Digital Space/Physical Place: Systems for Community Growth

by

Kristine M. Youngblood

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APPROVED, THESIS COMMITTEE:

Clover Lee, Assistant Professor
Architecture

C. Christopher Hight, Assistant Professor
Architecture

Christopher Kelty, Assistant Professor
Anthropology

Farès el-Dahdah, Associate Professor
Architecture

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Digital Space/Physical Place:
Systems for Community Growth

This thesis investigates how synchronous systems of digital space and physical place can play a role in developing community through access to information technology and the formation of networks. It looks at how a community technology network can develop through a synthesis of the community technology center and the dispersed digital network, examining this new model through the three layers of invisibility inherent to telecommunication systems: infrastructure, accessibility, and education. The project focuses on the Fifth Ward in Houston as a site for investigation, rethinking current modes of intervention taking place there through the existing i-community model.
This project happened thanks to the support and guidance of many people:

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This is for my grandma, Rose DeBrabander, who always had faith in me.
This project investigates how synchronous systems of digital space and physical place can play a role in developing community through access to information technology and the formation of networks. It looks at how a community technology network can develop through a synthesis of the community technology center and the dispersed digital network, examining this new model through the three layers of invisibility inherent to telecommunication systems: infrastructure, accessibility, and education. The project focuses on the Fifth Ward in Houston as a site for investigation, rethinking current modes of intervention taking place there through the existing i-community model.
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Though the system developed in this project could go in variety of locations, it focused on the Fifth Ward in Houston as a site for investigation, rethinking the current modes of intervention taking place there through the i-community model—an initiative begun in 2003 by a collaboration of Hewlett Packard and the Fifth Ward Community Redevelopment Corporation. The i-community aims to provide access to information technology and skills development in existing community centers.

The Fifth Ward was once a thriving neighborhood—home to predominately black working class people. However, with passage of integration laws in the 1960s, many residents left the community to seek wider opportunities. Today the Fifth Ward is home to 18,000 people, and is the lowest-income neighborhood in Houston—with 62 percent of its residents living below the poverty line. The ward is physically divided by two major freeways that run through its boundaries—US 59 & I-10.

Despite its level of poverty and sparse number of citizens and resources, The Fifth Ward remains a culturally rich sector of Houston. It is the location of many historic churches, the city’s first settlement house and black arts center, and it holds numerous landmarks of Houston’s music culture. Today realms of activity within the Fifth Ward revolve around schools, churches, community centers and parks.
Figure 1. Map of Greater Fifth Ward

Figure 2. Map of Houston super-neighborhoods
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networking discretely

The 5th Ward/HP i-community is a public/private community partnership between Hewlett Packard and the Fifth Ward Community Redevelopment Corporation. The Fifth Ward/HP i-community project seeks to accelerate social and economic development for the 5th Ward.

In 2003, Houston's Fifth Ward was selected as the site for HP's most recent i-community. Over the course of the last three years HP has donated $3 million in equipment and services to the area, as a means of "integrating technology into the fabric of the Fifth Ward community". The i-community began through the deployment of five Technology Access Points (TAPs). Each access point is connected to a credible organization within the area - familiar places that are highly trafficked by community members. The TAPs are meant to supplement the themes currently held by these centers, not to become the theme itself.

The impact of digital networks on our experience of place is based upon who is connected to these networks and who remains physically or technologically disconnected. Advanced infrastructure networks are often targeted solely on valued parts of the city - allowing for intense interactions with each other, creating a tunnel effect as they leave out less valued areas of the city.

In the fifth ward, we can see the discrete locations of the TAPs create a tunnel effect within the area.

connecting virtually

The 5th Ward Community Portal allows a level of collaboration and information previously foreign to the 5th Ward. The portal is the main vehicle by which the 5th Ward/HP i-community is building a global community.

The second phase in the development of the i-community was the launch of a website (http://www.fifthwardhouston.org/) where users can access useful information directed at the community's needs. The website also serves as a community register - collecting contact information from all of the members.

While access to information technology is an concern, an equally important issue is the provision of skills necessary to benefit from information technology. The digital divide exists between those who possess resources, education, and skills to work with modern IT, and those that do not.

How can the community add to the content of the website without access or know-how?
Prince Complex
center for youth athletic, recreation, and academic programs
access for seniors and after school academic enrichment

Phoenix Outreach Youth Center
educational center for children
access for tutoring and training programs

Lyons Village
community headquarters
access for small businesses and organizations

Pleasant Hill Village
independent living apartment complex for senior citizens
access for residents

Fifth Ward Multi-Service Center
public library, head start, american red cross, etc.
access for the community to internet and office tools

figure 3. location of Technology Access Points

figure 4. i-community website
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physical place: community centers

Community Technology Centers (CTCs) are a burgeoning form of community institution, providing a space where people can come together to exchange ideas and learn. These centers have become the most common way of making computers and human resources (i.e. training) available to the public, often targeting low-income areas. The main advantage of the CTC approach is that expensive resources (the devices, infrastructure, networks, etc.) can be used by a greater number of people.

There are multiple benefits to community technology centers. More information can be communicated in less time through face-to-face contact than any other medium – physical interaction plays a critical role in the development of strong communities. CTCs offer a space for this type of interaction - providing skills development as well as access to technology.

If the goal of the CTC is to get information technology into the hands of the public - computers at home, business, school, etc. - then the CTC needs to shift its identity in the community to become more of a center of interaction. In order for the CTC to become a sustainable model it needs to act as a center that enhances public life, in ways beyond providing computers for the users.

digital space: community technology

Collaboration needs to occur between CTCs in order to share information and resources. Online alliances can be forged through the creation of digital communities. They serve as support groups, empowerment tools for activism, and knowledge bases, etc. Digital communities, not being fixed to a place, allow for interaction both within and outside of geographic communities.
Figure 5. Fifth ward demographics and computer use
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CTC: Community Technology Center

Community Technology Centers (CTCs) are a burgeoning form of community institution, providing a space where people can come together to exchange ideas and learn. These centers have become the most common way of making computers and human resources (i.e. training) available to the public, often targeting low-income areas. The main advantage of the CTC approach is that expensive resources (the devices, infrastructure, networks, etc.) can be used by a greater number of people.

CTC: Community Center

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**digital space**

**TAP - Transit Access Points**

Wiring the home of every user in the community can be quite costly — deployment of new fiber costing as much as $200,000 per linear mile. Broadband networks can be installed at a lower cost through the use of wireless technology. In a wireless mesh network the infrastructure is decentralized and inexpensive, as each node only has to transmit as far as the next node. These nodes, or TAPs (Transit Access Points), are non-mobile, non-battery powered links that connect back to fixed wired base stations that act as gateways to the internet.

\[
\text{TAP} = \text{\#11} + \text{\#1} + \text{\#1} + \text{\#1}
\]

**CT - Community Technology**

Collaboration needs to occur between CTCs in order to share information and resources. Online alliances can be forged through the creation of digital communities. They serve as support groups, empowerment tools for activism, and connect sources of knowledge. Digital communities, not being fixed to a place, allow for interaction within and outside of geographic communities.

\[
\text{CT} = \text{\#11} + \text{\#11} + \text{\#11-11}
\]

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In the development of a connected community, three different levels of digital networks can be defined: local, regional and global.

**Nodes**

A combination of existing community technology centers and a new interface (described further on the following page).

**Local networks**

Each node provides wireless access to users within its range - a 1000 ft. radius. These nodes are connected via physical proximity, which allows for small, localized networks to take shape. Users within range of the network have the ability to add and change content to interfaces in the zone.

**Regional networks**

Certain nodes are wired. These wired nodes can communicate, giving them the ability to pass information between local networks. This allows for larger, regional networks to take shape. Users can share information and resources across communities.

**Global networks**

Wired nodes also have the ability to connect beyond regional boundaries via the internet, allowing for larger, global networks to take shape. Small communities are given the opportunity to share information and resources within larger regions/cities/states/etc.
Figure 6. Networks and territory mapping.
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There exists gaps between the existing community technology centers and the dispersed wireless network that they can help form. In order to create a community technology network, where the digital and the physical communities can work together, there is a need for a new interface that can fill these the digital/physical gaps.

The new interface developed for this project is a unit that is based upon a typical 4:3 screen aspect ratio. Operations are performed upon the unit in order to fit the interface into the existing infrastructure (multiply, fold, etc.). The screens provide a new public platform for people in the Fifth Ward to access information technology as well as begin to develop the skills necessary to use this technology. They have the ability to act as temporal meeting spaces for community gatherings – thus facilitating both technological and social needs of the users.

The screens provide new opportunities for existing networks, as well as create the possibility for the formation of new communities altogether – creating a space for community members to share knowledge and resources. The new interface is meant to be a public tool that enhances different types of communities – both existing and ad hoc.

The interface works as a tool that enhances education, provides a space for the sharing of collective information, creates exposure to art and music, and increases neighborhood security. The new interface also acts as a sign for the system within the ward – creating needed visibility for the community technology network.
figure 7. mesh networks and accessability
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The screens work within a set of accessible infrastructures that are available in the Fifth Ward community. Some elements of the interface are uniform throughout all of the infrastructures. One such element is an events calendar that allows users to add and receive content on current and future events within the Fifth Ward. The calendar also provides links to archived information on past events. Every interface is also connected to a bus alert/digital bulletin board system, and can be used for locally placed advertising.

The interface works somewhat differently at each scale of physical infrastructure, as each has been chosen to address a different faction of the population.

**Bus shelters:** located at bus stops and transit centers

The interface here works at the scale of the individual. A bus map provides access to real-time bus location information, as well as allows users to view other shelters - providing a connection across physical boundaries.

**Enclosed perimeters:** located around schools, community centers, parking lots, etc.

The interface here works at the scale of slow moving traffic and passersbys within the ward. The amount of information that can be displayed is determined by the length of perimeter, which in turn determines the number of screens that can be applied.

**Billboards:** located along freeways and major roads

The interface here works at the scale of fast moving traffic - calling attention to people outside the ward, especially at those locations along the freeway. The information provided through the events calendar is limited here to current and future events.

**Covered pavilions:** located in parks and school yards

The interface here works at the scale of groups, making them useful for large gatherings. Similar to the bus map, a park map allows users to view other parks and pavilions in the ward. The screens can work together to create a movie screen, score board, etc.
figure 8. physical infrastructure
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**Figure 9.** Instances of bus shelter interface
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figure 10. instances of enclosed perimeter interface
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figure 11. instances of billboard interface
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figure 12. instances of covered pavilion interface
There are few public spaces in the Fifth Ward – no existing museums, galleries, movie theaters, etc. The new interfaces respond to the lack of this type of community interaction, aiding in the formation of these spaces within existing infrastructure - for example they can be used for movie night in the park or to create an art exhibit around a fence.

The screens thus act as a pochē within these semi-voided public spaces – filling them with additional program and perhaps new people. They are linked to the ongoing digital environment in which the community will be interacting – encouraging digital collaboration at multiple skill levels.
January 13
Crafts for kids
Library - multipurpose center

03:15:09 PM
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There are five different modes for the interface:

**Sleep mode**
Programmed to occur between 12-6am - when buses are not running, parks are closed, and less traffic is on the road. The screens emit a dim light.

**Dream mode**
A level of low interaction between the interface and the community that occurs during sleep mode. Screens filter through images from the previous day when users pass by.

**Awake mode- Inactive**
The interface is awake from 6am-12am. The display is used for locally placed advertising when no direct interaction is taking place.

**Bus alert mode**
A lighting/bulletin board display is programmed to appear when a connected bus comes into the interface range during awake mode.

**Awake mode- Active**
Users can interact with the interface by selecting content and/or adding information.

There are various methods that one can use to interact with the interface:

**Motion sensor**
Motion sensors are used to trigger dream mode and to alert the display to brighten as users pass by during inactive mode.

**Touch screen**
The touch screen allows users to choose display content.

**Bluetooth**
Bluetooth enabled devices are alerted when entering range of interface, allowing users to add/receive content within the 30 ft. range.

**SMS/wi-fi**
Users can add/receive content via these wireless networks - locally and asynchronously.
- dream mode → motion sensor
- bus alert mode → motion sensor, bluetooth, SMS/wi-fi
- awake mode → touch screen, bluetooth, SMS/wi-fi
digital space/physical place:
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- motion sensor
- touch screen
- SMS/bluetooth/wi-fi

**figure 13. bus shelter timeline and modes**
14:00  
awake mode - active  
users post to the board via network  

16:00  
bus alert mode  

18:00  
awake mode - inactive  

20:00  
bus alert mode  

22:00  

24:00  
sleep mode  
display programmed to enter sleep mode from 24:00 to 06:00 - emits dim light  
awake mode - active  
users can add/change content via network
digital space/physical place: systems for community growth

<table>
<thead>
<tr>
<th>05:20</th>
<th>08:00</th>
<th>10:40</th>
<th>13:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>dream mode</td>
<td></td>
<td>awake mode</td>
<td></td>
</tr>
<tr>
<td>triggers</td>
<td></td>
<td>- active</td>
<td></td>
</tr>
<tr>
<td>usage sequence to appear on screen</td>
<td>advertising display appears when not in use</td>
<td>brighter display</td>
<td>enabled devices are alerted when entering range of interface</td>
</tr>
</tbody>
</table>

sleep mode

awake mode - inactive

bus alert mode

awake mode - active

users can add/change content via network

diagram label: 'awake mode - active'
don't change or add anything

figure 14. enclosed perimeter timeline and modes
16:00

bus alert mode
lighting/graffiti display programmed to appear when connected bus comes into range
users post to the board via network

18:40

awake mode - active
display can be programmed by users through the network

21:20

awake mode - inactive

24:00

sleep mode
display programmed to enter sleep mode from 24:00 to 06:00 - emits dim light
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04:00
dream mode
triggers image
sequence to appear on screen

08:00
awake mode - active

12:00
awake mode - active
display can be programmed
by users through the
network

sleep mode

dream mode

bus alert mode

awake mode - active

figure 15. billboard timeline
18:00

- bus alert mode
  - lighting/ graffiti display
  - programmed to appear when connected bus comes into range
  - users post to the board via network

20:00

- awake mode - active
  - users can add/change content via network

24:00

- sleep mode
  - display programmed to enter sleep mode from 24:00 to 06:00 - emits dim light
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motion sensor  touch screen  SMS/bluetooth/wi-fi

dream mode
triggers image sequence to appear on screen

awake mode - inactive
advertising display appears when not in use

awake mode - active
touch screen allows users to choose display content

equilivoked devices
are alerted when entering range of interface

sleep mode

dream mode

bus alert mode

awake mode - inactive

awake mode - active

figure 16. covered pavilion timeline
18:00

bus alert mode
lighting/graffiti display programmed to appear when connected bus comes into range

19:00

20:00

awake mode - active display can be programmed by users through the network

24:00

sleep mode
display programmed to enter sleep mode from 24:00 to 06:00 - emits dim light
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The goal of the formation of a community technology network is to create a system that is flexible enough to allow for the community to make it their own – helping them take control of both the content as well as its regulation.

The new interface acts as a public face for the system, working as a tool that can engage with the community at multiple skill levels. It is important to create a system that does not perpetuate the division between the haves and have nots, but rather encourages users to further their skills and knowledge.

While the existing community technology centers and the distributed wireless network are two critical components of the network, the third component of the interface works at another scale that brings the technology to the Fifth Ward community, allowing them to directly encounter the benefits of being connected in their everyday lives.
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digital design


digital divide


invisibility


telecommunications infrastructure

telecommunications infrastructure


virtual communities


websites

5th Ward HP i-Community
http://www.fifthwardhouston.org/

City of Houston Super Neighborhoods Links
http://www.houstontx.gov/planning/suprnhds/sn_links.htm

DataPlace: Explore Data about Places
http://www.dataplace.org/

The Handbook of Texas Online
http://www.tsha.utexas.edu/handbook/online/

HP Philanthropy
http://grants.hp.com/index.html

METRO: Metropolitan Transit Authority of Harris County, Texas
http://www.ridemetro.org/

Rice University TAPs Project
http://taps.rice.edu/

Wikipedia – the free encyclopedia
http://www.wikipedia.org
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**Ad-hoc network**
A wireless network that does not require a base station - computers and devices within range can connect.

**Black box**
A technological assembly, including infrastructure networks, whose inner workings are so completely unknown or hidden to its users that its successful functioning is totally taken for granted.

**Bluetooth**
An industrial specification for wireless personal area networks. Bluetooth provides a way to connect and exchange information between devices (such as computers, mobile phones, and PDAs) via a secure, low-cost, globally available short range radio frequency.

**Community Technology Center (CTC)**
A facility that provides free or low-cost computer access and training to people lacking the resources to have a computer in their home. The main advantage of the CTC approach is that expensive resources (the devices, infrastructure, networks, etc.) can be used by a greater number of people.

**Digital divide**
A term used to describe the division between those that have access to modern information technology (IT) and those that do not.

**i-community**
A community technology model that focuses on developing an entire region into a thriving, self-sustaining economic community. It uses technology to improve literacy, job creation, income, access to government services, education, and healthcare.

**Short Message Service (SMS)**
a service available on most mobile phones that allows the sending of short messages to other phones

**Technology Access Point (TAP)**
An existing organization within a community that dedicates a part of their facility for computer access and training for their users.

**Transit Access Point (TAP)**
Non-mobile, non-battery powered links that connect back to fixed wired base stations that act as gateways to the internet, creating an inexpensive way to install a broadband network for a community.
**Tunnel effect**
An effect caused by the warping of time and space through the use of advanced telecommunications and transportation infrastructures. These infrastructure networks are often targeted solely on valued parts of the city, allowing for intense interactions with each other while leaving out less valued areas of the city.

**Wi-fi**
A term for certain types of wireless local area networks (WLAN) that runs on an unlicensed radio spectrum and does not require regulatory approval for individual deployers. It allows local area networks (LANs) to be installed without cabling, potentially reducing the costs of network deployment and expansion.

**Wireless mesh network**
A type of internet infrastructure that is decentralized and inexpensive, as each node only has to transmit as far as the next node.
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**HP i-community in Mokopane, South Africa**

**replication not duplication**

*The intention of the project is that the breakthrough models developed in Mogalakwena will then be replicated, first in the rest of Limpopo, and then South Africa and into the rest of Africa. The project aims to bridge the divide between those who have access to the benefits of ICT and those who don't in manners that are sustainable, replicable and socio-economically harmonious.***

**phase one: training and education**
location - i-community center

- computer literacy training
- PC refurbishment training
- life skills basic education
- establishment of business resource centers
- digital culture archive development

**phase two: sustainable livelihoods, open source development**
location - i-community center

- sustainable livelihoods area development
- i-center prototype development
- launch of open source center
- call center and help desk implementation
- identification of least developed villages (LDV)

**phase three: i-center implementation**
location - least developed villages

*Integrating the key components of the project into a form that can be the basis of widespread and cost-effective replication*

The LDVs can choose the elements from the first two phases that meet their needs and integrate them into their own i-center.
HP i-community in Mokopane, South Africa

"a box...in a box...in a garden"

An i-center is a large container that provides public access to mobile phones, information and communication technology, a business resource center, a library and a shop for basic goods.

The i-center is envisioned as an extensible, customizable solution to catalyze development, especially in remote rural areas.

a box: computer
Computers are loaded with standard portfolio of software, as well as extensive training materials and documentation materials on how to launch and run all key i-community services.

a box: physical site
The physical site or service-delivery center - a mobile container, a school, a community center, a business office, a hospital, a government office, etc.. The model should be flexible enough to allow for deployment by government agencies.

a garden: physical environment
The model is extended to the community context and physical environment around the larger box - focusing on sustainable livelihood methods such as water and sanitation, alternative energy, food security, medicinal gardens, etc..
figure B1. a box...in a box...in a garden