times. This resoluteness and distrust, which has persisted from the dawn of humanity, naturally escalated in the latter half of the twentieth century and, naturally, the first two decades of the

twenty-first. The author of *Blade Runner*'s (1982) seminal work, *Do Androids Dream Electric Sheep*?, Philip K. Dick, is among many who have seriously asserted that our reality is a simulation. In his 1977 talk in Metz, France, Dick posited the notion that our existence could perhaps be a product of a computer-programmed simulation. This concept was actually a prevalent motif in his literary creations, notably in *The Man in the High Castle* and *Ubik*. This renowned 'Metz speech,' formally known as "If You Find This World Bad, You Should See Some of the Others," was spoken at a science fiction convention in Metz, France, in 1977. This speech was groundbreaking in many ways, as Dick's ideas were far ahead of their time. According to Dick, the environment that surrounds us is nothing more than a simulation controlled, altered, and managed by a super intelligent computer. Only in 1999 did the Wachowski sisters bring this concept to life via *The Matrix*. Coming back to Dick's idea and its possible connections with the *Tron* (1982) and *Tron: Legacy* (2010), the concept of synthetic realities is a central theme in both Dick's speech and the *Tron* franchise. Dick hypothesises that the apparent reality of the universe could perhaps be a computer-programmed simulation, a concept that significantly aligns with the premise of the films *Tron* (1982) and its sequel, *Tron: Legacy* (2010). Even before cyberpunk literature fully emerged, *Tron* was already exploring the concept of digital reality. As Hoberman observes,

> "Tron's literalist representation of cyberspace predated William Gibson's Neuromancer by several years, although the movie was actually closer to Alice in Wonderland or The Wizard of Oz in supposedly taking place inside a computer where all the characters, except the hacker Flynn (Jeff Bridges), were—in a longstanding Disney tradition—anthropomorphized computer code." (Hoberman, 2012: 8)

Within these films, the Grid symbolises a complete and concrete digital realm that exists within a computer system, embodying Dick's theoretical concept. In other words, the Grid is the alternative portal of this world. This analogy prompts a more thorough analysis of how fiction conceptualises and illustrates alternative worlds, and the consequences these depictions have on our comprehension of existence. Dick's remark significantly questions our preconceived notions on the fundamental nature of reality, a theme that is vividly portrayed in the *Tron* storylines. That is to say, realizing that this universe in which we have adapted to the concept of reality and in which we live is a holographic structure; or moving into an identical universe will be like a resemblance of what Plato's cave stands for. Thus, transitioning to an identical environment would essentially replicate the experience of Plato's cave analogy. This philosophical connection between reality and simulation is further reinforced by the Grid's carefully constructed sense of authenticity As Wood states,

> The Grid, then, has a familiarity to it, one that comes into view at an intersection of known cinematic language, a soundscape partly grounded in reality (the sound effects of the light cycles are

> manipulations of Ducati engines), and data bodies with recognizable patterns. Such familiarity, however, only catches at the edges of the possibilities of a data space (Wood, 2014: 37).

Similarly, the characters in *Tron*, especially those who shift from the physical realm to the digital domain, are faced with the task of confronting and reconciling with a reality that challenges their previous comprehension of existence. This narrative trick functions as a potent metaphor for Dick's philosophical argument, prompting audiences to thoroughly scrutinise their own ideas of reality. Dick's speech prominently explores the concept of a superior intellect that is accountable for the creation of our perception of reality. This concept is remarkably similar in the *Tron* universe, as exemplified by the character of Kevin Flynn. Flynn, as the creator of the Grid, holds a position similar to that of a deity in this digital realm. This analogy provides a fertile path for examining issues of power, accountability, and the moral consequences of constructing conscious entities, concepts that are fundamental to both Dick's philosophical investigations and the storyline of the *Tron* movie. Dick's works often focuses on the disintegration of borders between distinct realities, a significant theme in *Tron: Legacy.* Therefore, while the film presents a multi-layered reality, the fact that the alternative world can have countless alternative worlds emerges. For instance, the film's depiction of Isomorphic Algorithms (ISOs) and Quorra's odyssey from the digital to the physical realm exemplifies a notable merging of realms. In a way, Quorra's odyssey is a transition from digital to reality through AI, literally from inside to outside (from a digital world to our world), whereas Sam Flynn's journey on the Grid has a traverse structure. The juxtaposition of Quorra's unidirectional odyssey with Sam's traverse structure creates a rich narrative tapestry that explores the multifaceted nature of reality and consciousness. This dual approach allows the film to engage with Dick's ideas from multiple angles: these juxtapositional trips explore the potential for digital awareness to manifest in physical form (as shown with Quorra) and for human consciousness to navigate digital domains (as seen by Sam). Actually, an essential sequence that explores these notions occurs when Quorra is liberated from the physical realm of Grid at the conclusion of *Tron: Legacy*. This period presents a challenge to the very comprehension of the essence of consciousness and the demarcation between digital and physical life. As Sam and Quorra materialise in the tangible realm, the film raises a profound inquiry: Is it truly possible for a digital awareness to transform into physical existence? Quorra, an ISO originating from the grid, embodies an artificial life form that spontaneously arises within the digital realm. The shift to the tangible realm implies that consciousness, regardless of its source, has the ability to appear in various underlying strata. *The Tron* franchise not only explores the philosophical aspects of digital reality but also creates an embedded form of the ethical implications of creating sentient digital beings. This aspect of the films provides a compelling framework for examining the moral responsibilities that come with

technological advancement and artificial intelligence. More than that, Quorra represents a spontaneously evolved digital life form. She pops up suddenly like Homo Sapiens appeared all of a sudden right after the Neanderthals. Her presence gives rise to fundamental ethical enquiries on the essence of consciousness and the entitlements of digital creatures. As Kevin Flynn states in the film: "[t]he ISOs, they manifested like a flame. They weren't really from anywhere. The conditions were right and they came into being" (Tron: Legacy, 2010). These words by Flynn encapsulate the concept of digital sensitivity, which pertains to arguments on the ethical implications of artificial intelligence and its ability to develop consciousness, particularly in the context of artificial general intelligence.

The ethical dilemma becomes further intricate by CLU's extermination of the ISOs, which Kevin Flynn describes as "genocide" (Tron: Legacy, 2010). This condition forces one to confront questions about the moral status of digital beings such as whether they have rights or whether creators have any responsibilities towards their digital creations and so on. Current AI ethics debates parallel these and other questions about the potential rights and protections that highly advanced AI systems might receive. Furthermore, both *Tron* films describe programs as distinct entities with varying personalities and aims, prompting enquiries regarding the ethical handling of digital traits. For example, *Tron*'s character exemplifies characteristics such as loyalty, courage, and ethical decision-making before his final reversal by CLU. This portrayal prompts viewers to contemplate the circumstances under which a digital being may warrant the moral assessment commensurate with that of biological existence. These ethical considerations tie directly into Nick Bostrom's work on the implications of superintelligent AI. As Bostrom notes, it is imperative to exercise caution when designing the motivational systems of highly advanced artificial intelligence. Naturally, if we make an error, the repercussions could be disastrous (Bostrom, 2014: 132).

The Tron universe, particularly through CLU's actions in *Tron: Legacy* (2010), vividly illustrates a thought-provoking condition which cannot be easily overlooked. AI or any equivalent 'superpower' might retain the control and once it gets the lead, it might be too late to prevent the catastrophic events. Thus, by presenting these ethical dilemmas in a vivid, narrative format, the *Tron* films encourage viewers to grapple with the complex moral landscape that may arise as the technological competences advance. All in all, in the case of CLU, this scenario exemplifies the philosophical notion of sub-layer autonomy, indicating that consciousness is not contingent upon a certain physical milieu, but can conceivably manifest in diverse manifestations, including digital ones. Furthermore, it prompts ethical enquiries on the fundamental essence of being and the entitlements of digital possessions, should they attain genuine self-awareness. Furthermore, the excursions investigate the extent to which the barriers between different realities can be crossed, which is a prominent issue in

Dick's writing. Ultimately, the interplay between intrinsic and extrinsic movement prompts enquiries on the fundamental essence of identity and awareness during the process of transitioning between various states of being. This narrative element not only reflects Dick's ideas, but also expands upon them, suggesting a world where the distinction between digital and physical reality gets progressively blurred. Both Dick's philosophical postulates and the *Tron* franchise explore profoundly into the ramifications of technology on consciousness and perception as mentioned before. The portrayal of conscious programs in Tron's digital domain provides a tangible examination of Dick's conceptual reflections on the essence of awareness in a technologically mediated existence. This correlation prompts one to contemplate how progress in artificial intelligence and virtual reality can alter the very comprehension of consciousness and self-identity. Dick's consistent motif of concealed power hierarchies dictating the nature of existence is exemplified in the *Tron* films by the conflicts for dominance within the Grid. The Master Control Program (MCP) in the original *Tron* and CLU in *Tron: Legacy* exemplifies the notion of autocratic dominance within a simulated realm. The narrative elements in question offer a cinematic examination of Dick's preoccupations regarding the essence of authority and manipulation within possible recreated realities. The thematic parallels between Philip K. Dick's aforementioned "Metz speech" and the *Tron* movies further illustrate the lasting significance of enquiries into the essence of reality, consciousness, and existence in light of progressing technology. Castor, often referred to as 'Zuse' by other programs, serves as a prime illustration of Philip K Dick's skill at blurring the distinction between reality and virtual reality. Zuse formerly existed in a different form, and according to his own statements, he used to have faith in Flynn (the user), but now he is pursuing his own agenda. He informed CLU that young Flynn would arrive and negotiated an agreement. Is Zuse an independent program or is he emulating a program that possesses a desire for power and consciousness? The response to this inquiry lacks clarity, and this uncertainty closely aligns with the viewpoint of Philip K. Dick as the lines from *Tron: Legacy* (2010) presents a certain affinity to Dick's views:

> Programs are disappearing. Soon none of us will be left. Zuse can unite the factions, form the revolution…(Upon seeing young Flynn) Come away from these primitive functions… Zuse has been around since the earliest days of the gaming grid. By necessity, he has to mind all the percentages. All the angles… I believed in users once before. (Kosinski, 2010)

The framework described by Dick's statements is inherently ambiguous, revealing the potential for a simulation and its degree of resemblance to the *Tron* creations. Rizvan Virk also presents a comparable description and simulation idea, which will be discussed in the next section under the simulation hypothesis. This ambiguity aligns with Virk's observation that "…our consciousness is so interconnected with reality that

we may be living in a set of interconnected subjective realities" (Virk, 2019: 11). This perspective offers an intriguing lens through which to view the Tron universe's portrayal of interconnected digital and physical realms.

Simulation Hypothesis

In his book *The Simulation Hypothesis*, Rizwan Virk, a computer scientist, from MIT delves deeper into the idea of simulation theory. He suggests that human existence could be similar to a video game with player characters (NPCs) and player characters (PCs) controlled by an external entity within the simulation. Drawing parallels between the creation of video games and our reality Virk predicts that as video game technology advances the line between worlds and our own reality will become increasingly blurred. These uncertainties have long been part of history with beings like ghosts, vampires, extraterrestrial civilizations and mythical creatures such as centaurs and goblins appearing in literature before becoming staples of fantasy fiction. In the realm of simulation theory movies like *Tron* depict characters, like Sam Flynn and Kevin Flynn assuming roles as users or controllers. They possess significant powers and can be likened to gods in comparison to the individuals within the simulation as Virk states: "[a]ny beings living outside of the simulated reality would appear, at least to those of use in the simulation, as supernatural beings, angels or even gods" (Virk, 2019: 16). Of course, digitalization is more than just a character- or entity-based concept. This evolutionary process starts and continues with the controllers which command the digital frontier. Rizwan Virk underscores the significance of these linking, in his work *The Simulation Hypothesis*:

> While rendering technology is important, another key factor in these stages turns out to be the sophistication of the control mechanisms, or how players give input to the simulation. This includes keyboards, joysticks, specialized controllers, haptic technology (touch sensitivity), voice activation, and eventually mind interfaces and downloadable consciousness (Virk, 2019: 27).

The Tron series vividly shows the development of interface technologies starting with input tools and moving towards the potential, for connections to the mind. In the *Tron* film from 1982 Flynn gains access to the world through a laser acting as a simple yet creative interface. In *Tron: Legacy* from 2010 advancements in interfaces allow for transitions across realities. This coordinated development across platforms was intentional, as Harvey notes that "[t]he director of *Tron*: Evolution, Darren Hedges...talks about the interrelationship between the Legacy film and Evolution video game in terms of trans-media experience" (Harvey, 2013: 120). The evolution depicted in these movies mirrors our real-life journey from computer interfaces to virtual reality (VR) and augmented reality (AR) systems hinting at upcoming technologies like brain computer interfaces. The increasing complexity of these interfaces enhances our ability to interact with environments while blurring the line between virtual worlds bringing

us closer to the immersive digital experience portrayed in the *Tron* universe. Additionally simulated environments will undergo a transformation akin to advancements in video games. Potential interfaces for simulations include analogue to digital conversion and digital, to biological connections that facilitate integrating consciousness into the simulation.

There is a possibility of integrating computer codes into the body to establish a connection, between a chip module and the brain. This connection would enable the uploading of memories, data and various information. As a result, borders could be eliminated, allowing for transitions between worlds through a biological link connecting the digital realm to reality. It might also offer the ability to revisit moments from time periods and historical events by representing life and evolution reminiscent of experiences in games, like SimCity™.

There is another analysis that aligns with Virk's viewpoint and helps us better understand the *Tron* series. The concept of hyperreality as explained by the French philosopher Jean Baudrillard in his work *Simulacra and Simulation* presents an angle to explore the fusion of reality and simulation. According to Baudrillard in the era simulated versions of reality have become so prevalent that they have replaced reality leading to the emergence of a hyperreality (Baudrillard, 1994). The idea of hyperreality is particularly relevant to the world depicted in *Tron: Legacy,* where the digital realm has developed into a realized domain that closely resembles and perhaps even surpasses the world in terms of complexity and impact. Baudrillard's notion of hyperreality provides a framework for analysing the landscape depicted in the Tron franchise specifically in *Tron: Legacy* (2010). In *Simulacra and Simulation Baudrillard* suggests that in our society the line, between reality and simulation has blurred, giving rise to a state of hyperreality. Where "the real is no longer what it used to be," leading to "an age of simulation" (Baudrillard, 1994). This idea really connects with the concept of the Grid, in *Tron: Legacy*. In this world the Grid has developed into a realized and somewhat self-aware environment that competes with and even surpasses physical reality in terms of complexity and impact. The Grid is akin to Baudrillard's stage of the image, where it becomes a simulacrum without any ties, to actual reality (Baudrillard, 1994: 6). Initially created as a copy of the realm the Grid has transcended its purpose to become an independent and self-sustaining domain. This transformation can be seen in Kevin Flynn's words:

> The Grid. A digital frontier. I tried to picture clusters of information as they moved through the computer. What did they look like? Ships? Motorcycles? Were the circuits like freeways? I kept dreaming of a world I thought I'd never see. And then, one day... I got in (Kosinski, 2010).

Flynn's interpretation exemplifies the conversion of conceptual information into a physical, functional or even organic environment - a

hyperreal realm where the differentiation between reality and simulation becomes irrelevant. On the surface, Nick Bostrom' universe and the *Tron* universe might seem completely apart, yet they indeed have common points to be detected. Both works focus on the essence of reality, the capabilities of artificial intelligence, and the deep consequences of cutting-edge technology on human existence. Both Bostrom and Tron films aim to investigate the dots that connect the discontinuities of the digital and real worlds. These points no longer focus on probability, but rather on the question of when it will appear solidly. Bostrom's interest in simulated realities finds a vivid reflection in Tron's digital world. As Bostrom puts forward his idea, "If we are living in a simulation, then the cosmos that we are observing is just a tiny piece of the totality of physical existence" (Bostrom, 2003: 243). Bostrom's ideas are strongly echoed—though not directly nor in a conscious way probably—in Tron, where characters discover a vast digital universe hidden within a computer system, challenging their perceptions of reality and existence. As I.J. Good states,

> Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an "intelligence explosion," and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the last invention that man need ever make, provided that the machine is docile enough to tell us how to keep it under control (Good, 1965: 33).

The notion of an "intelligence explosion" is quite congruent with the ideas examined in both Bostrom's literature and the *Tron* fictional world. Good's conjecture regarding the possibility of machines surpassing human intellect and then developing even more sophisticated machines aligns with the examination of artificial intelligence and its ramifications in both domains. According to Bostrom's simulation theory, highly powerful artificial intelligence could potentially be the creator of the simulated reality that we currently perceive as our own existence. What is more, in *Tron*, the digital world symbolises a domain where artificial intelligence has advanced to form intricate systems and beings, reflecting Good's idea of machines developing superior machines. Good's concepts regarding the capacity of artificial intelligence to surpass human intelligence at a quick rate contribute an additional dimension to the shared elements between Bostrom's theories and the Tron universe. They all struggle with the repercussions of sophisticated technology on human existence and the increasingly indistinct boundaries between reality and artificial constructions. This relationship further highlights how these works together investigate the essence of reality, intelligence, and the significant influence of technological progress and self-realization on our comprehension of existence.

Onca again, the example of CLU demonstrates the understanding of this concept in *Tron*. However, in series such as *The Matrix*, *Terminator*, and similar dystopian movies, when high technology surpasses human intelligence, it is quite paradoxical but also possible that humanity's greatest invention is actually their last invention and their own executioner. The development of atomic and hydrogen bombs is a prime example for this. Looking at the *Tron* universe, Theo Brighton's digital philosophy may offer some more fascinating points to filter the aforementioned realm. Brighton's theory, particularly digital metaphysics, offers a complementary filtration to Baudrillard's hyperreality and sheds light on the philosophical implications of the digital boundaries described in *Tron*. Brighton suggests that the concept of reality can exist mainly digitally in nature, hypothesising that "the universe is, as its core, made of information" (Brighton, 2024: 45). This idea validates *Tron*'s depiction of the Grid, where legacy digital information surpasses physical properties and transforms into tangible, inhabitable territory. Brighton states that "if reality is digital, then the difference between simulation and reality becomes a matter of degree rather than kind" (Brighton, 2024: 78), which creates a fundamental bridge between the physical and digital worlds in the *Tron* universe. In addition, Brighton's examination of digital consciousness presents a striking comparison to the portrayal of programs as self-aware beings in *Tron*. Brighton states that "consciousness could be understood as a particular configuration of information processing" (Brighton, 2024: 112). This concept is clearly represented in the movie *Tron: Legacy* through characters like as Quorra and Tron himself, who demonstrates consciousness and the ability to take action despite being digital entities. Additionally, Tron's conscious transition back to the users' side towards the end of *Tron: Legacy* is reminiscent of the previous discussion about Castor's potential consciousness.

There is a very intriguing scene in *Tron* films that describes maybe one of the most fascinating moments: the Lightcycle duel is a highly memorable moment in both *Tron* films. These scenes effectively exemplify the notion of hyperreality. In the original *Tron* film, the Lightcycle contest is evidently a computer simulation, featuring rudimentary graphics and geometric patterns. Nevertheless, in *Tron: Legacy*, the Lightcycle conflict is transformed into a completely actualised and engrossing encounter that is indistinguishable from a tangible event in the physical world thanks to the latest technology and advancements in CGI. Sam Flynn's entry into the game grid resembles an in-medias-res reading experience, leaving readers stunned by the unfolding events that have already reached their peak. Thousands of spectators are watching him as he finds himself in the middle of a life-and-death situation. The cycles in the Grid produce luminous trails, which, although lacking a direct counterpart in our physical reality, are intuitively consistent within the Grid's framework. This scene embodies Baudrillard's fourth stage of the image, where it "bears no relation to any reality whatever: it is its own pure simulacrum" (Baudrillard, 1994: 6). In

that respect, the Lightcycle battle is not trying to simulate any real-world experience; in fact, it has already become the reality itself. Furthermore, the consequences of the game - the permanent elimination (death) for the unsuccessful participants - emphasise the exaggerated and simulated reality of the Grid. Within the sphere of digital technology, the outcomes are just as definitive and permanent as they are in the physical world, causing the line between simulation and reality to become even more indistinct.

In a similar way, Michael Talbot's *The Holographic Universe* (1991) presents a quite extraordinary conceptualisation of reality depending on principles of quantum physics. He suggests that the universe itself can be like a hologram, i.e., a real-time projector fed by a two-dimensional realm. Depending on what he says, one might perceive reality as misleading, with its true nature completely distinct from everyday life. The relationship between a simulated world and reality, or whatever we define it as, may not be as clear-cut as we think. *The Tron* films represent a completely functional realm that coexists inside computer systems. In a similar vein, Talbot suggests that what we perceive in this world could be a complicated computer program.

Furthermore, in the *Tron* universe, both the digital world and the real world can affect each other, which illustrates a common denominator: a solid interconnection between the two worlds. This shows a peculiar similarity with Talbot's holographic model, which presents an interconnectedness of all things, where each part has information or a part of the whole. *The Tron* films introduce the idea of nested universes, where a digital realm coexists within our physical realm. This concept aligns with both the holographic universe theory, which posits the existence of several levels of reality, and the simulation theory, which indicates that our world could be a simulation nested within a 'base' reality. In the realm of the *Tron* universe, everything is a part of information, and every bit and piece of information constructs the digital world. This closely supports Talbot's holographic model, which suggests that information might be more essential than matter itself. Simulated reality, according to simulation theory, must fundamentally consist of information. Another aspect of the *Tron* movies is the interaction between the creator and the created. That is to say, advanced beings might create some simulated realities and later interact with them. Kevin Flynn creates CLU and leaves 'him' behind to take care of the things in his absence. CLU is actually Kevin Flynn's trajectory copy, who would claim control of the grid and the rest later. As Talbot states, "some subatomic processes result in the creation of a pair of particles with identical or closely related properties" (Talbot, 1991: 46), so CLU acts as if he were an extension of Kevin Flynn to become the arbiter of the system.

Conclusion

The *Tron* series paints a picture of a universe offering an engaging backdrop, for exploring complex philosophical and scientific concepts. These

movies reflect dialogues in cognitive science, philosophy and computer science entering topics like the ethics of artificial intelligence, digital consciousness and simulation theories. The themes presented in *Tron* are gaining relevance as our society becomes digitized and virtual and augmented reality technologies become more prevalent. Through these films we witness the lines between the digital realm and the physical world highlighting both the opportunities and risks associated with our rapidly evolving tech landscape. Consequently, *Tron* encourages us to contemplate questions about existence, consciousness and our relationship with the systems we create. As long as AI capabilities continue to expand within the realm of computer-generated worlds, it is inevitable that critical inquiries will be sparked by examining the *Tron* movies. In the words of Nick Bostrom,

> Far from being the smartest possible biological species, we are probably better thought of as the stupidest possible biological species capable of starting a technological civilization - a niche we filled because we got there first, not because we are in any sense optimally adapted to it (Bostrom, 2014: 43).

As we progress through this technological society that we have built, works such as *Tron* are valuable thought experiments that help us anticipate and be ready for the possibilities and threats that our future may bring, thanks to its rising digitisation. Moreover, one of the best things the *Tron* movies can do is provide insight into where current AI, VR, and AR technologies could be evolving. It prompts us to question the fundamental nature of our reality and the possibility that our universe itself might be a form of simulation or information processing system. Also, the ethical dilemmas still present the never-ending danger of the ever-developing nature of technology. As we make progress in AI and virtual reality technology, the *Tron* franchise serves as a reminder to carefully consider the ethical consequences of our creations. This highlights the importance of creating strong ethical frameworks that can adapt to the possible development of digital awareness. With the progression of technology like brain-computer interfaces and augmented reality, the distinction between humans and machines may become increasingly indistinct, resembling the boundary between the Grid in *Tron* and the actual realm.

Consequently, the *Tron* movies provide not just pleasure but also a significant thought experiment that aids in anticipating and becoming ready for the technological and philosophical problems of our increasingly digitalised future. By engaging in a critical analysis of these films, we can gain a clearer understanding of the intricate ethical and existential dilemmas that emerge as we further explore the limits of what can be achieved in the digital realm. *Tron*'s legacy has a significant impact outside the realm of cinema, serving as a valuable reference for our continuous study of the digital frontier and our evolving connection with technology.

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