Grids: Re-considering Infrastructural Politics of Urban Space

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Abstract

For many centuries, the principle of linear planning based on a grid pattern has played a significant role in the spatial organization of urban boundaries. Additionally, the grid principle has formed the basis for policies and practices related to the emergence of "disciplinary societies", leading to the modern networked society. Drawing on the concept of the grid as a cultural technique by media philosopher Bernhard Siegert, this article examines the functioning of the grid as epistemic frameworks and the media of representation, order, and filteration. The article also provides insights into the manifestation of the grid principle in the context of the emerging field of social research on infrastructures, including the digital infrastructure of smart cities. This encompasses a wide spectrum, from smart devices and everyday communication to pervasive sensors and big data, from the sharing of images and impressions to advanced prosthetics, from the development of smart cities to the deployment of surveillance technologies and predictive algorithms. Through a range of case studies, from the study of structured territorial control of the Roman limitatio to the efficient grid patterns of pre-fabricated housing districts worldwide, the research examines the potential and transhistorical nature of the grid principle. The article is intended for media philosophers, anthropologists, urbanists and digital culture theorists.

Keywords

Grid Patterns; Cultural Techniques; Urban Grids; City Form; Surveillance Society; Urban Planning; Immunopolitics; Media of Control; Frontier Studies; Infrastructure Studies

Принцип «решетки» в переосмыслении инфраструктурной политики городского пространства

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Аннотация

На протяжении многих веков принцип прямолинейного планирования на основе паттерна «решетки» играет важную роль в пространственной организации территориий и выстраивания городских границ. Механизмы регулирования и рационализации, основанные по принципу «решетки», широко используются в качестве организационной системы в архитектуре и градо-строительстве. Они также легли в основу политик и практик наблюдения и контроля, связанных с появлением «дисциплинарных обществ» и современного сетевого общества. Опираясь на концепцию «решетки» как культурной техники (cultural technique) медиафилософа Бернарда Зигерта, в данной статье авторы рассматривают функционирование решетки в качестве эпистемической структуры и медиа репрезентации, порядка и фильтрации. Статья позволяет получить понимание проявления принципа «решетки» в контексте развития недавно оформившегося направления – социального исследования инфраструктур, в том числе цифровой инфраструктуры умного города. С помощью аналитики конкретных примеров, от изучения структурированного территориального контроля римского лимитацио до современных городских ландшафтов, в статье рассматривается потенциал и трансисторическая природа принципа «решетки». Статья предназначена для медиафилософов, антропологов, урбанистов и теоретиков цифровой культуры.

Ключевые слова

Introduction

For centuries, the grid has had a significant impact on human spatial navigation, the interpretation of images, text and maps, and the facilitation of trade and energy exchange. Entire cities have been structured on the basis of the rectangular division of space. While the grid is often associated with modernity and Western civilisations, it is worth noting that there are examples of pre-modern, non-Western cities that used grid-like layouts, serving as potential prototypes for today's urban environments (Pannekoek & Dankert, 2019).

The prevalence of grids in various cultures illuminates their universal language of order. Grids embody a fundamental human effort to impose order on disorder, to weave complex designs from potential threads, and to steer both physical and abstract creations towards a common goal of coherence and direction.

The grid, which has served as a powerful tool for governance and coordination, has a dual nature, as it has also been used for oppressive purposes. In todays' networked society, these organisational structures permeate both physical and abstract realms, encompassing railway networks, electrical grids and telecommunications systems. The term "critical infrastructure" has gained prominence in recent years, highlighting the crucial role of such basic supply structures and networks (Folkers & Lemke, 2014; Folkers, 2018) in the context of a critique of the modern security paradigm. This is because when we consider the political dimension of security, especially when it is viewed through a state-centric lens, there is a potential risk of transforming the infrastructure of the welfare state into a mechanism of *immunopolitics* (Esposito, 2021). This "immunological concept of security" seeks to protect against perceived external threats. However, this approach can inadvertently produce "figures of the Other", accompanied by racialisations, genderings and social exclusions (Loick & Thompson, 2022).

Therefore, as we explore the concept of grid, a crucial consideration arises: is complete disconnection from the grid still a viable option given the pervasiveness of surveillance, data pipelines and information accumulation?

Grids became the crucial media of control, linking "the concept of place" to "the notion of order" (Siegert, 2015, p. 97). Building on the concept of the grid as a cultural technique, this article examines how the grid functions as epistemic frameworks at the intersection of immunopolitics and infrastructure studies.

Grids as a Cultural Technique

Grids, as a fundamental tool for organization, play a pivotal and ubiquitous role in shaping human environments and expressions throughout varied cultures and historical eras. Their systematic configuration of intersecting lines serves as a fundamental framework for establishing order, structure, and coherence in both tangible constructs and abstract concepts.

The invention of the grid represents a significant pre-modern advancement that continues to shape contemporary conceptions and manipulations of space. Whether extended to cover vast continents or condensed within the confines of individual tenements, grids have emerged as a powerful cultural technique, serving as a principal means for comprehensive spatial regulation in various domains of our existence.

The emergence of rational space division embodied by the grid, and the establishment of zero as the center of a numerical system, facilitating virtual calculations, have given rise to contemporary standardized, technical, and interconnected spaces. The fusion of the matrix grid and GPS technology has enabled a global presence of operationalized deixis, transforming how we navigate and understand the world around us.

Bernhard Siegert, in his book "Cultural Techniques: Grids, Filters, Doors and Other Articulations of the Real", examines the role of cultural techniques, particularly the grid, as epistemic frameworks that interact with imaging technologies and diverse forms of knowledge such as mathematics, topography, geography, and governance. According to Siegert, a cultural technique is more than a mere tool or instrument; it is a fundamental mode of human interaction with the world: "operative chains that precede the media concepts they generate" (Siegert, 2013, p. 58). In this context, the grid serves as a prime example of a cultural technique that has three fundamental functions: as a grid of imaging, a grid of order, and a grid of filtering.

The grid operates as an imaging technology, employing algorithms to "project a three-dimensional world onto a two-dimensional plane" (Siegert, 2015, p. 98). Within this process, objects go through a series of abstractions necessary for their classification within the grid scheme. Essentially, the grid is a type of representation that presupposes an existing geometric space for object placement and integrates the representation of these objects within a framework influenced by theories of subjective vision.

Besides, the grid is a broad diagrammatic process utilizing particular addresses for storing and manipulating data, which can be applied both in tangible reality and in symbolic contexts. Grids can take on various forms, such as two-dimensional, three-dimensional, or combinations of both.

Finally, the grid plays a role in shaping a world of objects that exists in the imagination of a subject. This process draws on Heidegger's concept of "Gestell" or "enframing" focused on making things available and controllable, linking deictic procedures with symbolic operations that have tangible real-world effects (Siegert, 2015, p. 98). In visualizing the concept of "Gestell", it resembles a grid-like structure where humans perceive the surrounding world as passive and ripe for manipulation and exploitation. Conversely, this framework helps illustrate how a system or hierarchy can operate as a grid, often leading to the elimination of

interconnections and categorization of all elements under more specific forms of control and surveillance.

The ontological consequence of the grid is the modern concept of *place* and *being-in-one's-place*, founded on the media-theoretical distinction between data and addresses. In simpler terms, it presupposes the ability to represent absence effectively, meaning it can adeptly deal with both occupied and vacant spaces. This concept of place is intricately intertwined with the idea of order, and the modern concept of order cannot be conceived without a corresponding understanding of place. The universality of this concept of order is evident in its impact on the interplay between imaging technologies and mathematical, topographical, geographical, and governmental knowledge. This interplay, in essence, turns the grid into a cultural technique (Siegert, 2015, p. 97–98).

The grid occupies a unique position, straddling the boundaries between antiquity and modernity, signifying the transition from political to economic governance, and representing the shift from symbolically organised space to graphically coded surfaces. While we continue to grapple with the complex interplay of grids and cultural techniques, their influence on shaping our environments, perceptions and actions remains profound and far-reaching.

To further explore this concept, a historical exploration will be undertaken from Ancient Greece to the 20th century, encompassing the diverse applications of the grid.

Grids in Urban Planning and Architecture

Historically, it so happened that when creating a living space, humans sought to give it a distinct geometric shape in plan, preferably a rectangular one. This preference for rectangular spaces is primarily due to their alignment with inherent biological characteristics. The fact that the rectangle remained the foundation for planning in numerous structures of varying sizes and purposes, erected at different times, is supported by scientific research, including archaeological excavations.

In this regard, a tiny megaron from Troy and a huge palace of Crete, Babylon or Dur Sharrukin are releated to each other. However, while the megaron is simple and understandable due to its elementary character, the combination of several megarons, as seen, for example, in the Knossos palace and placed without a defined system, is perceived as a chaotic labyrinth.

In the same way cities could be formed. The builders of the vast majority of ancient cities favored structured layouts over chaotic designs whenever possible. They gave priority to a rectilinear tracing of streets dividing city area into square of rectangular quarters. Before the modern period it's hard to find evidence that the "organic" non-grided, non-geometrical city form was considered a rational

choice. Designing cities, as a conscious exercise, often involved incorporating a degree of geometric order.

However, human settlements were, and still are located in various natural and climatic conditions and zones: along riversides, coastlines, islands, hilly or mountainous terrains, deserts, and tundra. Therefore, builders needed to account for these differences. In many cases, there was a need to abandon strictly geometric plans in favor of a more flexible arrangement of individual structures, including those with regular prismatic volumes.

The aesthetic perception of a settlement largely depends on its overall layout configuration. A distinct (regular) planning system tends to make a city or village appear "disciplined", with a clear spatial organization. Conversely, the lack of regularity enhances the picturesque aspects of the layout, saturating the city with contrasts, revitalizing its appearance, and to a greater extent, complicating its perception and understanding as a cohesive entity.

From a historical research perspective, both of these artistic languages often coexisted without significant interference. This is exemplified by the heritage of Ancient Greece, where the practice of architectural composition governed by the strict rules of the classical order, was born, solidified, and subsequently widely adopted (Lisovsky, 2019, p. 41).

In Ancient Greece, the importance of the grid was closely connected to the rationality of democratic rule, as demonstrated through the geometric division *dihairesis* and the fair distribution of space *isonomia* within the polis. The grid pattern facilitated a feeling of structure, egalitarianism, and practicality when allocating urban space (Klose, 2015).

Additionally, the grid remains significant as a means of utopian and idealistic city planning. This concept has its origins in historical examples such as Milet and Thourioi, which were both planned cities attributed to Hippodamos of Miletus, a Greek urban planner from the 5th century B.C. Hippodamos'grid was made up of regular squares created by the intersection of streets at right angles, illustrating the notion that urban order is closely related to political order. However, archaeological evidence indicates that previous designs to the Hippodamian plan may have been inspired by Greek colonies established in the 7th and 8th centuries B.C. or earlier traditions stemming from Italianate cultures dating back to the pre-Indo-European migration era. Aristotle, however, viewed Hippodamus less as a pioneer of new urbanism but more as the innovator of a population segregation concept based on skilled workers, farmers, and a defense force (Aristotle, 1992, p. 134).
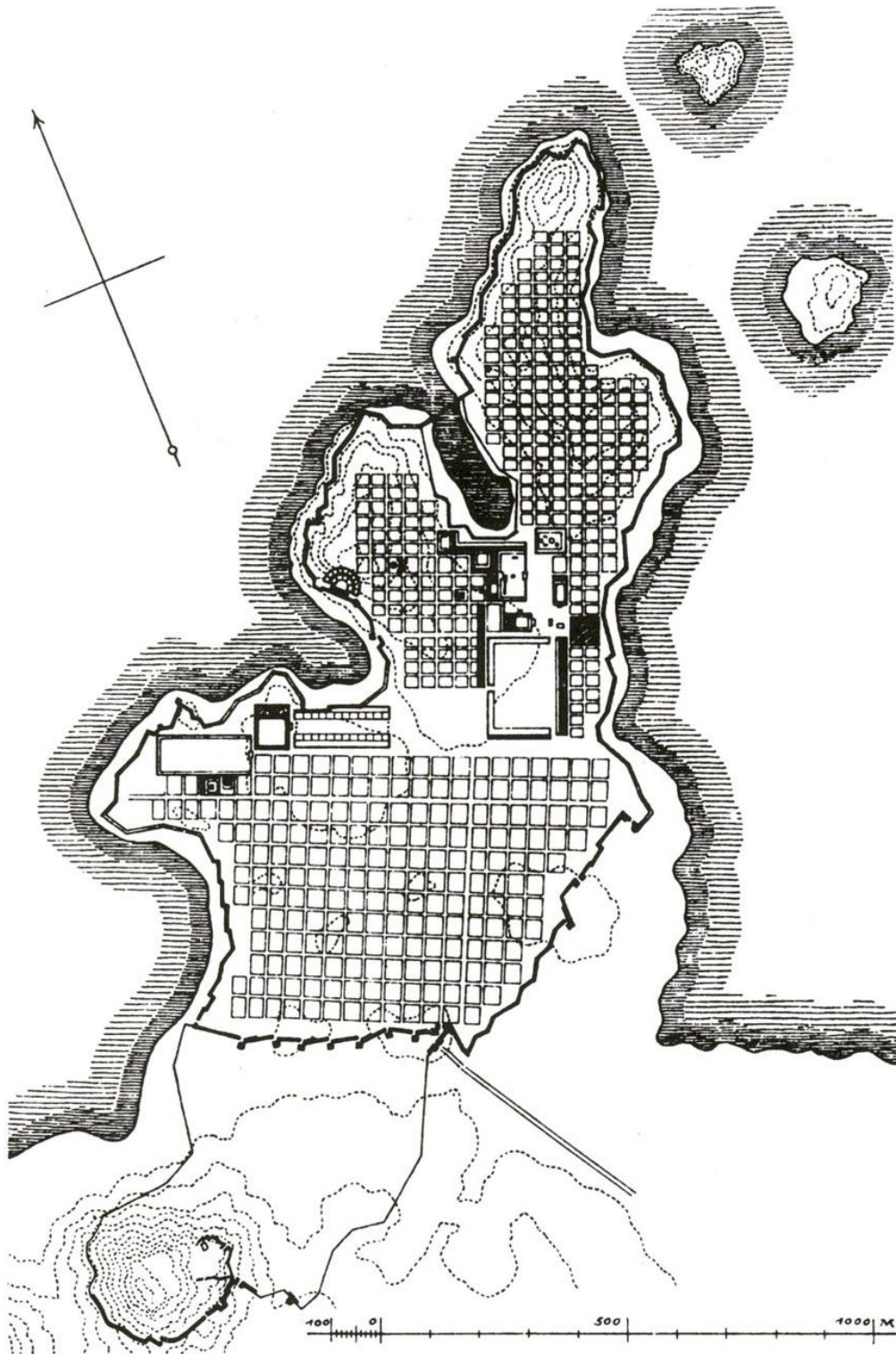
Figure 1. The grid plan of Miletus in the Classical period

The Roman civilization further refined the use of grid patterns in urban planning through the concept of the "castrum". The castrum was a military camp that

served as the foundation for many Roman settlements, characterized by a strict grid layout that provided an organized framework for both defensive purposes and civilian life. This grid system often featured two main intersecting streets: the *cardo* (running from north to south) and the *decumanus* (running from east to west), subsequently separating the city into four quadrants.
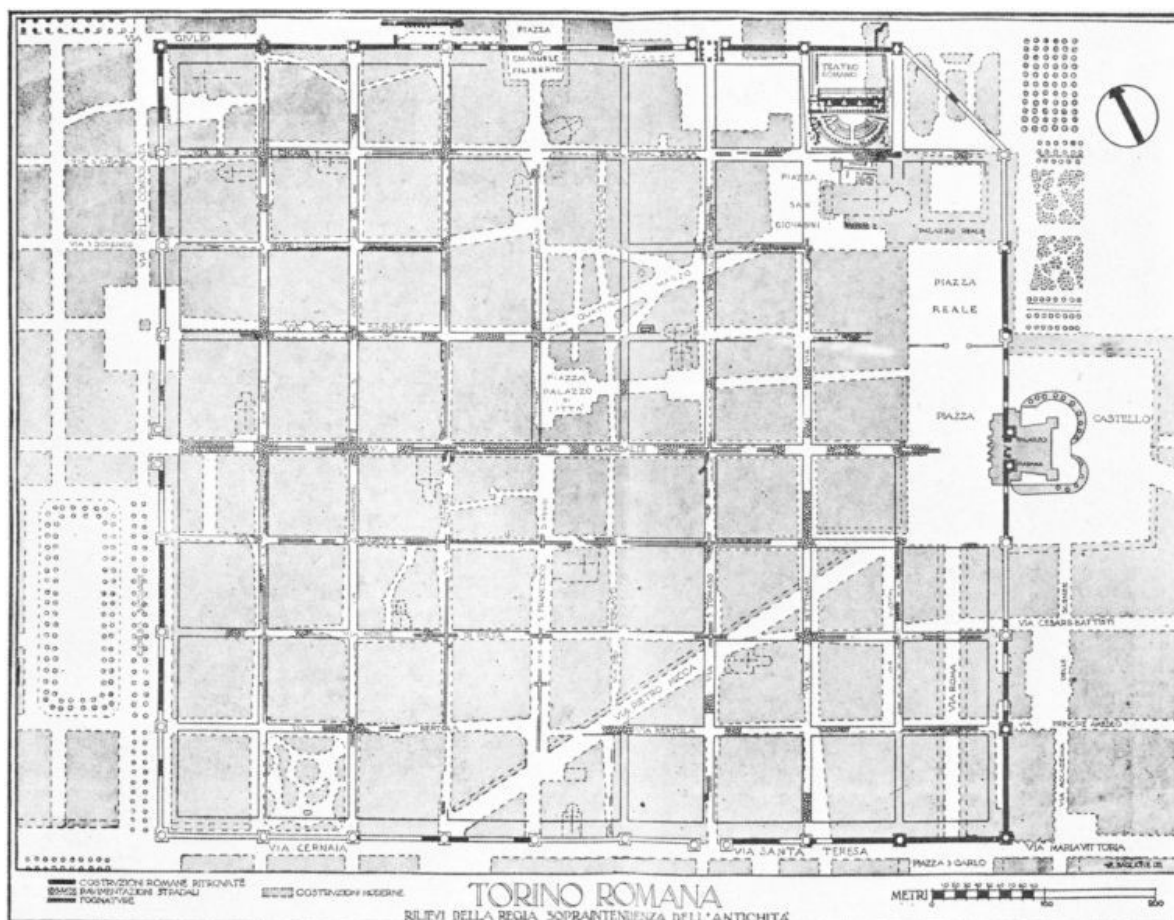

Figure 2. The Augustan colony of Turin is a classic example of Roman city planning

The Roman castrum reflects the practice of centuriation, which involves dividing land into square units known as centuries. This was carried out by Roman land surveyors called *agri mensores*. As Rome expanded its dominance in Italy, there was a growing need to partition public lands and establish new colonies. The primary measuring tool used was the *groma*, employed for creating straight lines, right angles, and squares. Land surveyors would divide the land, allot landholdings by drawing lots, guide settlers to their fields, and create maps and registers. The rule of the grid takes precedence over the demarcation of the *ager limitatus*, the limited territory. The system is first physically established on the land, and only afterward is it transposed onto a map, referred to as *forma*. This *forma* serves as a cadastral map, documenting the concrete and systematic execution of

the colonization plan. It's important to note that this isn't a mere representation but rather a form of mapping.

This mapping process remains open and incomplete in its definition; it extends far beyond being a mere figure. It embodies an all-encompassing, non-figurative *forma mentis*, a mental framework. The *forma* includes various elements: *the subsiciva* – this pertains to leftover land that remains at the periphery of the ager, situated between its outer boundaries and the end of orthogonal plots; the *ager extra clauses* – this category is applied when the available land surpasses the demand, resulting in excess land beyond the subdivided and assigned plots; and the *loca exceta e relicta* – these are plots that have not yet been allocated, but their boundaries are documented in the *forma*. In essence, the *forma* comprises both the grid and the irregular residues that emerge from its implementation. The orthogonal order and the external delimitation remain two distinct elements, existing separately or potentially separable due to uncontrolled or uncontrollable spaces (Stoppani, p.260).
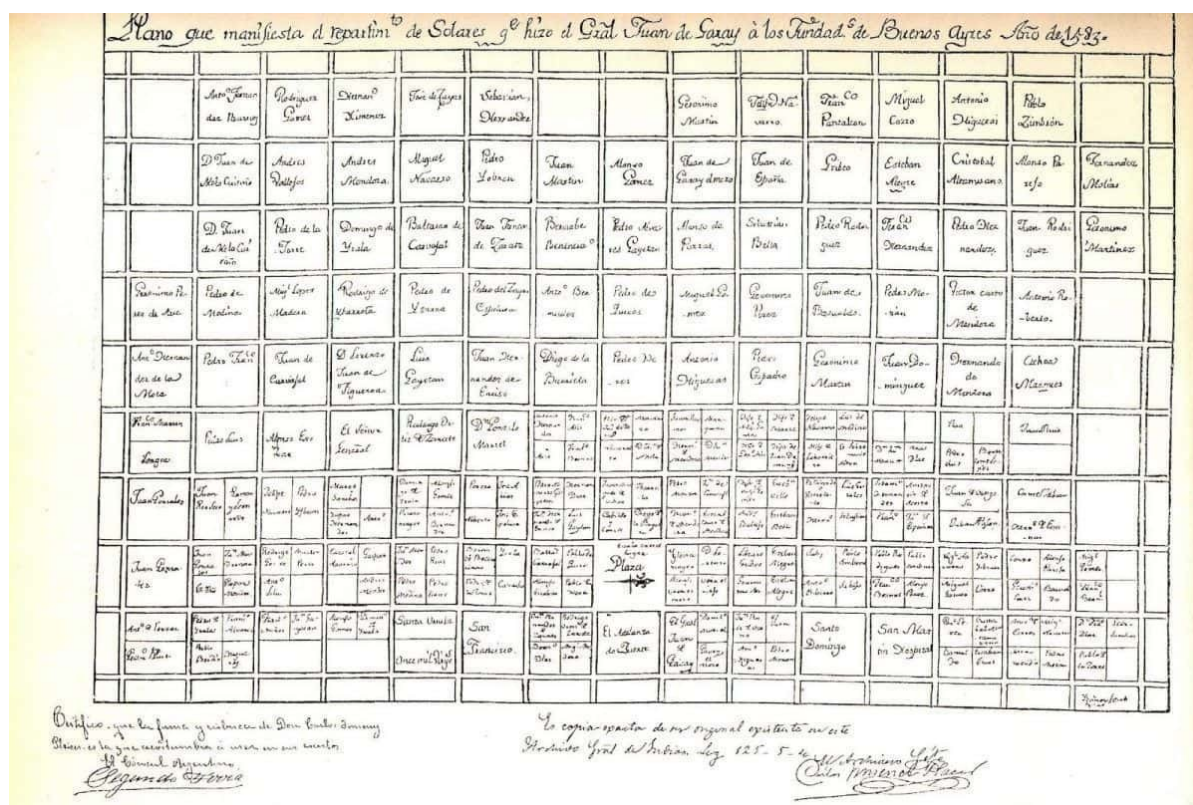
The emergence of Spanish-American cities most likely resulted from the attempts during the medieval and early modern eras, to adapt the layout of Roman military camps. This adaptation is illustrated in a medieval Spanish urban planning manuscript, specifically in the "Regiment de Princeps" by the Catalan Franciscan Francesc Eiximenis (circa 1340–1409), which outlines the characteristics of an ideal grid-shaped city.

However, there's a noticeable distinction between the Roman castrum's square shape with gates at the ends of the *decumanus maximus* and *kardo maximus* and the infinite expansion sought in planned colonial heterotopias. The gridiron pattern in cities like Lima, Santiago de Léon de Caracas, or San Juan de la Frontera, is reminiscent of Greek cities designed by Hippodamus of Miletus.

The grid, with its ability to seamlessly merge an imaging process with a topographical planning procedure, is prominently exemplified in the colonial settlement of Latin America. The integration of the representational concept with the urban grid during the era of colonialism reveals and activates the utopian social possibilities inherent in the grid-shaped heterotopias of Latin America. This process, which involves placing people and objects in specific locations, aligns with Heidegger's concept of "repraesentare". Three key dimensions of this superimposition include the ability to document the absent, the distinction between data and addresses, and the potential for limitless expansion in both time and space. These elements emphasize the grid's capacity as a tool for representing, structuring, and governing space, information, and ideas within the framework of colonialism and beyond (Siegert, 2015, p. 98).

The newly founded Latin American cities were not constructed based on the actual number of settlers or property distribution, but rather rooted in a settlement fantasy, allowing for the inscription of vacant spaces. This concept

depends on the separation of data and addresses, transforming individuals into data for subsequent retrieval.

A prime example of this is the 1583 city plan of Buenos Aires, which takes the form of a register but also functions as a city plan and cadaster. In these newly founded Latin American cities, individuals are both residents in a physical space and entries in a technological memory. The grid, with its implied boundlessness, exemplifies this duality.

Figure 3. Plan of Buenos Aires, 1583

In contrast to the 16th-century South American grid, the late-18th-century North American grid had a different purpose. It wasn't primarily a governmental technique but rather a scheme for capitalizing on federal land. The grid-shaped survey of the lands ceded by the states allowed the United States to acquire territory as a public domain, which could then be auctioned off in standardized plots at set prices. This rectangular survey, initially covering territories between the Appalachians and the Mississippi, later became the model for the entire continent's appropriation and colonization.

The North American grid no longer represented potentially infinite urban expansion but was extended across the entire territory, forming a homogeneous grid. Unlike Spanish colonialism which focused on urban development, this vision,

influenced by the idea that cities were hubs of vice and rural areas were virtuous, aimed at transforming America into a nationwide suburb (Carstensen, 1988, 39).

While Roman centuriation and Spanish colonialism grids expanded from their centers, often in a haphazard manner, the North American grid of parallels and meridians covered the entire territory. It was inspired by the Ptolemaic grid of latitudes and longitudes. The township became the base unit for various governmental purposes such as taxation, census, electoral districts, and road construction (Siegert, 2015, p. 104). This approach also meant that U.S. cartography relied not only on maps but also on contiguous survey plans. The rectangular system left no land unclaimed, ensuring that every piece of land was assigned its place within the grid.

In the early 20th century, advances in materials and technologies empowered the grid to transcend its role as a mere delineator of architectural space; it essentially became the architecture itself. This transition in modernist architecture reinterprets and evolves the earlier grid of colonial topography inherited from antiquity. Characterized by regularly intersecting streets forming squares, the grid's structure embodies a commitment to order and balance, ensuring equitable resource distribution while maintaining stability through well-defined boundaries. When this geometric arrangement unfolds into the third dimension, it results in a repetitive array of rectangular forms, exemplifying modernist architecture's fixation on box-like structures. This fascination with boxes can be methodically organized into a hierarchical system of nested grids, creating a complex pattern of boxed configurations (Le Corbusier, 1991).

Within the realms of architecture and urban planning, grids function as versatile solutions for both temporary construction and manifestations of contemporary architectural principles. These principles encompass industrial prefabrication, modularity, mobility, and flexibility. Influential proponents of this perspective, including Le Corbusier and Gropius, endorsed the "cell" as the fundamental unit of habitation.

A prominent figure in Bauhaus architecture and a student of Gropius, Ernst Neufert, envisioned architecture as an additional dimension of grids and advocated for complete standardization and universalization of grid systems across various scales (Siegert, 2015). His ideas were succinctly presented in the influential "*Bauordnungslehre*" ("Architects' Data"), which gained importance with a preface written by Albert Speer, a key figure in the Nazi regime. Neufert conceived an expansive grid that could interconnect all buildings within a construction site, potentially extending infinitely to encompass the entire globe, similar to a worldwide navigation system (Neufert, 1961, p. 95). This concept, resembling today's GPS technology, would enable precise geospatial information for buildings worldwide. Moreover, being applied to the proportions of individual buildings and rooms, the grid would determine the size and placement of each element within the edifice, akin to the functionalities of contemporary CAD (Computer Aided Design) programs.

Aligned with modernism's principles, the grid emphasizes efficiency, rationality, and harmony with technological advancements. The clear and logical structure of this grid embodies the principles of modernist design, marked by functionality, visual harmony, standardization, and geometrical order.

During the modernist era of architecture, the grid became one of the most successful facade designs. The non-load-bearing facade provided opportunities for diverse design possibilities. The Bauhaus utopia further influenced the adoption of this design approach. The grid facade's popularity was due to practical and financial considerations, as concrete plates for the facade could be mass-produced in factories. This led to the German term "*Plattenbauten*", used to describe buildings made from prefabricated slabs. The aesthetic appeal of the grid facade was derived from its ability to visually depict the internal structure of the modern building. The horizontal and vertical arrangement of the grid mirrored the standardized cell accumulation within the building's interior. The grid facade, therefore, served as a manifestation of the modernist principles of rationality, order, and standardization.
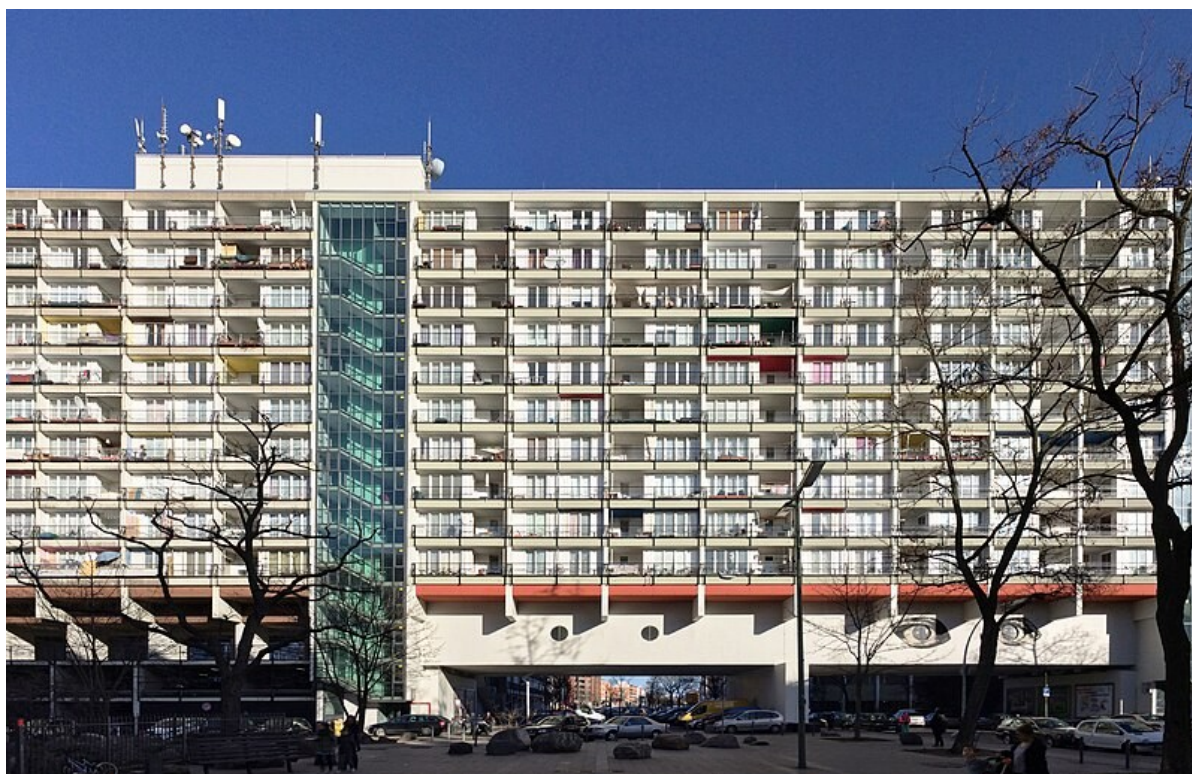

Figure 4. Pallasseum/ Wohnen am Kleistpark /Sozialpalast/ Sozialpallast, 1973–1977, Jürgen Sawade

One of the most significant spatial endeavors of the 20th century was the aspiration to create dignified living conditions for every member of society. This vision led to the development of prefabricated concrete elements that could be assembled

into highly rational compounds, forming a mechanized living environment. The aim was to liberate humanity from its darker inclinations, which had led to conflicts and oppression.

While notable examples such as Tiergarten in Berlin or Weissenhofsiedlung in Stuttgart stand as testaments to this vision, they are often overshadowed by countless imitations of the same principles applied elsewhere. Regrettably, the caricatured notion of dignity in today's context is often associated with poverty, deterioration, and social isolation. In the contemporary urban landscape, a substantial portion of the population resides in prefabricated housing blocks. The efficient grid patterns of modernism have given rise to these prefabricated housing districts worldwide. However, these prefabricated housing districts are not typically regarded as aesthetically pleasing environments. Instead, nowadays they merely tend to encapsulate zones of alienation, exclusion, and deterioration.

The concept of a smart city has become an extension of the modernist project. Its promotion is deeply rooted in rationality, supported by conceptual explanations, texts, diagrams, and visual representations. The idea of a smart city has been heavily influenced by imagery, including the utopias of the 1960s, such as *Superstudio*, which have left a noticeable mark on the work of emerging architects worldwide. *Superstudio* became widely known thanks to the project "Continuous Monument: An Architectural Model for Total Urbanization". The idea behind the project was to demonstrate how grid-like megastructures extend across global capitals and untouched natural landscapes, encompassing the Earth and even outer space. Among the most famous images is an unprecedented view of Manhattan covered by a horizontal monolith.

Figure 5. Continuous Monument Il, designed by Superstudio, New York, 1969, lithograph.@Fondazione MAXXI

One of *Superstudio*'s non-architectural utopias from the 1970s reintroduces the "perfect" grid, a geometric construct that carries a sense of social liberation. In their work "Supersurface", the concept of the superurban supernomad explores an infrastructure that is territorially invisible, rejecting notions of domesticity, root-edness, and individual control. The grid, like a thin layer of glass covering the earth, doesn't offer conventional architectural solutions; instead, it hovers above them. Its significance primarily lies in the realm of ideology rather than in practical architectural application.
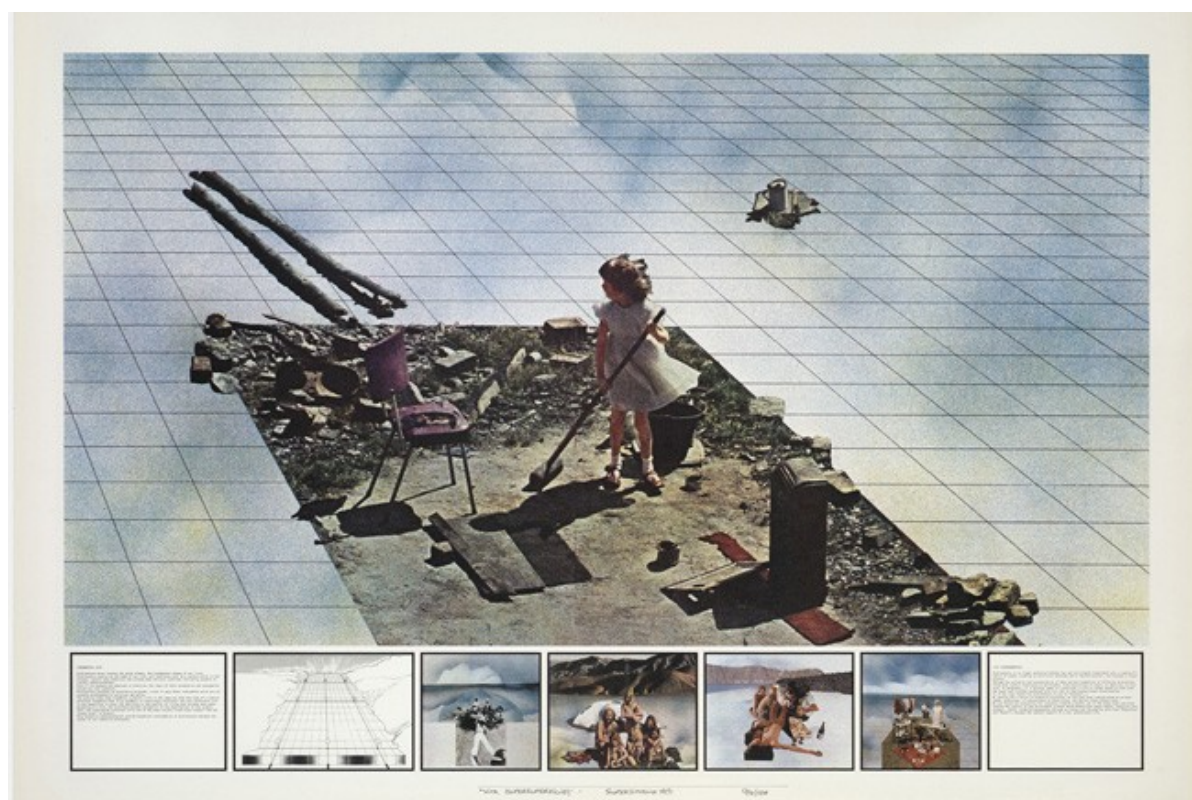

Figure 6. Superstudio, Fundamental Acts: Life, Supersurface, 1972

However, it's important to acknowledge that the works from that era, especially those of *Superstudio*, were marked by profound pessimism. Creations like the "Continuous Monument" and the "Supersurface" exude a sense of gloom, but this aspect is often overlooked by younger generations who are captivated by the visually striking aspects of these works and may not fully grasp the depressive context in which they were conceived.

It's worth noting that the subsequent careers of nearly all members of *Super-studio* serve as a telling example. They didn't wholeheartedly embrace new technologies, or celebrated every societal transformation, and some even adopted radical conservative views (Frolov, 2019, p. 26).

This demonstrates that the grid is fundamentally an ideological construct, rather than a purely architectural one. It exists independently of traditional spatial considerations in architectural design. While it boasts qualities of geometry, regularity, modularity, visibility, and organization, it remains detached from the intricate complexities of physical space.

To comprehend the far-reaching influence of the grid on architecture and territorial organization, one must shift the focus from these specific domains and explore the broader context. This investigation must encompass a diverse array of aspects, counting alienation and appropriation, inclusion and exclusion, politics of affects, forms of governance, and their intersections.

Infrastructural Politics of Grids

Throughout history, cartographers have employed the grid as a spatial ordering tool. Eventually, the first one to do so was Eratosthenes (III B.C.). Ptolemy, in the 2nd century, was a pioneer in projecting spherical surfaces onto plane surfaces, introducing a lattice of latitudes and longitudes. His work "Geography" was expanded by Byzantine scholars and later translated into Latin in 1406. Ptolemy's geographical treatise featured coordinates for approximately three hundred cities based on time measurements. Longitudes were determined relative to the Alexandrian meridian, with each hour equating to fifteen degrees of longitude, while latitudes were based on the length of the longest day, varying with distance from the equator (Siegert, 2015, p. 101).

Figure 7. A Byzantine Greek world map according to Ptolemy' first (conic) projection (From Codex Vaticanus Urbinas Graecus 82, Constantinople c. 1300. Parchment 575×418 mm)

Edward Wright's map (1599) emphasized the precise Euclidean relationships among points, lines, and surfaces. It employed the enhanced Mercator projection, representing longitudes as parallels. This map replaced the medieval rhumb system with latitudes and longitudes, effectively converting the grid into a diagram – a geometrical space where objects are organized in columns and rows without considering their interactions. This innovative concept turned a three-dimensional world into a two-dimensional, flat surface (Siegert, 2015, p. 98). This adaptation allowed for the representation of both spatial and temporal sequences, unveiling time as a spatial function.

Figure 8. Edward Wright's "Chart of the World on Mercator's Projection" (c. 1599), otherwise known as the Wright–Molyneux map

The central perspective concept, first formalized by Filippo Brunelleschi, enhanced further the representation of space and depth. By tying an object's identity to its specific location within the perspective framework, the grid became a powerful tool that implied specific mechanisms of including our perception of the visual world into the order and shapes. This representation, organizing, and controlling of space and information culminated in the grid's incorporation into governance practices. Grid's distinguishing characteristic lies in its capacity

to blend operations intended for the representation of individuals and objects with those associated with governance.

During the period from the 16th to 18th century, grid-shaped control became a prevalent practice, serving as the fundamental principle of modern "disciplinary societies". The following passage from Foucault's "The Order of Things" alludes to the significant implications of the use of the grid as a specific technique to combine the representation of both individuals and objects with governing practices:

> Order is, at one and the same time, that which is given in things as their inner law, the hidden network that determines the way they confront one another, and also that which has no existence except in the grid created by a view, an attention, a language; and it is only in the blank spaces of this grid that order manifests itself in depth as though already there, waiting in silence for the moment of its expression (Foucault, 2002, p. 21).

In Michel Foucault's works, we can delve into the formation of modern subjectivity, which assumes the physical manifestation of a gridded structure. Foucault describes the demand for autonomy as an effect of the internalization of mechanisms of power and surveillance. This critical genealogy points to the dark foundation of the shining ideals of the liberal Enlightenment.

The term "biopolitics", as articulated by Foucault, encompasses the control and exclusion of specific forms of life: "[b]iopolitics, generally speaking, describe the calculus of costs and benefits through which the biological capacities of a population are optimally managed for state or statelike ends" (Foucault 1978, p. 38). This concept plays a significant role in discussions related to immunological biopolitics. The key insight here is that as urban populations become more densely concentrated, the management of life takes on greater importance and becomes increasingly intertwined with political considerations of disciplinary society.

Foucault conducted a thorough analysis of the conceptual framework for enclosed environments, highlighting factories as a notable case in point. These spaces were designed to centralize individuals, spatially distribute them, impose a temporal order, and synergize their productive capacities to yield results surpassing the sum of individual efforts. However, Foucault astutely acknowledged the impermanent nature of this model. It marked a departure from the preceding sovereign societal structure which pursued distinct objectives, such as taxation, rather than production organization and governance over matters of life and death rather than life administration.

Foucault's exploration of the historical shifts in systems of knowledge and categorization, as presented in "The Order of Things" laid the groundwork for Gilles Deleuze's analysis of changing societal structures. Deleuze's concept of control societies can be seen as a response to Foucault's ideas regarding the dynamics of power, knowledge, and subjectivity. In 1990, Deleuze introduced "Postscript on the Societies of Control", a groundbreaking philosophical work that delved into

culture, economics, and evolving technology. This essay, concise and speculative, is divided into three sections. The first outlines the emergence and historical context of the control society by contrasting it with the preceding disciplinary society. The second section delineates the logic of the control society in terms of premises, behaviors, and concepts. The final section initiates a program for living in a society of control.

Another notable aspect of the concept of the grid, as emphasized in Deleuze's essay, is his comparison of textiles with a gridded pattern structure to a network of adaptable threads, constituting the fundamental logic of the control society. He characterizes it as "a sieve whose mesh will transmute from point to point", offering flexible control over "dividuals" (human subjects) within a landscape defined by fob keys, Internet protocols, and passwords (Deleuze, 1992, p. 3). In contrast, Michel Foucault's notion of the disciplinary society aligns with a production model where machines and humans collaborate in a coordinated fashion, adhering to explicit patterns. This society functions through tectonic joints or a mode of binding discrete thread-like elements, often represented through the grid pattern, which conveys a sense of order, repetition, and division (Smith, 2014).

The control society, on the other hand, operates differently, functioning like a sieve. In late-capitalist societies, with their flexible work models, the textile metaphor is reimagined as an operative potential – something adaptable and flexible. The figure of the sieve's mesh becomes a representation of the Net with its complex connections and protocols. The "mesh" here denotes a way of distilling data into increasingly malleable threads and binding or knotting off sections. In this societal model, textiles transition from material goods produced on machines and bought and sold to an underlying logic of "the fold" signifies infinite work or a process that never truly concludes but continuously modulates, spanning from corporate boardrooms to social media platforms (Deleuze, 2006, p.39). It becomes an abstraction of an abstraction.

The grid, which has been a potent instrument for governance and coordination, possesses a dual nature, having also been employed for oppressive purposes. In today's interconnected society, these organizational structures extend their influence into both physical and abstract realms, encompassing railway networks, electrical grids, and telecommunications systems. The term 'infrastructure studies' has gained prominence in recent years, underscoring the pivotal role of supply structures and networks within the context of critiquing the modern security paradigm.

This heightened emphasis on security is especially pertinent when viewed through the lens of a state-centric approach. It carries the potential risk of transforming the infrastructure of the welfare state into a mechanism of immunopolitics (Esposito, 2021). This "immunological concept of security" is designed to safeguard against perceived external threats. However, this approach can inadvertently lead

to the creation of "figures of the Other" often accompanied by processes of racialization, gendering, and social exclusion.

Infrastructure is a bustling nexus where numerous processes unfold. It's a space where economic trade flourishes, interconnectivity between people and places thrives, physical capabilities are harnessed, social reproduction occurs, and where a wide spectrum of emotions is stirred. Infrastructure can engender sensations of freedom and mobility, but it can also lead to experiences of impasse and stagnation. It contributes to carbon emissions, perpetuates unequal access to resources, transcends the local to engage with the global, and reflects the concept of planetarity.

Infrastructure is intentionally designed to blend into the backdrop of everyday life, drawing its essence from the spaces in between that shape the everydayness of our existence. However, this subtle presence doesn't imply that it's distant or insignificant. Quite the contrary, infrastructure is omnipresent, and this ubiquity holds significant importance for the types of ideas, issues, and critiques that cultural analysis can introduce to the examination of infrastructure (Diamanti, 2019, pp. 222-223).

The increased focus on infrastructure in the fields of social sciences and humanities has been a gradual development, with its roots traceable to the earlier emergence of the sociology of technology. Pioneering work by scholars such as Susan Leigh Star and Geoffrey C. Bowker during the 1990s and 2000s laid the foundation for this exploration. More recently, the concept of the "energy humanities" as coined by Imre Szeman and Dominic Boyer in "Energy Humanities: An Anthology" has further elevated the prominence of infrastructure in academic discourse.

Anthropology has long held an interest in studying both the material and discursive aspects of infrastructure due to their capacity to shape cultural practices. In the field of science and technology studies, the influential work of Bruno Latour has provided a comprehensive framework for examining networks of actors, encompassing not just human agents but also the materiality of infrastructure.

Within the humanities, there is a convergence of interests between historical materialism and new materialism when it comes to the forces and relationships inherent in infrastructure. For instance, scholars like Jane Bennett in her work "Vibrant Matter", highlight how the grid exemplifies the vitality of nonhuman actors, including entities like electrons, trees, wind, fire, and electromagnetic fields (Bennet, 2001).

Information technologies are increasingly penetrating the objects and buildings that surround us, forming what is commonly referred to as a smart environment. The smart city concept encompasses various elements, including network structures, information technologies, ecology, green construction, energy efficiency (with technologies like Smart Grid for intelligent energy supply networks), alternative energy sources, and smart mobility. Its primary goals can be summarized

as the "three Cs": comfort, control, and commercialization. These programs aim to improve the quality of life for urban residents while simultaneously exerting control over aspects like mobility, production, consumption, and redistribution. Furthermore, they seek to derive economic benefits from these efforts. It's important to note that these objectives can either align or conflict with each other (Lobanov, 2019, p. 33).

There is no doubt that the primary driving force behind the concept of the smart city is rationalization and humanity's desire to organize the inhabited world as efficiently as possible. Achieving this goal often requires the influence of military and disciplinary state systems. The history of architecture offers compelling evidence of this phenomenon. Equally significant is the endeavor to master the domain of the irrational, the natural, and the non-human, which has manifested in various historical periods. The distinctive features of today's technologically advanced urban environment began to emerge as early as the 19th century, with the influential urban planner Baron Haussmann, who rationalized Paris through a concept that philosopher Paul Virilio later termed "dromocracy" – the rule of speed realized through an infrastructure of roads. It is noteworthy that Haussmann applied this concept to a picturesque and organic old city (Virilio, 1986). Today, we find ourselves revisiting this experience and adapting it to the future in modern megacities.

When it comes to infrastructure grids, a critical perspective is essential. Criticizing infrastructure should extend beyond condemnation and involve integrating critique into the infrastructure itself. This approach goes beyond repetitive accusations, like highlighting the biases in civil engineering, which often only reinforce pre-existing beliefs. Instead, a more innovative and historically grounded materialism is required, one that deeply engages with the intricate dynamics that make infrastructure both bewildering and remarkable. Such a perspective allows us to explore the multifaceted nature of infrastructure and understand its complex workings.

Conclusion

As a fundamental means of spatial organisation, the grid has played a central and ubiquitous role shaping human environments and expressions across different cultures and historical eras. Its systematic configuration of intersecting lines serves as a foundational framework for establishing order, structure and coherence in both tangible constructs and abstract concepts.

The grid has proven to be a useful tool for governance and organization, yet it has also been utilized for oppressive purposes. The concept of grid is closely intertwined with environments and infrastructures, formalized by means of cables, ports, pipelines, roads, and refineries. In today's networked society, these forms of organizational structures seem to be everywhere, both in material and immaterial

forms. In response to this, an increasing number of people in the Western world are seeking ways to live outside the hegemonic grid, to regain control over their lives[1].

On the contrary, achieving an off-grid lifestyle may appear unattainable for only an exclusive group. In various regions of the world, obtaining grid access remains a challenge for individuals, who require it for fundamental necessities such as educating their children, commuting to school or work, heating their homes, or staying connected with family members residing far away. In certain locations, such as favelas, inhabitants opt to link their personal cables to electricity pylons, thereby directly connecting to the grid they have been barred from and simultaneously subverting and manipulating the system.

Taking these modes of interaction seriously requires us to closely examine them from a dual perspective infrastractural politics, to identify pivotal areas that enable us and our allies to strategically intervene, both theoretically and materially.

This article attempts to delve into these and other questions by examining how the grid functions as an operator of epistemic sanation; so it was grappled with the media antropological approach in researching the grid as a cultural technique: an imaging grid, a grid of order and a filtering grid. To explore the potential and enduring nature of the "grid effect" in various cases are examined. These cases range from the empirically structured tool of territorial domination seen in Ancient Greece and Roman civilization to the efficient grid patterns of prefabricated housing districts worldwide. The use of grid structures in urban design not only emphasizes the efficient arrangement of space, but also mirrors the socio-cultural values and administrative principles of these societies. Utilizing the grid in both urban and territorial contexts liberates it from its conventional constraints. This means that it reveals and enacts the grid's operations, extending beyond its mere visual form.

Instead of viewing it solely as a form or a tool for representation, this article proposes that the grid operates as a spatial organizer. This perspective emphasizes its operational state rather than merely its figurative representation as a grid pattern.

In essence, the urban grid, which encompasses various scales from architecture to territorial planning, unveils the space that exists between the representation of the grid and its practical implementation. It distinguishes the figure of the gridiron as a given form from the effects produced by the grid as an ongoing process. This perspective challenges and questions the fixed form of the grid.

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1   The term "off-the-grid" characterizes buildings and a lifestyle that have been intentionally designed in a self-reliant manner, without dependence on one or more public utilities. Typically, this concept is primarily associated with the disconnection from the electrical grid, but it can also encompass independence from other utilities such as water, gas, and sewer systems. This approach can be applied to a range of settings, from individual residential homes to small communities. Living off the grid affords the capacity for buildings and their occupants to achieve self-sufficiency, which proves advantageous in remote areas where conventional utilities are inaccessible. Additionally, it appeals to individuals who seek to minimize their environmental footprint and reduce the cost of living (Vannini & Taggart, 2014).

Acknowledgments

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