RICE UNIVERSITY

CONFLUX: INFRASTRUCTURE FOR A HYPER-CONNECTED URBANISM

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ABSTRACT

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The last decades, have seen Mexico’s City’s urban conditions change, from what many people believe to be a place of untapped possibilities to what now many refer to as a failed state. It’s hyper-dense conditions coupled with a government unable to control socioeconomic issues have created urban and social disruptions that manifest themselves as severing devices of its infrastructural networks, resulting in a segregated city, “decaying and its core”, as crime, social gatherings, and vehicular traffic paralyzes the cities transportation infrastructure, disconnecting one of the largest most vibrant cities of the world.

This project explores and manipulates the correlation between the crowd, infrastructure and technology to mitigate these challenges by impacting the city in three scales [local, metropolitan, and virtual] through notions of interstitiality, fluidity and crowd surveillance.
TO MY FATHER.
Acknowledgments

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CONFLUX:
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MEXICO CITY

The 2009 estimated population for the city proper exceeds 8.84 million people, and with a land area of 1,485 square kilometers (573 sq. mi), Mexico City is one of the most densely populated cities in the country. Mexico City metropolitan area population is 21.2 million people, making it the largest metropolitan area in the Americas and the third largest agglomeration in the world [1].

In most if not all mega-cities, hyper-dense conditions, social climate, and economical factors, combine to create complications for cities to operate as intended. Mexico City is no exception. With a population of over 25 million people, Mexico’s metropolitan area [comprised of Mexico D.F, and the southern part of Estado de Mexico] combine to create one of the largest, densest, and most problematic metropolitan areas in the world. Urban and social disruptions play a major role on how the city operates, limiting the flows of material and information that generally constitute the urban fabric of a city. Crime [social disruption], social gatherings [social disruption], and vehicular traffic [urban disruption] are among the most common and damaging disruptions that paralyze the city as they play themselves out within the existing infrastructure. In today’s world, which depends on inter connectivity and exchange of information between local and global environments, and scales are in constantly shifting between local regional and international, the city must play its part and provide a setting in which these interchanges can develop.

Here is Mexico City in two satellite images, the left one taken in 1973 (population then at 9 million) and the right in 2000 (14+ million) [2].
DISRUPTIONS

Crime

With conviction rates of approximately 5% combined with an economic crisis in place for the last decade and a half Mexico City has allowed crime to grow at a rampant pace and plague the city and its citizens, becoming one of the main limiting factor of everyday life. It has become one of the cities’ main industries, which consequently atomizes the city, and creates invisible boundaries between adjacent areas, rendering the idea of public space in Mexico City useless.

Kidnappings are among the most profitable of the illegal activities, with over 7000 abductions a year, Mexico City is now considered a conflict zone like Iraq and Colombia when dealing with security as kidnappings jumped 40% between 2004 and 2007. Police estimate that there are 750 abductions a year in Mexico but independent studies show the real number is closer to 7000. Two out of three residents consider the overall public security is decreasing as in the last 3 months, 24% of Mexico City residents have been victims or close to an incident. The last poll indicated that 57% claim to have a high level of fear of being kidnapped while only 54% would trust the government to file a claim. It is estimated that only 20% of crimes are reported in Mexico City [4].

Social gatherings

Another social disruption, one collapsing the operating infrastructure, is Social Gatherings. There are over 3,000 large gatherings a year in Mexico City, 8.2 gatherings a day, with an estimated 10 million participants; costing the city an estimated $15 million a day in lost revenues. 40% of the gatherings are of a political nature and 21% of them occur at Mexico City's main square, el Zocalo, located in the heart of the city and is framed by the office of the government. While these demonstrations are aimed at paralyzing the cities arteries, others types of gatherings like sporting, religious, cultural events and celebrations, paralyze the city as a by-product of these events [5].
Sporting events like soccer matches attract hundreds of thousands of spectators to the different venues while national team victories result in massive crowds taking to the streets in celebrations that quickly turn into chaos. Religious events like Sunday mass disrupts the transportation infrastructure as well, but it is on the weeks leading up to “Dia de la Virgen” [day of the virgin], the world’s second largest religious pilgrimage takes place as millions of people walk and even crawl from all over the country to present themselves to the Virgin of Guadalupe.

Vehicular traffic

The 3rd disruption, an urban consequence of hyper-density, is vehicular traffic. With an estimated 5.5 million registered cars in Mexico City [not counting the floating population of cars that come in from what constitutes the Metropolitan area of Mexico City] its residents spend an average of 2.5 hours commuting what in many cases are relatively short distances, by comparison this average is 54 minutes less than commuters in London. It is estimated that residents of the city will spend 5 years of their lives in their commute. Independent studies show that 55% of journeys are made by minibus or collective taxis and there are approximately 391 cars per 1000 people, compared to 38 in Shanghai [6].

All disruptions that act upon Mexico City naturally play themselves out in the cities infrastructure, in its public spaces and on it transportation infrastructure. Manifesting themselves within such hyper-density and under a governmental system lacking the adequate resources to deal issues of such propensity makes for a proposal for a new typology necessary. As these disruptions are embedded into the urban fabric of the city, they deeply affect it, resulting in a decaying force of one of the largest cities in the world.
### Crime by Municipality (per 100k inhabitants)

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Crime Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milpa Ato</td>
<td>22</td>
</tr>
<tr>
<td>Magdalena Contreras</td>
<td>35</td>
</tr>
<tr>
<td>Tlaxiaco</td>
<td>47</td>
</tr>
<tr>
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<tr>
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<td>64</td>
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<tr>
<td>Cuajimalpa</td>
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<tr>
<td>Algodones Cosquín</td>
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<tr>
<td>Tlaxco</td>
<td>95</td>
</tr>
<tr>
<td>Gustavo A. Madero</td>
<td>106</td>
</tr>
<tr>
<td>Iztlacolco</td>
<td>117</td>
</tr>
<tr>
<td>Coyotitán</td>
<td>128</td>
</tr>
<tr>
<td>Atotonilco</td>
<td>139</td>
</tr>
<tr>
<td>Venustiano Carranza</td>
<td>150</td>
</tr>
<tr>
<td>Miguel Hidalgo</td>
<td>161</td>
</tr>
<tr>
<td>Benito Juárez</td>
<td>172</td>
</tr>
<tr>
<td>Cuautitlán</td>
<td>183</td>
</tr>
</tbody>
</table>

### Demonstrations in 2008

- **Concentration**: 121
- **Marches**: 110
- **Cultural**: 33
- **Religious**: 24
- **Political**: 19
- **Others**: 37

### Traffic

- **Minibuses**: 90,000
- **Street Vendors**: 25,000
- **Cars**: 120,000

*Note: All data are preliminary and subject to change.*
MEXICO’S SOLUTIONS

Connectivity

Mexico City has reacted to address the problems described in the previous chapters. The connective infrastructure of Mexico has been in constant growth since the 1950’s and have recently expanded their effort to deal with this issue of connectivity. It’s subway system, second only to New York City’s, is under expansion, and so are its roads and highways.

This decade has seen an ambitious project of expansion of El Periferico, the connective highway that stretches from North to South. “El Segundo Piso” [the second story] is an infrastructural project that proposes to build just that, a second story, above the existing Periferico, 35 miles of heavy infrastructure. Proposals to begin the same scale of project on other highways like El Viaducto, and overpasses in most problematic intersections are being considered and approved by the local government.
Surveillance

Mexico City has also taken measures to deter criminals from acting in areas believed to have a large influence on the metropolitan area. Their proposal is to install approximately 4000 street surveillance cameras throughout the downtown district.

This method, while popular in most countries, especially Great Britain, has proven to be extremely unsuccessful in crime prevention and crime solving. In Great Britain, the most surveilled society in the world, it is estimated that only 1 out of 1000 crimes are solved using this system. This failure is in large part due to the unrealistic expectation of policing that many cameras with only a limited number of dedicated "watchers". It has however, proven successful in achieving a perceived sense of security within the citizens of surveilled societies.

Even though large efforts have been undertaken by the Mexican authorities to deal with the problems the urban and social disruptions described inflicts on the city, and it counts with some of the largest and most advanced public transportation infrastructure in the world, it cannot deal with these disruptions using conventional ways. Simply throwing more hard, mono-functional in-
structure to the problem has not achieved the desired result. Looking for solutions in convention, in a city that operates in the realm of the absurd, leads to infrastructural impasse, where real progress is stagnant.

THE PEOPLES RESPONSE
Marcha por la Paz

In 2004, the living conditions imposed on the city by these disruptions merged and manifested themselves into largest gathering in Mexico’s history. An estimated one million people took the streets and marched on to the Zocalo to plead the government for security and control. The entire city seized to function, and incredibly not one crime was reported. The crowd, sharing a single goal, that of safety, provided the people with the security needed to march through boundaries imposed on the city by the disruptions and reclaim, for a day, one of the most dangerous areas of the city. People of all walks of life participated in this march, and were all united with no economic or social distinction among them, they were all one, dressed in white, silently marching to the Zocalo.
The significance of this peace march, changed Mexico. It gave the silent majority a voice and a belief in the people and that change was possible. It also demonstrated the power of the collective with a common goal.

TOOLS
It is here, within the clashing of these urban elements where my proposal intends to intervene and challenge the mono functionality of existing infrastructures. These conditions create an opportunity to develop a new urban typology, an urban node whose design involves exploring and manipulating the correlation between the crowd, infrastructure, and technology to reconnect the city in a new and secure manner. A multifunctional infrastructure with the ability to affect the area at a local level, but affect the city on a larger scale, forming part of a network capable of adapting to the programmatic needs of the city.

Crowd Behavior
“There is nothing that man fears more than the touch of the unknown. It is only in a crowd that the man can become free of the fear of being touched. That is the only situation in which the fear changes into the opposite” [11].

Elias Canetti

As demonstrated in the March for Peace, the intention of this new typology is to bring people together. Crowds need a goal to maintain their unity, to keep acting as one, and to act responsibly. As Mexico City loses its public spaces to crime, gatherings and an overwhelmed transportation infrastructure, there is a need for a new type of infrastructure beyond the hardware that provides a setting for people to merge, to come together, and create a crowd controlled environment, in a setting where authority is highly mistrusted.

An attack from the outside will draw its members in and strengthen the crowd.

An attack from within can quickly make the crowd crumble.
Infrastructure

The disruptions of any city play themselves out on the existing infrastructure. In Mexico City's case, they paralyze the city as they clearly overwhelm it. It is therefore necessary to introduce a hybridized infrastructure that establishes break from the mono-functionality of infrastructure by introducing "creative infrastructure" able to connect the city on both micro and macro scale. Given the density of Mexico's urban fabric, the design proposes to attract visitors a new type of meeting space, provide security and programmatic changes. To affect change on a micro scale, it must be able to absorb vehicles and pedestrians from the street and connect them on a macro level to other sites.

Technology

Telepresence refers to a set of technologies which allow a person to feel as if they were present, to give the appearance that they were present, or to have an effect, at a location other than their true location. Telepresence requires that the senses of the user, or users, be provided with such stimuli as to give the feeling of being in that other location. Additionally, the user(s) may be given the ability to affect the remote location. In this case, the user's position, movements, actions, voice, etc. may be sensed, transmitted and duplicated in the remote location to bring about this effect. Therefore information may be traveling in both directions between the user and the remote location.

This technology achieves a level of connectivity that goes beyond a projection, it acts as a portal between to places which allows users to affect a location other than their own. It is important to note that this type of connectivity is two way feed, open to as many spaces as desired, thus allowing a "virtual crowd" to emerge and create the controlled environment previously mentioned.
This type of connectivity between strategically chosen sites would allow the city to programmatically adapt to its needs as disruptions play their established roles on the city and establish "safe zones" of public spaces as the users would be protected by either the existing physical, or virtual crowd.

As these new urban typologies appear throughout the city, the hybridized infrastructure would connect crowds from all over the city, crowds with the same goal, that of safety thus acting as a new type of surveillance system. As crowds are assembled on this virtual platform, where exposure to other crowds is a constant, an inverse panopticon effect is achieved. Eliminating the central observation tower that establishes a one-way observation scheme and exposing everyone to each other, security is achieved by the will of the crowd. Self policing as they share the common goal of inhabiting a public space.

**Inverse Panopticon**

The concept of the design is to allow an observer to observe (-opticon) all (pan-) prisoners without the prisoners being able to tell whether they are being watched, thereby conveying what one architect has called the "sentiment of an invisible omniscience". It is designed "to induce in the inmate a state of conscious and permanent visibility that assures the automatic functioning of power”[14].
Neo Panopticon

A new panopticon can be achieved by using the other prisoners as a security or control mechanism. Every one is now observed on 6 sides, discouraging bad behavior [15].

Inverse Panopticon

By using same theory in a voluntary means of control, and replacing "walls" with safety design mechanism can be removed as long as the users are part of a crowd and perceiving a greater sense if safety.

The combination of these elements; the crowd, infrastructure, and technology will provide a new setting, a stage in which a new type of interaction can occur and a reestablish public space in a city where there are none.
Conflux:
Infrastructure for a Hyper-Connected Urbanism

The incremental growth in density that transforms cities into Megacities reshapes traditional urban spaces and infrastructures, imposing three crucial challenges: connectivity, security, and collectivity.

This thesis first explores and then manipulates the correlation between the crowd, infrastructure, and technology to mitigate these challenges in Mexico City. An established mega city that can no longer manage its growth and consequently, faces constant social and urban disruptions that manifest themselves as severing devices of its infrastructural networks. These restrict material and information flows, while limiting distribution of culture and knowledge, which generates the development of an urban fabric.

The project operates in three scales [local, metropolitan and virtual] through notions of interstiti-
ality, fluidity and crowd surveillance. Here, a new urban typology is introduced, that breaks away from the mono-functionality of existing infrastructures and creates a new hybridized condition. This thesis proposes not only physical linkages between segregated areas of the city, but moreover acts as a catalyst for social interaction and urban security.
SITE STRATEGIES

The design proposes to activate different areas of Mexico City with an "urban acupuncture" like intervention, to reconnect and consequently recreate the urban fabric of the city. As isolated areas start physically bridging over disruptions and connect to adjacent areas, the sites activate themselves to create a field, and by introducing technology in the form of virtual connectivity, the field becomes a network.

Due to the dense conditions that exist in Mexico City, the proposed design for each of the kind of sites is a variation of a bridging strategy. Suspended over the city as it negotiates its way through/above the site-specific disruption.

The sites are selected by identifying first disruptions, and the effect they have on the area around it. Depending on the site specific condition, a variation of the proposed design would be implemented depending on the connection needed: virtual, or both virtual and spacial. This project will identify all areas of the city that fit the parameters but will only propose the design of one of the sites.
<table>
<thead>
<tr>
<th>Site</th>
<th>disruption</th>
<th>connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>social/urban</td>
<td>heavy crime</td>
<td>virtual</td>
</tr>
<tr>
<td>large gatherings/protests</td>
<td></td>
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<tr>
<td>social/urban</td>
<td>heavy crime</td>
<td>virtual</td>
</tr>
<tr>
<td>hyperdensity</td>
<td></td>
<td>spatial</td>
</tr>
<tr>
<td>social/urban</td>
<td>heavy crime</td>
<td>virtual</td>
</tr>
<tr>
<td>vehicular traffic/infrastructure</td>
<td></td>
<td>spatial</td>
</tr>
<tr>
<td>social/urban</td>
<td>large gatherings (religious)</td>
<td>virtual</td>
</tr>
<tr>
<td>la villa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>social/urban</td>
<td>heavy crime</td>
<td>virtual</td>
</tr>
<tr>
<td>hyperdensity</td>
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</tr>
<tr>
<td>iztapalapa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>urban</td>
<td>moderate crime</td>
<td>virtual</td>
</tr>
<tr>
<td>gatherings/protests</td>
<td></td>
<td>spatial</td>
</tr>
<tr>
<td>vehicular traffic/infrastructure</td>
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<tr>
<td>fuente de petróleos</td>
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<td>urban</td>
<td>moderate crime</td>
<td>virtual</td>
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<td>large gatherings/protests</td>
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<td>spatial</td>
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<tr>
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<td>social/urban</td>
<td>heavy crime</td>
<td>virtual</td>
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<tr>
<td>large gatherings (sport)</td>
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<td>moderate crime</td>
<td>virtual</td>
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<tr>
<td>large gatherings/protests</td>
<td></td>
<td>spatial</td>
</tr>
<tr>
<td>plaza de las 3 culturas</td>
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<td></td>
</tr>
</tbody>
</table>
MAIN SITE

The site, Fuente de Petroleos, lies at the northeast corner of Chapultepec Park, adjacent to the interchange of two major highways [which consequently separate the districts of Las Lomas and Polanco]. Situated at the edge of the park, major infrastructure and the city, the project has the potential to benefit all three [17].

Site Analysis

Analyzing the site and its context. Where traffic and infrastructure creates a void between its borders where the park is situated. The infrastructure in this case acts as a security device, denying people access to the park to the adjacent districts.
Physically bridging this condition and providing the site with a new type of public space would alter its surroundings in a major way, not only reconnecting formerly disengaged sections of the park and the city, but alleviating traffic flows in the area as well.
Site Plan

Plans
Metropolitan Scale
Final Panel

Conflux: Infrastructure for a Hyper-Connected Urbanism
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