ECOLOGIES OF INFRASTRUCTURE / ECOLOGIES OF URBANISM

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ABSTRACT

The increasing scarcity of fossil fuels will dry up affordable access to auto-mobility, leading urban populations to re-prioritize life-styles of accessibility, threatening to make urban living a more exclusive proposition and mobility a new luxury. Growing cultures of mobility is critical to maintaining cities as democratic and economic bodies.

Concurrently, infrastructures – particularly transportation which structures the city in space and time – have become delaminated from the culture of cities. They are conceived from a narrow functionalist point of view. Understandings of how they encounter the flows urban sites have been lost; they exist as parallel realities. In order to grow cultures of mobility, transportation infrastructures must be meshed with the culture and ecology of the city.

As mechanical infrastructures of mobility emerged in cities of the 19th century they created a confrontation between their immaterial forces and physical form, interrupting the “organic unity” of cities. This confrontation continues to cloud our understanding of infrastructure to the present day. In the 1990’s, Bertolini and Spit diagnosed transportation projects – stations primarily - with bipolar disorder: their personalities are split between being nodes and places. In contemporary discussions around Transit Oriented Development this node-place binary is understood as a problem, where the system and node threaten to overrun qualities of place.

Urban infrastructures are a site where diverse systems – functional, economic, social, and perceptible – overlap, and no one discipline is uniquely equipped to address it. This situation is exacerbated by disciplinary (planning, engineering, design, art) silos which frustrate the understanding of how urban morphologies, design strategies and transportation infrastructures develop symbiotically.

This is a presentation of practice-based research and speculation that addresses that gap. The work was initiated from an urban design and architectural perspective – looking at the specific design of infrastructural and urban interfaces. The work was conceived by cross disciplinary teams that drew from design, engineering and artist practices. The presentation will focus on three case studies (pictured above) that investigated how infrastructure can create urban, environmental and economic stimuli. In case study is an infrastructural project that addresses a different mode of urban mobility: pedestrians, mass transit and cycling.

We will forward a new approach to infrastructure and urbanism in which design acts as an interface that hybridizes qualities of node and place. Ultimately, the strength of the interface bolsters both the infrastructure and the local context. The binary of node and place isn’t an either/ or proposition. Seeing as both/ and offers richer opportunities.

The increasing scarcity of fossil fuels threatens to dry up affordable access to automobility, leading urban populations to re-prioritize life-styles of accessibility, making urban living a more exclusive proposition and mobility a new luxury. Growing cultures of mobility is critical to maintaining cities as democratic and economic bodies.

Since the 19th Century personal mobility has undergone a number of technological augmentations, with successive waves of development and innovation altering individual practices of space and time and the material form of the city. These successive transformations have created infrastructural systems that often function in isolation from one another, even though they may co-exist spatially in the contemporary city (Morish and Brown 138).

We forward that urban mobility needs to be conceived ecologically as a series of symbiotic systems that reinforce and extend one another - offering diversity and robustness to the transference of people and resources. We see a critical role for architecture and urban design in the conception of interfaces between these diverse systems. This paper is a presentation of three projects undertaken by FIRM a.d. that seek to follow through on this proposition. In order to frame our approach, this paper will sketch a hypothesis on the historical interaction on technologies of mobility and urban form, and the effects produced when multiple technologies converge in contemporary urban space.

HISTORICAL PERSPECTIVES: Technology and Morphology

Since the advent of the steam engine, urban environments have been roiled and rocked by successive waves of technological change that have fundamentally altered space and time within them. Understanding the myriad ways transportation technology has participated in urban change – either as a primary agent or in concert with other contemporaneous factors - is a limitless task. But by looking at the most quotidian uses of transportation infrastructure we can begin to sketch out certain tendencies.

David Harvey, who endeavors to explain urbanism as “a process” with “no fixed spatial boundaries,” defines “the urban” as a “geographically contiguous labor market (127)” the extents of which are dependent on “commuting range (128).” The urban field, while spatially mutable, is tethered at any given moment by its inhabitants’ ability to get from home to work and back again. By examining the ways in which technological advancements have impacted the daily commute, and by extension, the urban field, we can begin to understand the force and effect dynamics between infrastructure and urbanism.

Compare three urban snapshots:

When Friedrich Engels visited Manchester in the 19th century, he discovered an alarming disparity between the living conditions of different classes caused differing patterns of personal mobility (Engels). City centers swelled with an influx of people from rural areas who were seeking work opportunities. They settled in dense slums around the industrial cores of the city, kept within walking distance of the factories where they worked (Hall 22). The working classes in industrial English and American towns had a very limited commuting range. They could walk to and from work, and work hours were very long.

Engels observed members of the upper classes passing these slums daily – near them but never seeing them – in horse pulled omni-buses. Able to avail themselves of equine transportation, they enjoyed a larger commuting range and the ability to live at the periphery of cities. Even before the onset of mechanized transportation, differential access to means of transit stratified the city along class lines.

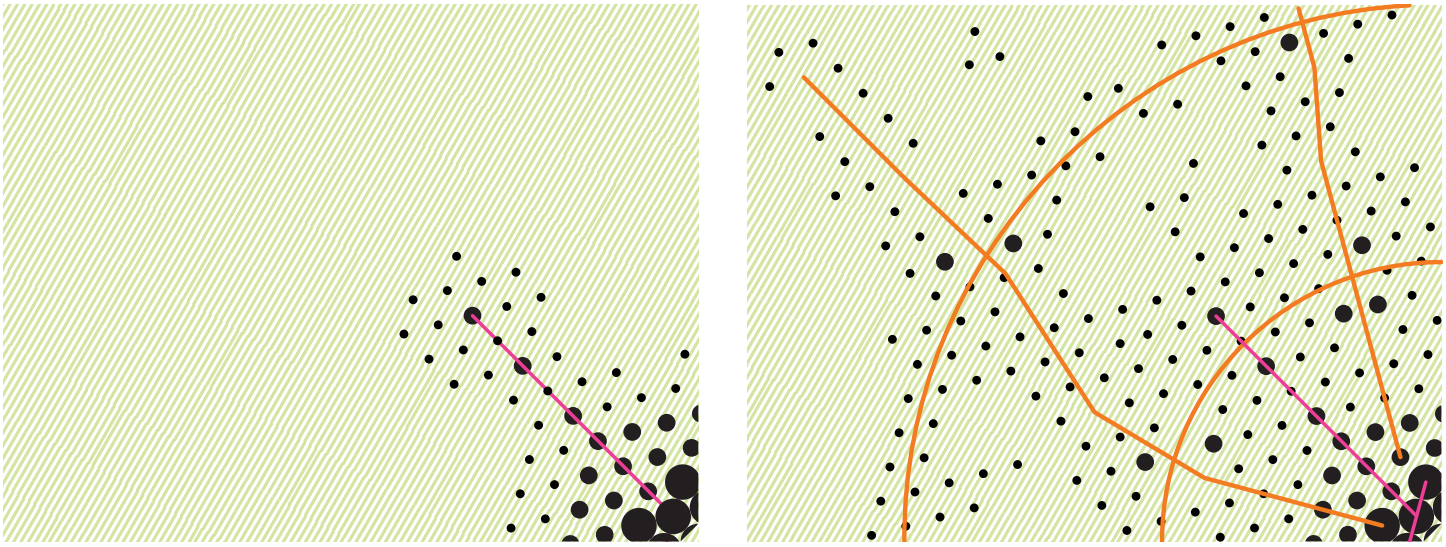
Industrialization’s evolution from steam and iron to electricity and steel at the end of the 19th century brought infrastructural innovations to the city. A new family of “technologies of the metropolis” (to borrow Rem Koolhaas’ phrasing) such as the elevator, the streetcar, steel frame construction, and the electrical light radically altered the spatial practices of the urban classes.

Streetcar infrastructures, which were often co-developed with domestic neighborhoods known as “streetcar suburbs,” made peripheral living in single family homes affordable to greater numbers (Jones 45). While cer-

tain spatial constraints were vaulted, time continued be problematic. Notably, the long unregulated hours made long commutes difficult for industrial workers. In response to this, actors within the city changed their political alignments. Samuel E. Gross, the streetcar suburb developer in Chicago, for example, crossed the political spectrum to side with laborers in advocating for the regulation of the eight hour work day (Hayden 71). Though his political realignment was motivated by capitalist interest in opening more time in the workers' days for commuting, the episode demonstrates how structures of time had to be altered in conjunction with the changes in the extents of urban space.

As steel and electricity produced technologies that lead to the dispersal of domestic aspects of the city, it concurrently produced others, such as the elevator and steel frame, which lead to the densification of commercial aspects through vertical growth. If the 19th century city could be typified by a horizontal stratification along class lines, the emerging urban forms in the 20th century were increasingly stratified along temporal and programmatic categories.

Early technologies of mobility created spatial freedoms, but their structural limitations allowed other binding agents to assert themselves. For industry and business, the concentration of vital resources in the city center acted as a binding agent; the city center's concentration of industry and business in turn bound regional domestic communities; access limitations and quotidian needs centered and bound each domestic community. All of which were tethered by spatially rigid streetcar and rail systems which created linearly distributed concentrations of populations. Metropolitan urbanism of the early 20th century – though never completely, ideally realized – was clear in its spatial hierarchies, limits and behaviors (Park and Burgess 50).



Urban Morphology and Technological Change: Streetcar Suburbs and Automotive Suburbs

In American cities, the period between wars saw commuters increasingly adopt the automobile as their primary vehicle for commuting. This ultimately lead to the unbinding of the spatial structures rail-based technologies brought to urban form. The collective nature of these infrastructures was supplanted by the individuated logic of the cars. Concentrations produced by their nodal nature were diffused by the distributed logic of roadways (Rowe 10). The car in combination with technological advancements in telecommunications, industry and business rendered urban form more flexible and diffusible (Castells 431 and Lang 29).

The redistribution of labor, business and leisure resources freed contemporary urbanization to spread across regional geographies without regard for political boundaries and any pre-conceived image of the city (Khamsi and Goldman 84). In comparison to its antecedents which corralled and structured individual commuting itineraries, auto-infrastructure offers seemingly limitless freedom. And in comparison to those antecedents, which were by measures dis-aggregative and centralizing, the auto-infrastructure is dominantly dispersive (Lang 40).

NODE - PLACE

Using technology and mobility as a lens, we can conclude that infrastructures have ambivalent effects on the material form of the city: they can be aggregative or dis-aggregative. Though there appears to be general correlation between increasing technological development and increasing spatial freedom, a finer analysis of this history would reveal that economic stratifications affect levels of access to those technologies and freedoms. They come at a cost, and furthermore, they come with a cost too.

It is these costs that frame current discussions around transportation development. For myriad social, economic and ecological reasons, collective public transportation continues to be needed and expanded. Whereas the schematic history of the city recounted here told the story of urbanism pushing outwards from the city core into green fields, current discussions center on introducing or increasing communal transportation in grey fields – sites that have already been urbanized (Belzer, Autler, Espinosa, Feigon, and Ohland, 33). The historical sketch above demonstrates the influence technologies have on patterns of urbanism through the freedoms they allow or limitations they impose. What, though, are urban patterns and forms that are produced when multiple technological modalities intersect? What are the dynamic patterns that describe the transformations of urban fields with the introduction of new infrastructures? These questions have lead urban practitioners to seek new models.

One such model for this encounter was provided by Bertolini and Spit who, in City on Rails, diagnose transportation projects – train stations primarily – with a bipolar disorder: their personalities are split between being nodes and places. Stations act as points within an infrastructural network, while concurrently they participate in the “space” and “atmosphere” of their local context (19). Their study focused on the introduction of regional and national rail resources to European city centers and observed the disjunctions that occur when one nationally scaled system meets another set of systems that exists at a radically finer scale.

In recent years, Bertonlini and Spit’s node - place frame has been applied by North American Transit Oriented Development advocates to understand the introduction of urban public transit systems to low density suburban sites (Belzer and Autler).

In this context, a number of problematic limitations to the node - place binary emerge. First, its binary structure, which treats dynamic categories as fixed entities, proves to be inadequate in relation to multimodal situations which invariably generate more complex flow dynamics. Secondly, while it may be clear enough to define what the node and network are, place is much more ambiguous. The specific agency and potential of place are hard to quantify. Further, the vigorous defense of a place by vocal local stakeholders often emerges as a political roadblock to infrastructural development (Sherman 250).

In TOD discussions, the node-place binary is understood as a problem, where the system and node threaten to overrun qualities of place (Belzer, Autler, Espinosa, Feigon, and Ohland, 32). Because of these circumstances, TOD projects typically involve cloaking unfamiliar and potentially menacing transportation developments in safe, quaint and familiar architectural form. Design becomes a political defense mechanism. We typify this approach as skeuomorphic urban design, an approach that Roger Sherman calls the “wolf in sheep’s clothing” and Shannon and Smets calls “the domestication of infrastructure.”

Of this approach, we ask the following. If the potential of mobility infrastructures originates precisely from the way it allows the transference of resources between systems and environments – by being node and place at once – does the packaging and constraining this potential in familiar, stable and ultimately closed forms frustrate necessary and vital flows?

INTERFACE

Understanding the limitations of such an approach, we began to see the relationship between between this discourse and discussion happening in other fields of design. In particular, the recent redesign of Apple’s IOS interfaces raised interesting questions. Their design team lead by Jonathan Ive embarked on a comprehensive

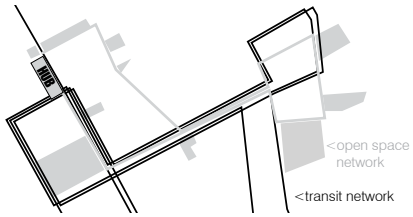
redesign of the user interface for iPhones and iPads in response to criticisms of the skeuomorphic icon driven nature of the original IOS. Through the skeuomorph, we began to understand something specific about the engagement of design – architecture, landscape, urban design – with technologies of mobility.

Design acts through discrete projects; its involvement with infrastructure is incremental. Each project is linked to pre-existing systems, thus the infrastructural systems are externalities to design. A product designer sees the interface is the point of contact between people and abstract technological systems. Interfaces allow people to use technology. We can scale that idea up for our purposes, design is the interface between populations and the technological systems of infrastructure. We can also expand that statement laterally: design interfaces between different systems, such as mechanical systems, development systems, social systems (etc…), which operate at different scales and can be disjunctive or potentially disruptive. Such an approach is centered on the point of view of the user and their mobility. It treats node and place as a unity and mobility as an energizing agent that affects built form. In this approach, design strives to direct and channel forces and flows.

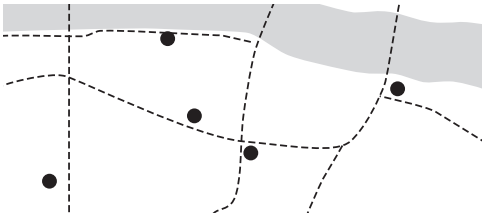
CASES

Three projects by FIRM a.d., which were undertaken as competitions, participate in infrastructural systems with a specific mode of mobility as its focus and impetus. All three projects endeavor use and approach in which design acts as the interface between node and place and as the interface between people and technological systems. As such, it can foster the transference of populations, resources and energy between places, releasing stimulating potential. Designing towards stimulating potential is a form of critical practice that can direct the city to outcomes other than those produced by market capitalism.

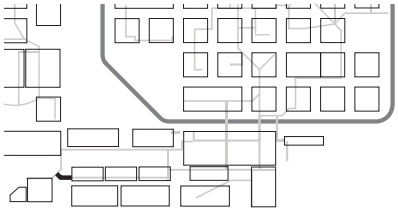
By assembling and connecting local resources to broader networks, each project seeks to play a stimulating role in both its places and the networks it participates in.



CHARLESTON HUB
SPECULATES on a new open space network anchored at the transit hub



BANKSIDE BIKESHED
VISUALIZES the local cycle network through imageable nodes



SFC BRIDGE
CONTINUES the Toronto Path network, making it more robust

Charleston HUB proposes a new new open space network that can be linked to an expanding transit network.

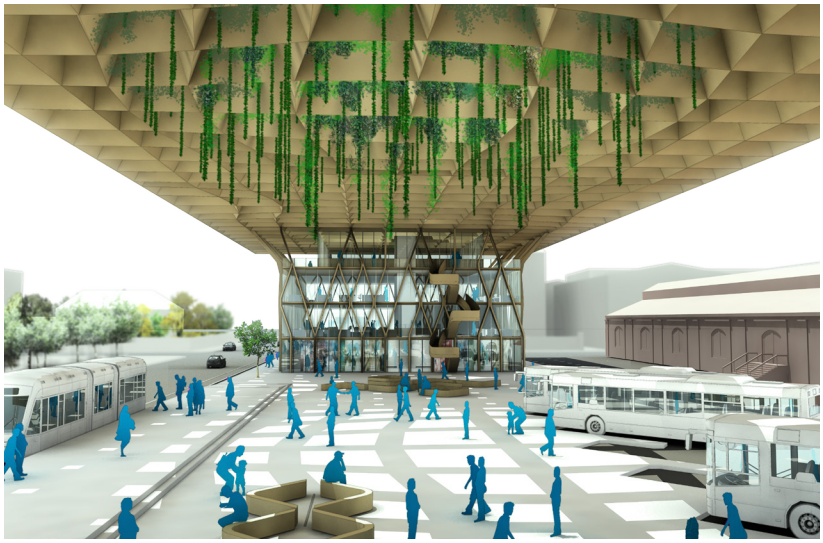
Bankside Bikeshed uses a family of “microns” positioned at key interchange sites to give visual identity to South London’s cycle network.

The SFC Bridge extends Toronto’s PATH network and creates a visual interface between its interior spaces and the street level city.

Beyond network concerns, human perception, interaction, and participation are critical to each project. So this work is about ecologies of perception in as much as it is about ecologies of infrastructure. The projects are conceptualized across multiple scales - the scale of the urban network, but also at the tectonic scale - to create meaningful relationships between people and these systems of mobility. This multi scalar negotiation resulted in projects with different forms that respond to multiple performance criteria.

Thus each project is a specific assemblage of materials, energies and perceptual effects. Perceptual stimuli are harnessed to structure each interface by directing flows of movement and fostering cognitive relations. These negotiations between infrastructural stimuli and perceptual produces different specific design tactics that ultimately result in different formal wholes. All of which enmesh spaces of mobility with the culture and of the city.

CASE 1: Charleston HUB



This transportation hub houses stops for a new LRT, local buses and taxis, as well as provisions for retail and office space. By consolidating program elements, and building to the maximum permitted height, 75% of the site is left open for public use. The Charleston HUB began by speculating if the project could act as a hub for a transportation network, while also acting as an anchor to a series of local open and civic spaces.

We studied how program could be arranged to create efficient connectivity between different transportation modes, and in doing so realized that the project ground quickly became congested by flows of movement. How then could this also become a civic space? Studying local open spaces, we came to understand that in the hot and humid climate of Charleston, civic spaces are not so much defined by their grounds, but by their canopies which create shape and cool.

So we extended a long wooden canopy over the site to shade the core of the project. The canopy is engineered for a range of passive cooling tactics - including stack effect through perforations, and evaporative cooling through a green roof. Transit movement crosses its core, rest areas are consolidated at its ends, it is enlivened by patterns of light and shadows created by the roof.

CASE 2: Bankside Bikeshed

Bankside Bikeshed is a prototype for a covered bike storage unit that can be positioned at key nodes where London’s underground, bus and bike networks coincide in the neighborhood of Southwark.

We thought that these sheds could behave like certain infrastructural elements in London that deal with transportation and communication. We called these elements MICRONS, they are small, repetitive, distributed and woven into daily life. They are also typically RED. They perform in different ways to ICONS, which are singular and monumental. Both are equally important to the definition of the urban environment.

The units are all made of a lattice of CNC bent steel members, from which a waterproof tarpaulin is suspended. The tarp could be patterned in different ways to create a family of different yet repetitive members. The form communicates the lightness and dynamism of its core function.

CASE 3: SFC Bridge

The SFC bridge is an incremental extension of Toronto's underground PATH network.

As commercial development has migrated south, the PATH network has migrated above ground, and provides pedestrian access to a urban territory that is divided by heavy infrastructural elements such as train tracks and an elevated highway.

This bridge connects a new hotel tower to an existing pedestrian skywalk in Toronto's financial center. It presented us with an opportunity to bring a new spatial experience to Toronto's PATH network that is not so disconnected from the street level city. This design seeks to frame an interface between these parallel urban spaces, asking could this bridge be both a path and a place?

It is bent in plan, and we sought to use its diagonal truss structure as a device that can frame visual connections between the interiority of the path network and the urban fabric both near and far. To bring intrigue to the tubular experience of the bridge I worked with local artist to create a mural based on dazzle camouflage that fragments and distorts linear perspectives. On the outside, thick dark bands bind the bridge, framing triangular windows, creating a graphic icon within the city.

CONCLUSION

By engaging ecologies of infrastructure and ecologies of perception, we aim to bring create experiences that are at once novel and considered, which foster multiple engagements between networks, local context and people. Ultimately, the strength of the interface bolsters both the infrastructure and the local context. The binary of node and place isn't an either/ or proposition. Seeing as both/ and offers richer opportunities.

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