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Recognizing the Interactive Relationship Between Avant-Garde Architectural Discourse and Science Fiction Cinema

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ABSTRACT

Objective: Art resides within the fabric and context of life. Architecture is the vessel of life, and cinema is its narrator; both serve as platforms for perceiving and constructing differently. The ideas and theories of avant-garde architects exert influence not only within their professional community but also on filmmakers. Conversely, directors, by employing this discourse, create works that, in turn, inspire architects. Studying the interaction between these two artistic domains provides a more precise interpretation of cinema's role in the process of architectural formation, from theory to actualization. This study aims to reinterpret the formal and conceptual influences of avant-garde architecture and science fiction cinema on one another. It seeks to answer the following questions: Which characteristics of avant-garde architecture have attracted the attention of filmmakers? And what kind of relationship, within a temporal framework, can be conceived for the influence of architectural discourse on cinematic works and, subsequently, on architectural practice?

Methods: The present research adopts a qualitative approach and an argumentative methodology. Data has been collected through documentary methods. The statistical population of the study encompasses science fiction films released up to the end of 2020, with ten selected titles, all depicting future timelines.

Results: The conducted study demonstrates that the imagination of filmmakers is influenced by the dominant societal discourse and the theories of avant-garde architects that precede it.

Conclusion: Avant-garde architectural theories, with a time lag of approximately one decade, have laid the groundwork for filmmakers' imaginations. After being depicted in cinema, these ideas return to the realm of practical architecture and, with another approximate decade-long interval, become a source of inspiration for other architects. This bidirectional, interactive relationship has, on one hand, contributed to the advancement and refinement of architecture and urban planning, and on the other hand, has enriched the imaginative scope of science fiction cinema.

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Introduction

Architecture and cinema are two domains that interact extensively; architecture is the vessel of life, and cinema is its narrator; both teach new ways of *seeing* and *building*. Consequently, in this bidirectional interaction, architects learn from filmmakers and, simultaneously, influence them.

Due to their understanding of space, architects have a distinct experience of cinema. This experience becomes even more distinctive when encountering science fiction cinema, where extraordinary buildings and cities are often depicted. On the other hand, science fiction cinema has thus far inspired numerous researchers and scientists, leading to many inventions and innovations. In the realm of architecture and urban planning, images of buildings and cities that seemed fantastical and unbelievable in films of past decades have now taken on the hue of reality.

Throughout the entire history of cinema, from the silent era to the present day, architecture has served as a tool for storytelling and narration, while cinema has, in turn, been a source of design inspiration for architects (Caplescu, 2015). Although cinema is a relatively nascent art form, dating back to the late 19th century, due to its shared fundamentals with architecture, such as space, movement, and connection (Tousi, Feizabadi, Kamelnia, 2016) it has, within this short period, influenced architecture and been influenced by it more than any other visual art.

A review of the literature concerning the interaction between cinema and architecture reveals that, despite numerous studies confirming this interaction and the contexts of their mutual influence, no specific study has been conducted on the relationship between avant-garde architecture and pioneering cinematic genres (specifically, the science fiction genre). Therefore, it is necessary to study the interaction between these two artistic domains to achieve a more precise interpretation of cinema's role in the process of architectural formation, from theory to its actualization.

Accordingly, the objective of this research is to reinterpret the formal and conceptual influences of avant-garde architecture and science fiction cinema on one another. In other words, this research also seeks to establish a relationship between the three domains of dominant theoretical discourse in architecture, cinematic works, and architectural practice. To achieve this objective, the research questions are:

1. What characteristics of avant-garde architecture have attracted the attention of science fiction filmmakers?

2. What kind of relationship, within a temporal framework, can be conceived for the influence among the three domains of architectural discourse, cinematic works, and architectural practice?

Based on the above questions, the research hypotheses are:

1. Avant-garde architecture has influenced pioneering filmmakers in terms of content through the deconstruction of concepts, and in terms of form through Form, Space, and Order.

2. Although science fiction cinema has been influenced by avant-garde architectural discourse with a time lag, it has subsequently influenced the form of progressive architecture.

Research Background

Numerous studies have examined the relationship between cinema and architecture. Juhani Pallasmaa (2012), in an article addressing the interaction between cinema and architecture, has made the influence of cinema on contemporary architecture the subject of his study. Rostami Gharagozloo and Adel (2021), in an article, have investigated the relationship between architecture and cinema as two complementary and identity-forming elements of space and place. They contend that architecture, spatial configuration, and film set design encompass not merely physical decors and structures but everything conveyed to the viewer's eyes and ears through the film's frame. Proceeding from this premise, they conclude that the structure of the cinematic image and the concepts derived from it are all influenced by the type of composition and arrangement within the film frame. In cinema, this is examined through artistic design (encompassing architecture, set design, and generally, the arrangement of everything seen or heard within the frame). Consequently, by altering the architecture of the cinematic image, the interpretation, conveyed concepts, and its impact on the audience can be modified and controlled.

Frootan Yekta and Barzi (2016), while examining the architectural methods of the first Pahlavi period in the series *Zero Degree Orbit* argue that to achieve a desirable outcome in the set design of historical series, in addition to correct aesthetics, one must pay attention to the essence and nature of the work and the architectural characteristics of its historical context. Sarabi and Molanaei (2017) have studied the relationship between architecture and cinema from the perspective of architectural education and believe that utilizing cinematic capabilities can be beneficial in teaching architecture. Hosseini, Abizadeh, and Bagheri (2009) have addressed the reciprocal connection between architecture and cinema as two complementary elements and their role in giving identity to urban places and spaces, discussing the synergy between these two arts and techniques.

However, a review of the literature indicates that research specifically linking architecture and science fiction cinema is considerably limited. Alalhasabi and Sheikh (2020) have utilized science fiction cinema to explain the challenges facing future cities. They believe that in the contemporary era, the science fiction genre has increasingly moved beyond simple scientific predictions to display concerns about the future of humanity and human society. The findings of their research show that in most science fiction films, future cities are portrayed with a dystopian image encompassing aspects from government and governance to environment and culture. The

researchers believe the message underlying these dark sci-fi cities is quite simple and illuminating: if humanity cannot correctly amend its current path, it will step into a strange and complex future.

Mokhtabad Amrei and Panahi (2007) investigated the role of interior architecture in manifesting meaning within science fiction films and concluded that the interior architecture in these films is shaped by imagination, and architectural elements play a significant role in creating meaning and spiritual concepts. They assert that filmmakers can utilize architecture, especially through semiotics and meaning, for character development, establishing identity, and evoking a sense of time and place in their films.

Another study has examined architectural representations in live-action and animated science fiction films. The aforementioned research, while reviewing selected materials and outlining the criteria employed, seeks to analyze the design of buildings and urban landscapes. It concludes that across all scenarios, architectural features can be realized either as physical models or through CGI, or alternatively, by utilizing existing buildings and cities from the real world (Caplescu, 2015).

"The Importance of Future Architecture in Science Fiction Films" is the title of another article that seeks to answer the question: How are aspects of future architecture in science fiction films utilized as architectural signifiers by directors to convey personal viewpoints and statements? This study, which analyzes various science fiction films, argues that architecture plays a crucial role as an effective signifier. The article also predicts that our world is undergoing rapid and significant changes driven by massive technological development and capitalism, with the film industry playing a primary role in depicting these transformations (AboHela, Al-Gohary & Dewidar, 2007).

A thesis has also examined and analyzed architectural space and form in four science fiction films, raising specific themes in each. These include the implicit/inherent spatial duality in the design and production of both architecture and cinema, the postmodern city, and architectures of control (Manasseh, 2000).

Theoritical Foundations

Avant-gardism

Charles Jencks remarks on the avant-garde: "The avant-garde is a strange term and concept; partly because a military metaphor is applied to the artistic and cultural realms, and also because it has become synonymous with and a substitute for the more comforting term 'modern' or the Modern Movement, or because it describes a sociological class of unsupported individuals. And it is partly a false concept used to boost the reputation of those who have entered the Vatican of

Modernism (the New York Museum of Modern Art). This museum is a quasi-official institution that turns the acts of inventing and abolishing modernism into relatively eternal icons to be studied, classified, and sometimes even worshipped." (Jencks, 1994).

Pioneering or avant-garde artists are those who, in a given period, employ ideas ahead of their time and, by challenging the prevailing conventions of society, utilize the most advanced techniques or themes in their works. They are often the instigators of new movements and step towards new frontiers with the aim of expanding the boundaries of art; this stands in contrast to conservative artists who persist in adhering to tradition (Rahmani, Etesam, and Mokhtabad Amrei, 2017).

Avant-garde art movements emerged with the industrialization of society in the 19th century and are fundamentally based on the continuous destruction of prior works in pursuit of the new. The theory of the avant-garde, proposed by the American sociologist Peter Burger (1929-2017), positioned the avant-garde as a historical phenomenon, counterposed to a purely aesthetic one. He contends that the avant-garde constitutes an assemblage of accumulated strategies deployed in protest against an established model of cultural production. Berger, emphasizing function, posits art as an affirmation of the inherent values of the society that produces it. In every epoch, avant-gardism overshadows all fields of aesthetic production, including architecture. Consequently, architecture is established as a particular strategy of avant-gardism. In art and architecture, the avant-garde signifies a cultural and vanguard phenomenon (Burger, 1984).

Renato Poggioli, the Italian professor of comparative literature (1907-1963), in his 1965 book *The Theory of the Avant-garde*, after examining the historical, social, psychological, and philosophical facets of avant-gardism, extends his generalization beyond unique instances of art to demonstrate that the avant-gardes are a group with shared ideals and values, whose manifestation is the rebellious lifestyle they have chosen. Avant-garde culture can be considered a branch of that lifestyle (Poggioli, 1981). According to Poggioli's perspective, the position of avant-garde art is separate and distant from the established values of the past, and it leans from the present towards the future (Figure 1).

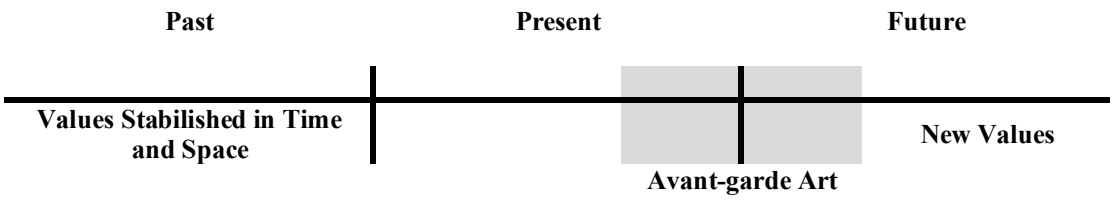

Figure 1. The Position of Avant-garde Art in relation to the past, Present and future (Source: The Author).

Avant-garde Architecture

Architecture, in any given period, is a synthesis of the prevailing values and ideologies of its socio-temporal context and the subjective, personal ideas of the designer. However, there are instances where the architect's ideas and creativity in the design process become more prominent than the weight of commonly held societal values and thoughts. Such architects, who strive through their creativity to disrupt established conventions and forge a new language, are considered avant-garde. It is crucial to clarify that "avant-gardism does not seek to negate the past; rather, with a radical perspective, it pursues a transitional shift to liberate itself from the repetition of redundant and stereotypical patterns" (Rahmani, et al., 2017).

Consequently, avant-garde architecture can be regarded as an endeavor that, through engagement with interdisciplinary discourse, attempts to establish values and ideas acceptable to an evolving society. Based on such ideas, it aims to create works that, as manifestos of architecture's transition into a new era, reflect these aforementioned values. The discourse of avant-garde architecture strives to create a different future and, prior to entering the realm of architectural practice, requires a medium to visualize its principles. In critiquing a work of avant-garde architecture, two distinct approaches exist for its analysis:

1. The avant-garde work is evaluated against the criteria and rules of prevailing architecture.

2. The avant-garde work is evaluated against the criteria and rules of the emerging, new architecture.

In the first scenario, where the avant-garde work is judged by the rules of conventional architecture, the outcome of this assessment seems predictable: the denial, even rejection, of the avant-garde work due to its deviation from the established value system. However, in the second scenario, when the avant-garde work is measured against new and still-forming rules, the outcome of the evaluation differs significantly. Due to its alignment with the new value system, it receives a mark of approval. Therefore, an evaluation based on the second approach cannot occur immediately after the work's creation and necessitates the passage of time (Rahmani, et al., 2017).

Science Fiction Cinema

Damien Broderick, the Australian science fiction writer (born 1944), analyzes the science fiction genre as follows: "Science fiction is that mode of storytelling native to a culture undergoing the epistemic changes implicated in the rise and fall of industrial-technological modes of production, distribution, consumption, and disposal. This genre is characterized by:

a. Metaphorical strategies and ironic techniques.

b. A focus on signs and the overarching interpretive framework of a generically determined mega-text, with a de-emphasis on fine writing and character development.

c. Specific priorities found more in scientific and postmodern texts than in literary models; notably, an attention to the object rather than the subject" (Adams, 2004).

These films generally deal with phenomena not necessarily accepted by mainstream science; phenomena such as extraterrestrial beings, alien worlds, extrasensory perception, and time travel, often combined with futuristic elements like spacecraft, robots, or other advanced technologies (Hayward, 2022).

Time is a key element in these films, as the narratives of science fiction films almost invariably take place in the future—a future where humanity has achieved significant advancements, resulting in profound impacts on human life. Writers and creators of science fiction unleash their thoughts and imaginations to project into the future, depicting in cinema what is not yet possible due to scientific limitations. Other characteristics of the genre include elaborate visual and computer-generated effects, and a frequently pessimistic and uncertain outlook on the future relationship between science and humanity.

The Relationship Between Architecture and Cinema

Few films exist that do not incorporate architectural imagery. This statement holds true regardless of whether buildings are explicitly shown, as the framing of the shot, the definition of scale, lighting, and so forth, inherently involve the creation of an architectural space (Pallasmaa, 2012). Architecture and cinema are each, individually, composites of arts and techniques; and together, they contribute to creating the space and spirit of life. They share fundamental elements such as form, space, order, light, movement, and vision, and both arts adhere to common principles in the process of spatial perception.

Cinema employs a combination of elements like color, light, perspective, mise-en-scène, editing, and sound to create a strong connection with the viewer and facilitate their mental journey into the film through spatial construction. In architecture, space is considered the very essence of the discipline. In cinema, the filmmaker constructs space subjectively, while in architecture, the architect gives space objectivity. The filmmaker relies on architectural space to manifest intended meanings, and architecture, in turn, needs cinema to extend and promote its virtual realities and spatial visions (Rahimian, 2020). Penz and Thomas have identified five methods of mutual influence between cinema and architecture (Table 1).

Table 1. Platforms of Mutual Influence Between Cinema and Architecture (Source: Penz and Thomas, 1997).

Platform	Mode of Influence	Manifestations/ Examples
Conceptual	Content-based	Spatial Design, Ideological Thought, Scenario/Narrative
	Form-based	Rhythm, Hierarchy, Spatial Revelation, Light, Form, Stasis
Referential	Architecture in Cinema	Set Design
	Cinema in Architecture	Contemporary Modern Buildings
Instrumental	Digital Technology	Architectural, Cinematic, and Graphic Computer Software

Architecture remains distant from the deceptive techniques employed by filmmakers for dramatic purposes. It lacks the tools of storytelling, sound, specific editing, and other cinematic devices. However, the filmmaker requires architectural space to manifest their intended meanings, and conversely, cinema bestows upon avant-garde architects new expressive methods—a fact acknowledged by figures such as Le Corbusier, Frank Lloyd Wright, Bernard Tschumi, and Rem Koolhaas. The avant-garde architectural movement and science fiction cinema share a common objective: to create a future distinct from the status quo. The difference lies in cinema's inherent virtuality, allowing it to depict its idealized future far more rapidly than architecture, which necessarily requires patience to materialize its utopias.

Form and Space in Architecture and Cinema

Among the similarities between architecture and cinema is the issue of form and space. Architectural space and form in science fiction cinema often reflect the identity of the persona occupying the frame. However, in such films, form and space serve a purpose beyond merely delineating the environment. During the viewing process, the audience's act of identifying and comprehending the space is of particular importance. The viewer must be able to recognize the space, find their way within it, and connect with the film's architecture (Manasseh, 2000).

Louis Kahn believed that architecture is the thoughtful creation of spaces. The continual renewal of architecture stems from the pursuit of spatial concepts. Research into the evolution of the concept of space in architectural theory leads to the conviction that the architecture of today and the near future will find its foundation in a new understanding of space. In science fiction cinema, postmodern space is characterized not by a new idea of what space is, but by a new understanding of how it is inhabited. This signifies that the new space differs from the old because what traverses or permeates it is no longer systematic or disciplined (Ibid.).

Cinema is an art that occurs within space—a space sometimes limited to the architecture of cities and at other times to the architecture of existence itself. Architecture, as a space, is always present in cinema. In other words, cinema is composed of combined elements. Shots are the components of a scene. Regardless of what the individual shots are meant to convey, in combination they form a unified whole that can be called a film. Therefore, a film, being

composed of shots and ultimately becoming a holistic entity, shares similarities with architecture. Cinema is architecture in motion, and architecture is cinema in stasis (Goharpour, 2008).

The scenographic space in a film is derived from three factors: physical space, editorial space, and acoustic space. Physical space concerns the relationships between objects and their surrounding environment within a single shot. Editorial space, however, is achieved through the sequence of individual shots, and finally, acoustic elements can also contribute to creating a sense of scenographic space through their appropriate use.

It is worth clarifying that the concept of space is also a subject of debate among architects. Bruno Zevi argues that architecture is the art of building space. Auguste Perret sees architecture as the art of organizing space. Sigfried Giedion considers space the central and primary discourse of architecture. Throughout different periods, architecture has engaged with concepts such as the illumination of space, the multi-temporality of space, the purity of space, lightness and heaviness, spatial diversity, the multi-valency of space, and spatial richness, imposing no strict limitations on the methods and materials used to realize these concepts. Indeed, space is one of the most fundamental elements of architecture, and understanding architecture is dependent on understanding space and its elements. The concept of existential space in architecture is based on the notion that every human action has a spatial dimension. Actions take place in locations and require a more or less defined framework to occur (Goharpour, 2008). The theoretical foundations of the research are summarized in Table 2.

Research Method

This research employs a qualitative approach and an argumentative methodology, utilizing both inductive and deductive reasoning. Data has been gathered through documentary methods, specifically visual documents. The statistical population of the study comprises all science fiction films produced from the beginning of cinema history (1920) until the end of 2020. The selected samples adhere to the following criteria:

- They fall within specified temporal intervals.

- They are indexed under the science fiction genre on the *Metacritic* website.

- They possess a score above 70 based on *Metacritic's* rating system, with consideration also given to their *IMDb* and *Rotten Tomatoes* ratings.

- The concept of "architecture" in the selected samples refers to permanent structures. Consequently, space stations, capsules, containers, and other temporary constructions are not considered architecture, with the exception of massive space stations that function as equivalents to settlements and themselves contain multiple buildings. In this study, interior design is also considered part of architecture, as it influences spatial qualities and is significant for the analyses

conducted. The specifications of the selected samples, based on the above criteria, are presented in Table 3.

Table 2. Summary of the Research's Theoretical Foundations (Source: The Author).

Domain	Paradigm	Theorist	Extracted Foundational Principles
Art	Avant-garde (General)	Pakbaz (2021)	- Use of pioneering techniques and themes in a given period - Instigator of new movements
		Jencks (1994)	- Synonymous with the Modern Movement
		Peter Burger (1984)	- A historical phenomenon counterposed to a purely aesthetic one - Protest against an established model of cultural production |
		Renato Poggioli (1981)	- A branch of a rebellious lifestyle adopted by a group with shared ideals and values
Architecture	Avant-garde (Specific)	Rahmani, Etesam, Mokhtabad Amrei (2017)	- Disruption of prevailing conventions - Creation of a new language - Transitional shift to liberate from repetitive and stereotypical patterns - Engagement with interdisciplinary discourse - Establishment of values and ideas acceptable to an evolving society - Creation of works as manifestos heralding architecture's transition to a new era |
Cinema	Science Fiction	Damien Broderick	- Use of metaphorical strategies and ironic techniques - Focus on signs and a collectively determined generic mega-text as an interpretive framework - De-emphasis on fine writing and character development - Specific priorities found more in scientific and postmodern texts than in literary models - Attention to the object rather than the subject
		Sheikhi (2017)	- Deals with phenomena not necessarily accepted by science - Concerns phenomena not fully confirmed by science - Imagination is blended with science to an inseparable degree - Time is a key element in this genre (future time) - A generally pessimistic and uncertain outlook on the future relationship between science and humanity - Depicting in the future that which is not currently possible due to scientific progress

Table 3. Specifications of the Most Significant Science Fiction Films, Sorted by Production Decade (Source: www.metacritic.com).

Decade	Year	Film	Director	IMDb	Metacritic		Rotten Tomatoes
Pre 1960s	1927	*Metropolis*	Fritz Lang	8.3	98	8.6	97
1960s	1966	*The Face of Another*	Hiroshi Teshigahar	8.0	---	---	100
	1966	*Fahrenheit 451*	François Truffaut	7.2	---	---	81
	1968	*2001: A Space Odyssey*	Stanley Kubrick	8.3	84	8.2	92
	1968	*Planet of the Apes*	Franklin J.Schaffner	8.0	79	8.1	86
1970s	1971	*Solaris*	Andrei Tarkovsky	8.1	90	8	92
	1971	*A Clockwork Orange*	Stanley Kubrick	8.3	77	7.2	87
	1977	*Star Wars: Ep IV- A new hope*	George Lucas	8.6	90	8.8	92
	1979	*Alien*	Ridley Scott	8.5	89	9	98
	1979	*Stalker*	Andrei Tarkovsky	8.1	---	---	100
1980s	1980	*Star Wars: Episode V – The Empire Strikes Back*	Irvin Kershner	8.8	82	9.1	94
	1981	*Mad Max: The Road Warrior*	George Miller	7.6	77	8.5	94
	1982	*Blade Runner*	Ridley Scott	8.2	84	8.4	89
	1984	*Guest from the Future*	Natalya Guseva	8.3	-	-	-
	1984	*The Terminator*	James Cameron	8.0	84	8.7	100
	1985	*Back to the Future*	Robert Zemeckis	8.5	87	9	96
	1985	*Brazil*	Terry Gilliam	8.0	84	8.7	98
	1986	*Aliens*	James Cameron	8.4	84	9	97
1990s	1991	*Terminator 2: Judgment Day*	James Cameron	8.5	75	9	93
	1995	*Twelve Monkeys*	Terry Gilliam	8.0	74	8.7	89
	1999	*The Matrix*	Wachowskis	8.7	73	9	88
2000s	2000	*Battle Royal*	Kinji Fukasaku	7.6	81	7.9	88
	2002	*Minority Report*	Steven Spielberg	7.6	80	7.1	90
	2006	*Children Of Men*	Alfonso Cameron	7.9	84	8.5	92
	2008	*WALL·E*	Andrew Stanton	8.4	95	8.9	95
	2009	*Star Trek*	J.J. Abrams	8.0	82	7.9	94
	2009	*Avatar*	James Cameron	7.8	83	7.5	81
2010s	2010	*Inception*	Christopher Nolan	8.8	74	7.5	87
	2013	*Snow Piercer*	Bony Joon-ho	7.1	84	7.2	94
	2013	*Her*	Spike Jonze	8	91	8.6	94
	2013	*Gravity*	Alfonso Cuarón	7.7	96	7.8	96
	2014	*Interstellar*	Christopher Nolan	8.6	90	8.6	72
	2015	*Mad Max: Fury Road*	George Miller	8.1	90	8.6	97
	2015	*Star Wars: The Force Awakens*	J.J. Abrams	8.0	80	6.7	93
	2015	*The Martian*	Ridley Scott	8.0	80	8.1	91
	2017	*Blade Runner 2049*	Denis Villeneuve	8.0	81	8.4	88
	2017	*Logan*	James Mangold	8.1	77	8.4	94
	2018	*A Quiet Place*	John Krasinski	7.5	82	7	96
	2019	*Avengers: End Game*	Anthony Russo; Joe Russ	8.4	78	7.8	94

A review of the samples allows for their classification into two main categories:

1. Films that narrate a future time and whose mise-en-scène consequently expresses a futuristic, technological, and mechanized space, influenced by the filmmaker's imagination.

2. Films that narrate the present time, where the element of the filmmaker's imagination and ideation is applied to areas other than the mise-en-scène and architectural space.

The samples falling into the second category lie outside the scope of this research. Therefore, from the films listed in Table 3, a total of 10 titles belonging to the first category constitute the research sample. Images from these films are provided in figure 2. The characteristics examined in the 10 selected films are:

A. Formal Components: Including type of form (geometric and non-geometric) and proportions.

B. Spatial Components: Including hierarchy, transparency, and enclosure.

C. Technology and Construction Materials.

Research Findings

The study of the research components within the selected films is presented in Table 4. The analysis of the films reveals that the selected films utilize geometric and non-geometric forms in equal measure. Furthermore, the forms are less frequently (30%) focused on human proportions. In the selected films, spatial design shows limited attention (30%) to the factors of hierarchy and enclosure, but demonstrates a significant inclination towards transparency. All samples (100%) pay attention to the theme of technology and construction materials. Curvilinear and fragmented geometries, non-human proportions, unconventional materials (metal, glass, and carbon fiber), neutral colors (accentuated by lighting), and polished, texture-less surfaces are observed in the majority of the samples. It appears that directors have deliberately employed these elements to create minimalist spaces with simple yet unconventional geometric structures.

Table 4. Components of Form and Space in the Selected Films (Source: The Author).

Film	Form			Space			Technology & Materials
	Type		Proportions	Hierarchy	Transparency	Enclosure	
	Geometric	Non-Geometric					
Metropolis	✓	---	✓	---	✓	---	✓
2001: A Space Odyssey	---	✓	---	---	---	✓	✓
Solaris	---	✓	---	---	✓	---	✓
Alien	---	✓	---	✓	---	✓	✓
Blade Runner	✓	---	✓	✓	✓	---	✓
Aliens	---	✓	---	---	✓	---	✓
The Matrix	✓	---	✓	---	✓	---	✓
Inception	✓	---	---	---	✓	---	✓
Blade Runner 2049	✓	---	---	✓	---	✓	✓
Avengers: End Game	---	✓	---	---	✓	---	✓
Total	**5**	**5**	**3**	**3**	**7**	**3**	**10**

A chronological analysis of the interaction between architectural discourse, cinema, and built works reveals the following dynamics:

1920 to 1960 AD

Science Fiction Cinema: From this period, the film *Metropolis* (1927), directed by Fritz Lang, has been selected. *Metropolis* depicts a futuristic city in the year 2026 where humanity is divided into two classes: the thinkers and the workers. The architectural space in this film is thoroughly mechanized and industrial, characterized by rigid, rectilinear geometries and a Brutalist aesthetic.

Architectural Works: The major architectural works of this era consist of Modernist buildings created by architects such as Frank Lloyd Wright, Mies van der Rohe, Alvar Aalto, Le Corbusier, Louis Kahn, Philip Johnson, and others. Common characteristics of these structures include the use of pure geometric volumes, materials like steel and concrete, and a transparency of form enabled by advancements in structural engineering. (Figure 2)

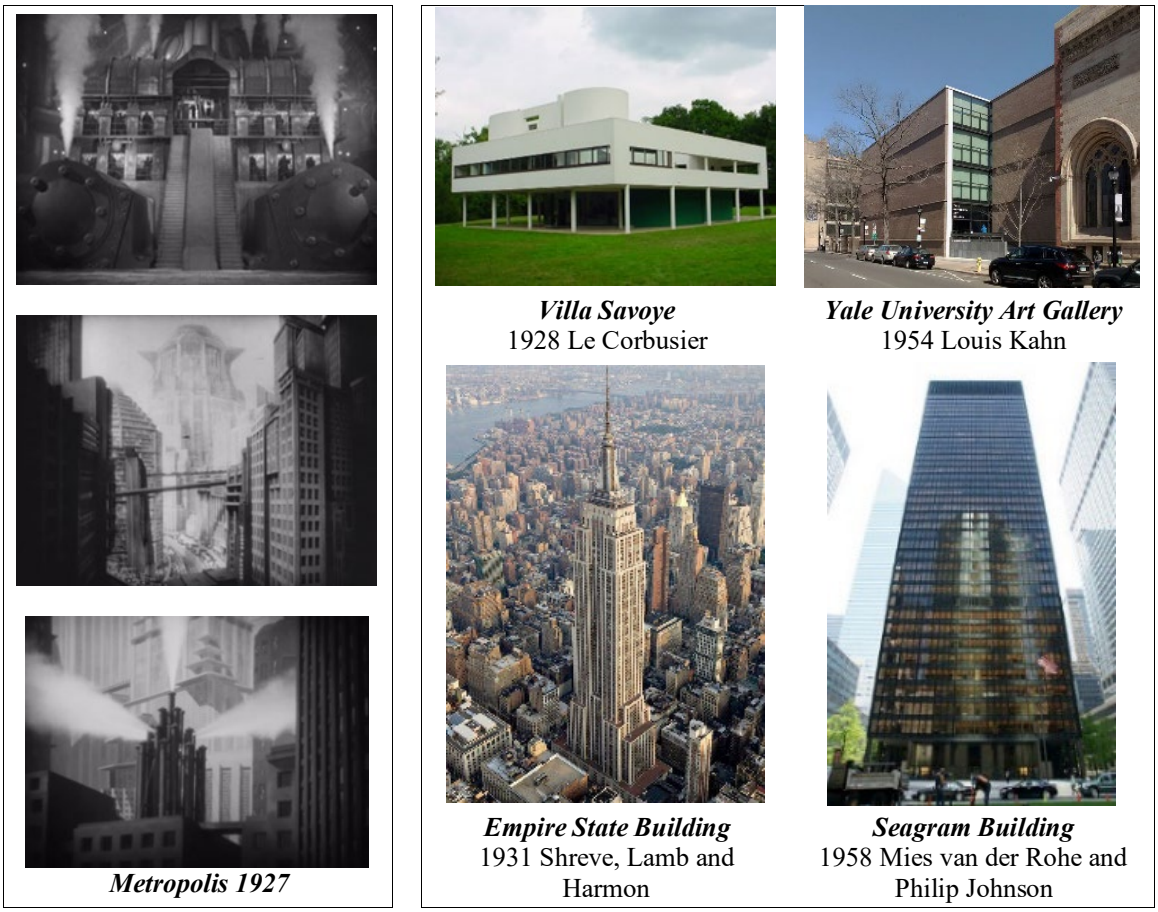

Figure 2. Works of avant-garde architecture and science fiction cinema of the 1920s (Source: The Author).

The 1960s, 1970s, and 1980s

Science Fiction Cinema: Notable films from this period include *Alien*, *Aliens*, *2001: A Space Odyssey*, *Solaris*, and *Blade Runner*. The predominant narrative theme across these three decades revolves around humanity's story at a time when it has gained the capability to leave Earth's atmosphere and travel to other planets. The architectural spaces in these films often consist of spacecraft designed on the scale of cities. The focus on architecture in these works is primarily on the physical dimension, with machinery employed to produce new materials and create forms with unconventional geometries.

Architectural Works: Various works in architecture and related fields have engaged with the concept of the "machine". From a formal and visual standpoint, architectural styles that emerged in the second half of the 20th century, such as High-Tech, can be seen as inspired by this particular conception of architecture (Tobe, 2017). (Figure 3)

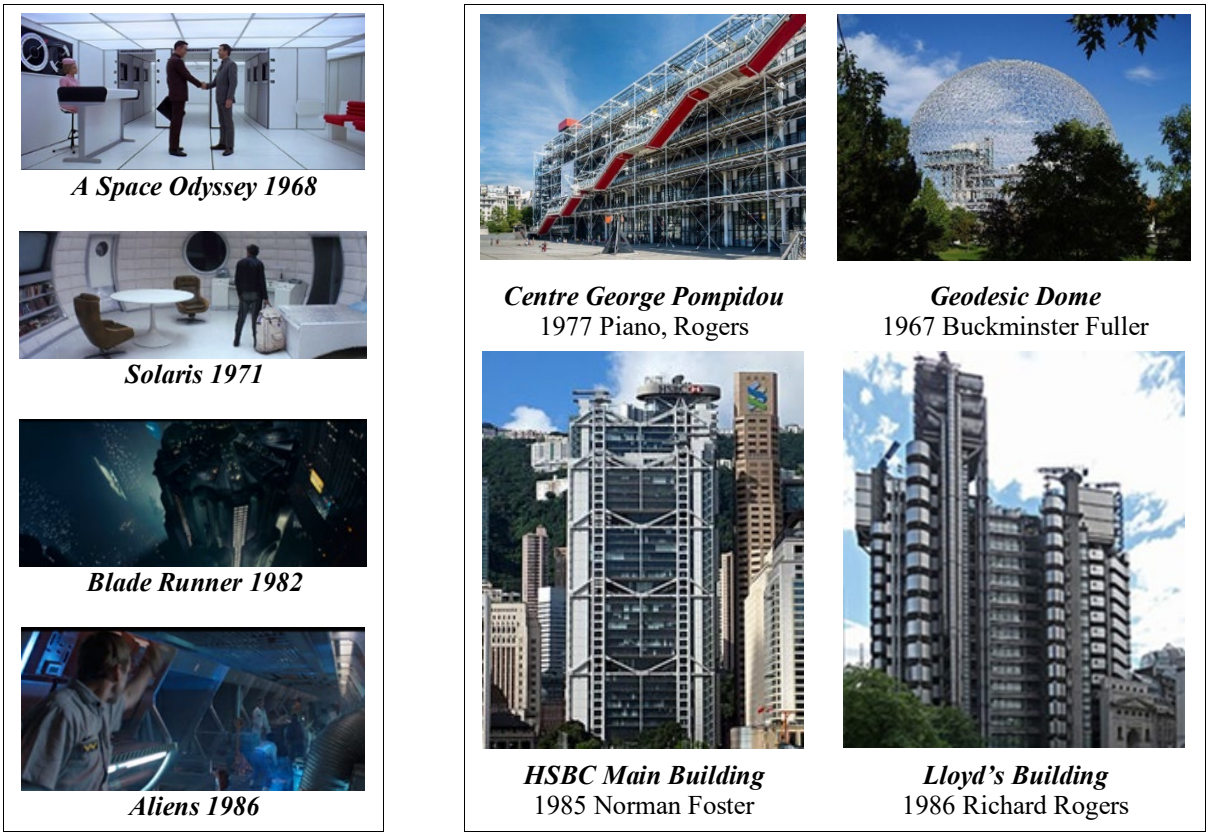

Figure 3. Works of avant-garde architecture and science fiction cinema of the 1960s, 1970s and 1980s (Source: The Author).

The 1990s

Science Fiction Cinema: The most prominent film of this era is *The Matrix* (1999). Architectural space holds a special place in this film; the filmmakers' entire imagination is based on space rather than physical form, introducing a kind of cyberspace. The main characteristic of architecture in the films of this period can be described as a structural, quality-less, and expandable space, made possible for humans through the aid of the machine.

Architectural Works: The major architectural works of this era are Modernist buildings created by architects such as Frank O. Gehry, Daniel Libeskind, Steven Holl, Peter Eisenman, César Pelli, and others. Common characteristics of these buildings include the use of curvilinear and fragmented geometries, materials like metal and glass, transparency of the structure, and smooth, polished surfaces. (Figure 4)

Figure 4. Works of avant-garde architecture and science fiction cinema of the 1990s (Source: The Author).

The Early 21st Century

Science Fiction Cinema: Films such as *Inception* (2010) and *Blade Runner 2049* (2017) feature references to Virtual and Augmented Reality technology within an architectural context. In these films, architectural space is entirely at the individual's command; it can be altered using technology to assume desired qualities or functions.

Architectural Works: The major architectural works of this era are Modernist buildings created by architects such as Charles Correa, Rem Koolhaas, and Norman Foster. Common characteristics of these structures include the use of curvilinear and fragmented geometries, materials like metal and glass, transparency, the utilization of smooth, polished surfaces, and a maximization of spatial experience. (Figure 5)

Inception 2010

Blade Runner 2049 2017

Avengers: End Game 2019

Shanghai Tower
2016 Gensler

Casa da Musica
2005 Rem Koolhaas

The Ismaili Centre
2014 Charles Correa

Apple Park
2017 Norman Foster

Figure 5. Works of avant-garde architecture and science fiction cinema of the early 21st century (Source: The Author).

Discussion

The research findings indicate that across various decades, the imagination of filmmakers has been influenced by the prevailing societal discourse and the theories of avant-garde architects that preceded it. These theories, with a temporal lag of approximately one decade, have laid the groundwork for filmmakers' imaginations. Subsequently, after being depicted in cinema, they have cycled back into the realm of praxis, and, following another decadal interval, have served as a source of inspiration for other architects. The diachronic interactive relationship between architecture and cinema is illustrated in Figure 6.

	Dominant Theoritical Discourse	Sci-Fic Cinema	Architectural Works
Early 20th Century	Modern Architecture; A house is a machine for living in Le Corbusie 1923		
1920-1960	Deconstruction Discourse; Derrida 1967	Machine Architecture in *Metropolis 1927*	Yale *University Art Gallery* *Seagram Building* *Empire State Building*
1960-1980	The Continuation of the Deconstruction Discorsue/ Planning of Space according to Events/ Disappearance of the Relationship between Form and Program	Creating Broken Geometry/ Curved Shells using Lightweight Materials *Aliens 1986*	Benham and Nicholson's Idea of mechanical Architecture High-Tech Architectural Style
1990-2000	Rise of VR Technology 1989	Changing Cyberspace *Matrix 1999*	*Guggenheim Museum Bilbao* *Petronas Towers* *Ferdric Wiseman Modern Art Museum*
Early 21st Century		VR in *Inception 2010 &* *Blade Runner 2049 2017*	*Casa da Musica* *The Ismaili Centre*
The Future			Architectural Spaces in *Metaverse*

Figure 6. The Interactive Relationship between Avant-garde Architecture and Sci-Fic Cinema Over Time (Source: The Author).

Investigation into the evolution of the concept of space in architectural theory leads to the conviction that contemporary and near-future architecture will find its foundation in a novel apprehension of space. In science fiction cinema, the old space is distinguished from the new not by a new idea of what space is, but rather by a new understanding of how it is inhabited. This signifies that in science-fiction cinema, postmodern space (as seen in *Metropolis* and *Blade Runner*) diverges from developments within architecture proper.

For instance, the transportation systems and soaring edifices observable in *Metropolis* may replicate the director's perspectives. However, one of the most remarkable themes in *Metropolis*, apart from its incorporation of the complexity of Le Corbusier's contemporary city, is its method

of establishing binary structures: between capitalist and worker, brain and hand, intellect and emotion, tyranny and chaos, old and young.

This structure of binary oppositions is also present in *Blade Runner*, and it is precisely enabled by the nature of the space created through architectural form in both films. In these works, it is the architecture of the city that bifurcates space. It can be argued that the presented cityscape epitomizes a modernist tendency to partition the city into two primary spatial realms. In *Blade Runner*, this spatial duality is manifested through the urban and corporate spaces, akin to *Metropolis*. By juxtaposing the various types of depicted space, Ridley Scott delivers a potent social commentary. In Luc Besson's *The Fifth Element*, conversely, architecture is utilized to forge a holistic, totalizing space. The shared space of *The Fifth Element* is the postmodern world the film inhabits. This type of architectural space in cinema reflects a postmodernism wherein corporate dominance permeates the entire urban fabric. The postmodern architectural space constructed in the film is fundamentally one where organizational and urban spaces intermingle to constitute a total (indeed, absolute) space.

The wondrous and extraordinary narrative of *Inception* is such that the film's characters can create or alter exceptional architectural structures within dreams, via the mind. The very conception that one could, unfettered by constraints and through thought alone, conjure the most limitless architectural forms possible and shift the boundaries of architectural space holds profound inspiration for architects. As articulated in a portion of the screenplay, it is an exceptional opportunity to construct a utopia that was never built, to share perspectives, and even to play with each other's ideas in otherwise impossible ways.

In summation, and considering the commonalities inherent in the paradigmatic foundations of avant-garde architecture and the science-fiction genre, these two arts are not only (more or less) interactive but also exert a profound mutual influence upon one another (Table 5).

Table 5: Summary (Source: The Author).

Period	Theoretical Discourse	Avant-garde Architecture		Science Fiction Films	
		Characteristics	Examples	Characteristics	Examples
1920-1960	Deconstruction, Derrida 1967	Pure Volumes/ Steel and Concrete/ Structural Transparency	*Guggenheim Museum 1959*	Futuristic City/ Mechanized Space/ Rigid Form/ Rectilinear Geometry/ A Future Planned by Mankind	*Metropolis 1927*
1960-1980	Post-Structuralist view of Eisenman/ Discourse Dominated by Human Subject/ New Relationship between Subject and Object/ Event-based Spatial Planning/ Erosion of Form-Function Relationship	High-Tech Architecture/ Metal, Glass, Carbon Fiber, Neutral Colors/ Texture-less, Polished Surfaces/ Curvilinear Geometry	*Centre Pompidou 1977*	Narrative of Travel to other Planets/ Fragmented Geometry/ Shells/ Use of Lightweight Materials	*Blade Runner 1982*
1990-2000	VR Technology 1989 Enabling technology	Metal, Glass/ Smooth, Polished Surfaces/ Curvilinear and Fragmented Geometry	*Petronas Towers 1998*	Cyberspace/ Filmmaker's Imagination based on Space (not Form)	*The Matrix 1999*
2000-2020	Novel Technologies	Architectural Space Changeable by the Individual Using AR/VR	*Apple Park 2017*	Direct and Indirect Reference to VR Technology	*Inception 2010*

Conclusion

Science fiction cinema, by its very nature and the powerful tools at its disposal, has consistently served as the premier medium for visualizing the theories of avant-garde architecture. This is because the filmmaker, operating within a virtual environment unbound by natural laws, can depict avant-garde architectural discourse through visual effects, even in the absence of corresponding advancements in construction technology. Beyond these powerful tools, the filmmaker's active imagination creates a visual groundwork. Architects, influenced by these visions, subsequently utilize the most advanced technologies of their time to actualize these architectural fantasies.

The conducted study demonstrates that the discourse of avant-garde architecture, alongside prevailing architectural theories and the emergence of creative, pioneering filmmakers, engaged in a bidirectional interaction. This interplay fostered the advancement and refinement of architecture and urban planning on one hand, and enriched the imaginative scope of science fiction cinema on the other. (Figure 7)

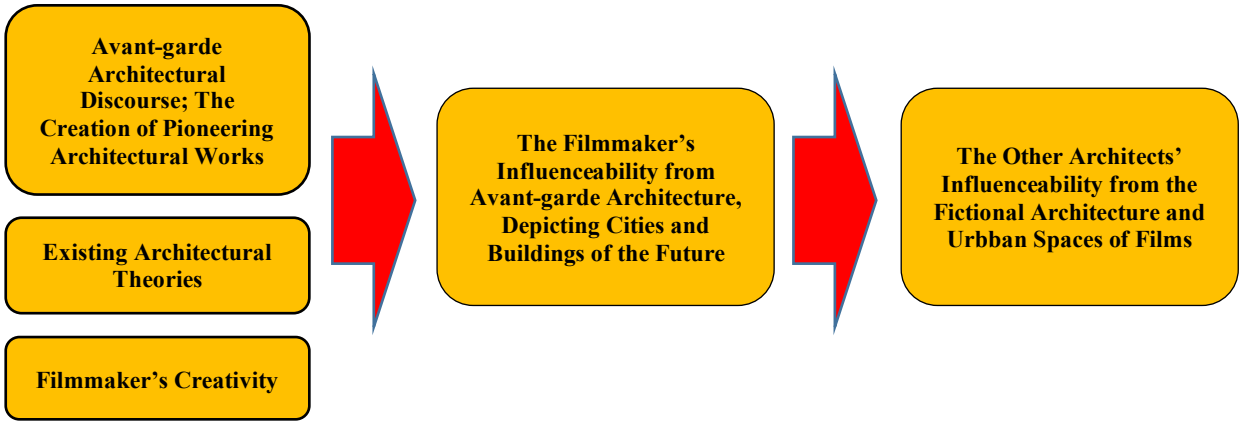

Figure 7. The Interactive Relashionship between Avant-garde Architecture and Science Fiction Cinema (Source: The Author).

Data Availability Statement

Data available on request from the author.

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Ethical considerations

The study was approved by the Ethics Committee of the Islamic Azad University. The author avoided data fabrication, falsification, plagiarism, and misconduct.

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