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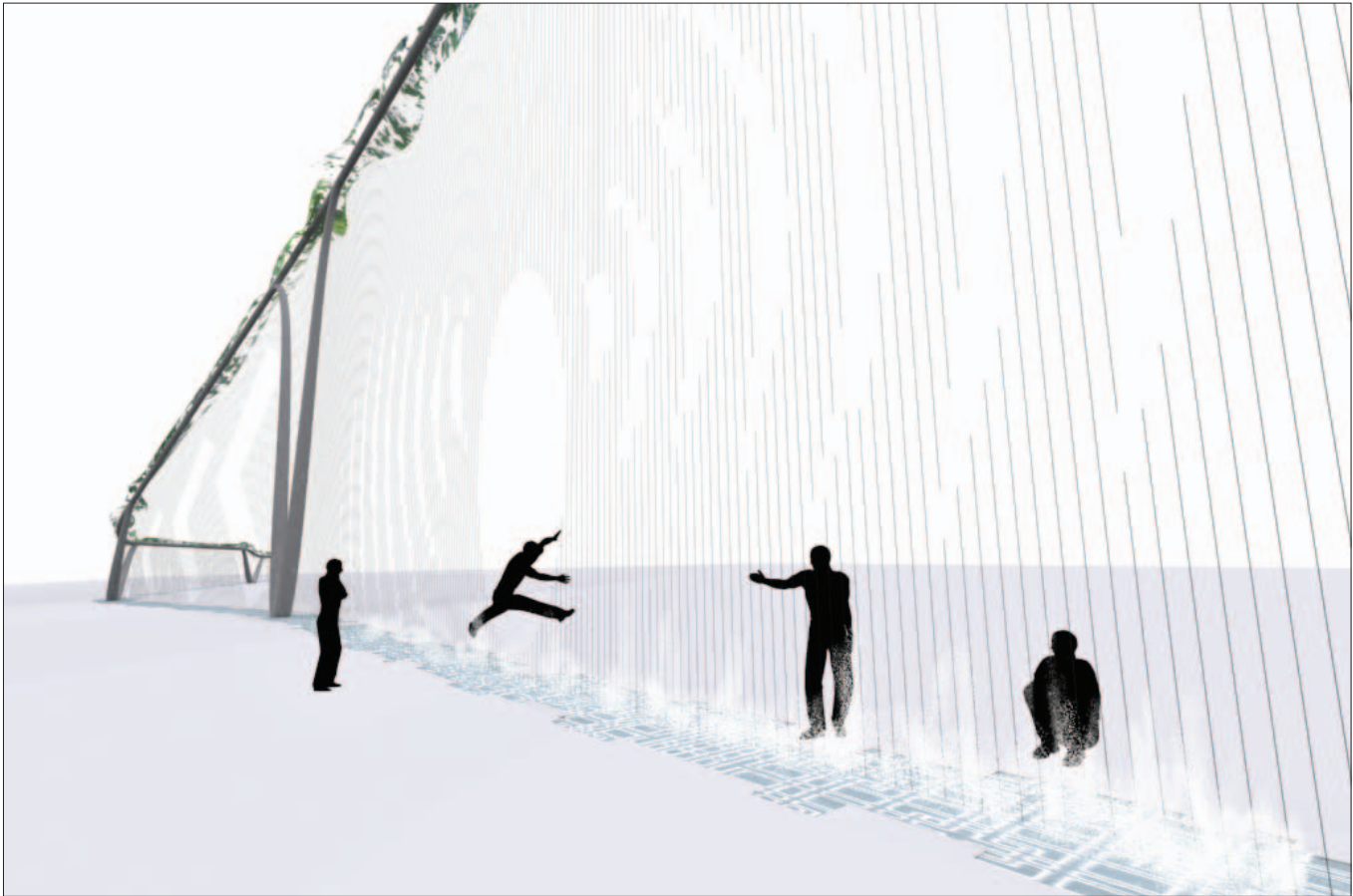
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Zaragoza's Digital Mile: Place-Making in a New Public Realm

Dennis Frenchman and Francisca Rojas



As the hot desert sun wanes across the plaza, horizontal shades along the roof of the museum, over the cafe, and at the bus stop suddenly rise in a graceful ballet. Pivoting upwards one at a time, they become a row of vertical screens. Gradually, they take on the subtle, complex patterns of a Moorish mosaic, a backdrop for the evening's performance. On the lawn, as the last soccer players leave, people settle down on their chairs and blankets and turn to the stage.

Two kids take a running leap at the curtain of water, but it parts before they can get wet. Landing in a puddle on the other side, the sound starts a wave down the curtain that ripples along and fades in the distance. Jump twice and you get a bigger wave; jump in syncopation and you get the biggest waves of all.

Such experiments in place-making are now being designed for the ancient city of Zaragoza, Spain, as part of an unusual development project that will herald the city's arrival into the information age. Known as the Digital Mile, the project aims to incorporate digital media into everyday aspects of the public realm, making places that respond to their users, change to accommodate multiple activities, provide stories, information and services, and hopefully, become deeply meaningful to a rich array of people in Zaragoza who will live and learn within them.

At first glance, Zaragoza is an unusual venue for experiments with digital media. One of Spain's oldest cities, it was founded by Ceasar Augustus at a strategic location on the Ebro River in the middle of a desert. Later it became

Above: Waterwall: An urban-scaled interactive fountain system in which falling streams of water can respond to people by digital means. Image by Andres Sevtsuk.



a stronghold of the Moors; then capital of the Christian Kingdom of Aragon, which stretched into Italy. Today it is a fast-growing university and intellectual center of 750,000 people.

Over the centuries inhabitants of the city have drawn on their predecessors, maintaining a remarkable continuity of expression and culture. The city's physical fabric is a palimpsest of Roman ruins, Arabic decorations, intimate streets, and grand public spaces, overlooked by a collection of fantastic Baroque towers. This layering of form and ideas is poignantly embodied in the Aljaferia, a palace of Moorish and Christian kings, and the current seat of the Aragon regional government.

Today a new layer of culture is being added to Zaragoza with the completion of a high-speed rail line, bringing the city within commuting distance of Barcelona and Madrid. Signaling this future, an enormous new rail station has recently opened in the Almozara area on the western edge of town, bringing new people, firms, and real estate speculation. Meanwhile, the old in-town rail station at Portillo has been demolished, and tracks between the two sites have been placed underground, freeing a mile-long swath of highly valuable land. The transformation of this corridor with new development will begin at its outer edge, along the banks of the Ebro River, where Zaragoza will host an International Expo in 2008 dedicated to the theme of water.

Mayor Juan Alberto Belloch originally conceived the Digital Mile as a project to harness his city's increased accessibility and visibility. Among his strategic urban and economic development goals were to create a global identity for Zaragoza; assert the city as a regional center for technological innovation; build local skills in the use and

development of information technology; activate urban spaces that are currently underutilized; and express the evolving history and culture of Zaragoza.

In the fall of 2005 the city joined with a team of researchers from MIT's Joint Program in City Design and Development and the Media Lab to create a vision for the Digital Mile. Guided by an advisory panel of sociologists and designers, the team focused on the potentials of advanced communications and media technology in the public realm rather than in buildings and private development.

The study encompassed an area extending from Portillo and Aljaferia to the high-speed rail station and out to the Expo site—linking the fabric of the old city with the new. Existing plans for the area called mainly for conventional open spaces and public facilities. However, the introduction of the technology theme raised some interesting potentials and questions. Can technology enhance public use and enjoyment? Can it make space more productive? Or meaningful? What types of urban forms best accommodate the transmutable qualities of digital media? Can it create a public realm that is more flexible and adaptable to different users, activities, or moods? How do you develop content for the media, and who should manage it?

This article discusses these questions in the context of the Digital Mile and illustrates some of the urban design hardware, media software, and content proposed for this unique place.

Above: Old Zaragoza: A fabric of water, bridges, towers, walls and layers.
Photo by Felix Bernad.



The “Open-Source” City

The nature of digital public space is just beginning to be understood. Although there are now many examples of digital media in public places, such as large digital screens and wireless access to the Internet, the experience of these places remains pretty much unchanged. A truly digital space would bring together multiple layers of media within a responsive physical enclosure. In other words, the physical form must be able to change and respond to information, much like media, and the media must become instrumental in shaping its form. The challenge of the Digital Mile was to approach this ideal in simple, realizable ways to create good public spaces—adding to the collection the city already has.

Above: Aerial view of the Digital Mile project site. Old train station site at Portillo (right); the new high speed rail station at Almozara (left). Expo 2008 site lies across the Ebro River (top). Photo courtesy of City of Zaragoza.

An inherent advantage of a digital realm is that different needs can be accommodated by urban spaces that are flexible and changeable, making them responsive to different circumstances. These changes might be achieved by enabling conventional physical alterations in the landscape. But they can also be realized through programmable digital elements that can change the visual and physical quality and content of a space with the time of day, season or activity. Thus, for example, on a Saturday afternoon in the summer, strollers and soccer players may use a park for recreation, while in the evening it may be transformed into an outdoor theater with screens and sound. Enabling users to influence, even shape, these changes creates a more dynamic, participatory, “open-source” environment.

The concept of open source comes from the field of computer programming. It stipulates that anyone can modify and reorganize the source code for a piece of software. Through people’s adjustments and improvements, software thus evolves to better respond to users’ needs. In

keeping with the project's overarching theme of creating an "open-source city," this was precisely the goal of the Digital Mile.

It was imagined that an open-source approach to the development of content and use of digital media along the Mile would serve several purposes. It might help break down people's fear of technology by being a means of technological capacity-building. It might create a sense of ownership of the Mile for Zaragoza's residents. Moreover, it might provide a means through which people could construct and reveal narratives about the city's culture, functions and history. Of course, since the Mile will be a networked environment, remote development of content is also possible. That is to say, people could conceivably access, experience and contribute to the development of Zaragoza's Digital Mile from anywhere in the world. This means that content might also be produced at a global scale and expressed in the physical environment at a local scale, making the Digital Mile a place that defies political boundaries.

Once articulated, such an open-source concept seemed readily applicable to the design of urban places. Throughout history the public realm has combined physical form with mediums of expression. Great public space is a form of theater that needs a good stage set, that is human scaled and comfortable, surrounded by supportive activities and architectural enclosures. Great public spaces also enable personal and public communications and exchange of goods, information, emotions and ideas—and therefore become imbued with meaning for the people who claim them, and for the cities in which they are located.

Advanced communications and digital media are today providing new ways of achieving these traditional characteristics in an open-source way. Perhaps the most obvious example involves application to elements of spatial enclosure. Digital displays are now being incorporated into the facades of buildings—not as signs, but as integral aspects of architecture, very much like the polychrome tile decoration on the cathedral facade in Zaragoza (itself, a form of "media"). However, new digital media allow the visual surfaces of urban space to change: in pattern or color, to carry messages, or to show motion pictures. And the really interesting aspect here does not just concern dramatic new uses of media, but the fact that the quality and mood and content of the space can be altered with the time of day, season, or—if accessible by the Internet—the present desire of users.

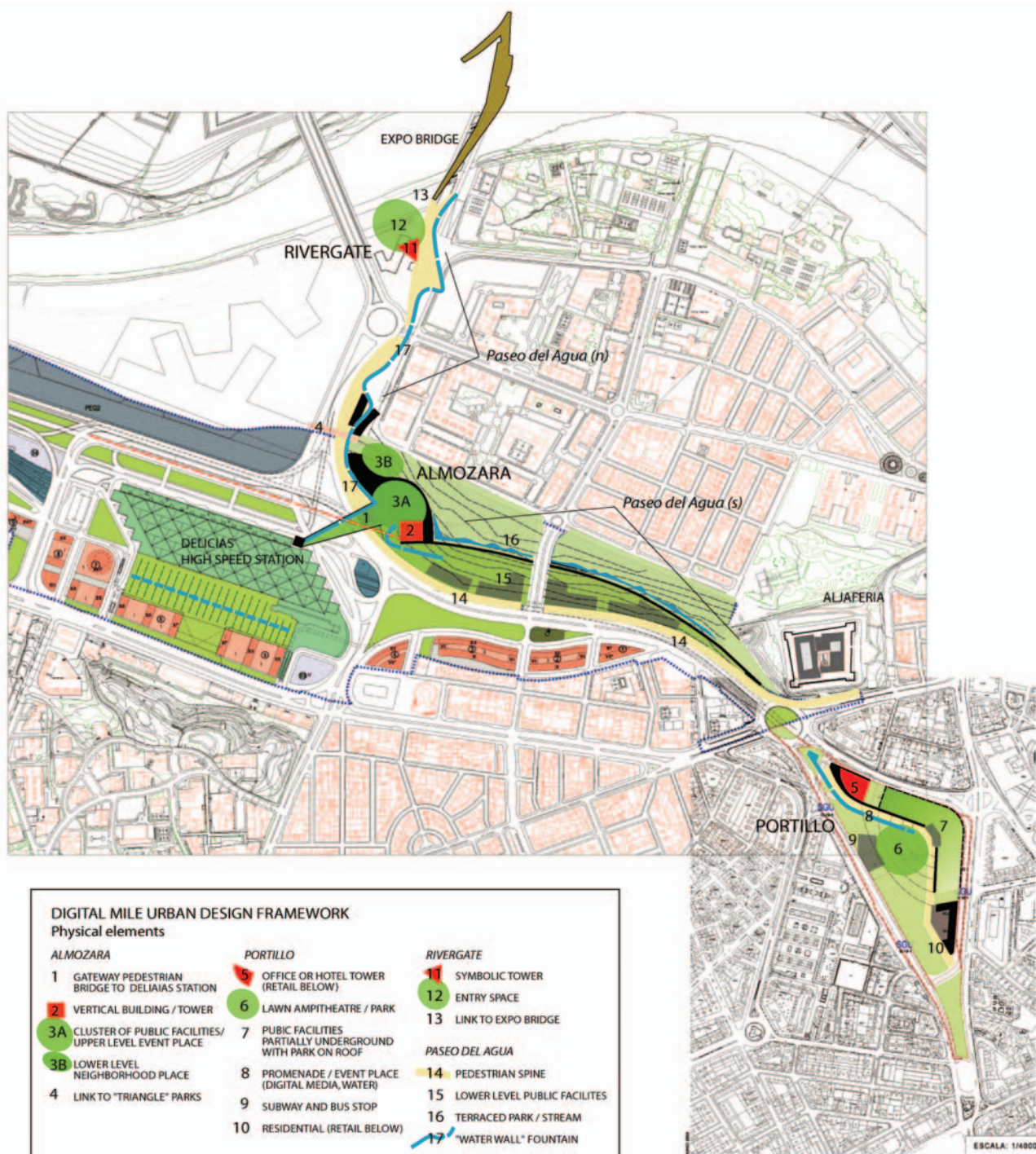
A second example involves the ubiquitous presence of wireless access to the Internet. Of course, this is the key to accessing the responsive elements described above. But

it can also add a layer of functionality to public spaces and parks, enabling them to be used for work, education, and other activities that increasingly rely on access to electronic information. Equally important is the ability to deliver tailored content over this medium to specific groups in particular, prescribed locations. This is possible through location-based wireless services. For example, visitors may be able to access information related to history, tours, and nearby restaurants at certain sites (or on certain streets) and nowhere else. Such a role might be likened to that of traditional public spaces like the forum, where people might go to get information about politics; or the marketplace, where they might get information about commerce. Such digital spaces would eventually become important nodes within the larger network of information and flows.

A final example involves the incorporation of digital capabilities into the everyday objects of the city. This, too, has always occurred in traditional public spaces—as awnings are unfurled when it rains, or decorations are put up for celebrations. But digital space can be far more sensitive to the needs of users. In particular, street furniture—lights, tables, awnings, umbrellas, decorations and fountains—can play a key role in making space responsive. The capabilities of these urban elements are now being reconceived to enhance the use and experience of urban spaces. For example, light fixtures are being designed to sense and respond to the time of day or the number of users nearby, providing general illumination when there are large crowds, more intimate lighting for cafe patrons, or colored lights during a special event. Outdoor cafe tables might also be designed to allow patrons to call up a menu on an electronic surface, view reviews of the dishes, explore sites in Zaragoza to plan a tour of the city, or access personal messages before the food is served. All of this will be facilitated in the near future by the advent of radio frequency identification (RFID) tags that will communicate information to the furniture about you and the level of access you desire.

Complementary Frameworks: The Physical and the Digital

The Digital Mile offers both great opportunities and difficult challenges to create a unified, imageable, and transformative project. A key problem is that new physical infrastructure, including the high-speed rail station and planned roadways will divide up the area, separating its parts from each other and the rest of the city. The overall concept of the design, then, has been to visually and functionally knit disparate elements together through



Above: Digital Mile Physical Framework incorporates the Portillo, Almozara and Rivergate development/activity nodes, connected by Paseo del Agua. Image by Dennis Frenchman.

Opposite: Digital Mile Digital Framework includes different layers of media systems overlaid onto the physical design framework. Image by Dennis Frenchman.

a network of community and educational facilities, public spaces that serve multiple users, and digital features. We see this task as equal to the creation of the other great works of urban design that have given Zaragoza its powerful urban character. Elements of the proposal include both physical components (the “hardware” of the project) and digital components (the “software”).

Physical Elements

From examining the development of Zaragoza, it became apparent that certain elements have been integral to the fabric and culture of this city for centuries, including *water* (connecting to the natural environment); *bridges* (linking places and ideas); *towers* (providing a unique image and voice); *walls* (defining edges, inside and out); and *layers* (of culture, information and landscape).

The Digital Mile utilizes and reinterprets this ancient code of form. The design organizes elements along a pathway called the Paseo del Agua because of its innovative uses of water. The Paseo is anchored by two event places marked with towers: Portillo and Almozara. At Almozara, a spectacular new pedestrian bridge will connect the Digital Mile to the high-speed rail station and neighborhoods to the south and west. The pedestrian bridge will become a symbolic gateway to Zaragoza, spanning the highway that leads into the city from Madrid. The Paseo del Agua continues northward to the Expo 2008 site, which is accessed by a second pedestrian bridge across the Ebro River. Together, the pathway, bridges, towers and event places will knit together the Digital Mile and provide an armature for many uses.

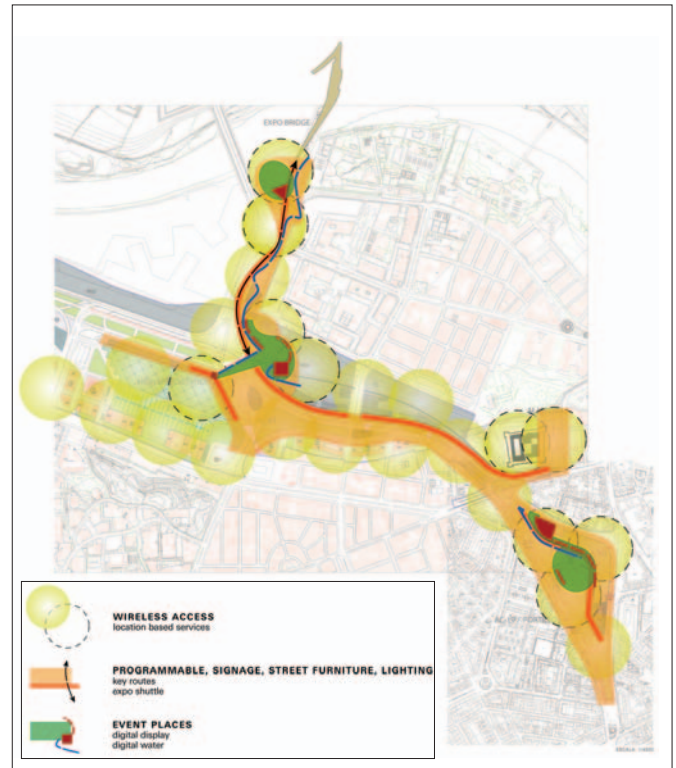
Digital Elements

A proposed digital framework overlays and completes the physical framework, and is composed of three parts.

Ambient technology. All of the spaces, parks and buildings in the Digital Mile will include free, public wireless connectivity to the Internet as well as access to responsive media elements on the Mile. Location-based services will provide tailored content through cell phones or personal digital assistants (PDAs) to subscribers at key spots—providing, for example, historical interpretation at the Aljaferia or directions at the train station.

Systems. Digital systems will facilitate the public use and understanding of the environment, and will be concentrated along the pedestrian armature of the Mile. Proposed systems include intelligent street and building lights that can be accessed and programmed to change color or intensity in response to the time of day, demands for use, or artistic desires. Digital street furniture—cafe tables, bus stops, signage—will display information about food content, where your bus is located, or available parking spaces.

Digital Places. Nodes on the Digital Mile will include responsive elements that support different activities and facilitate users' personal association with the urban environment. Elements proposed for the Mile include digital facades, moveable physical elements that can provide shade



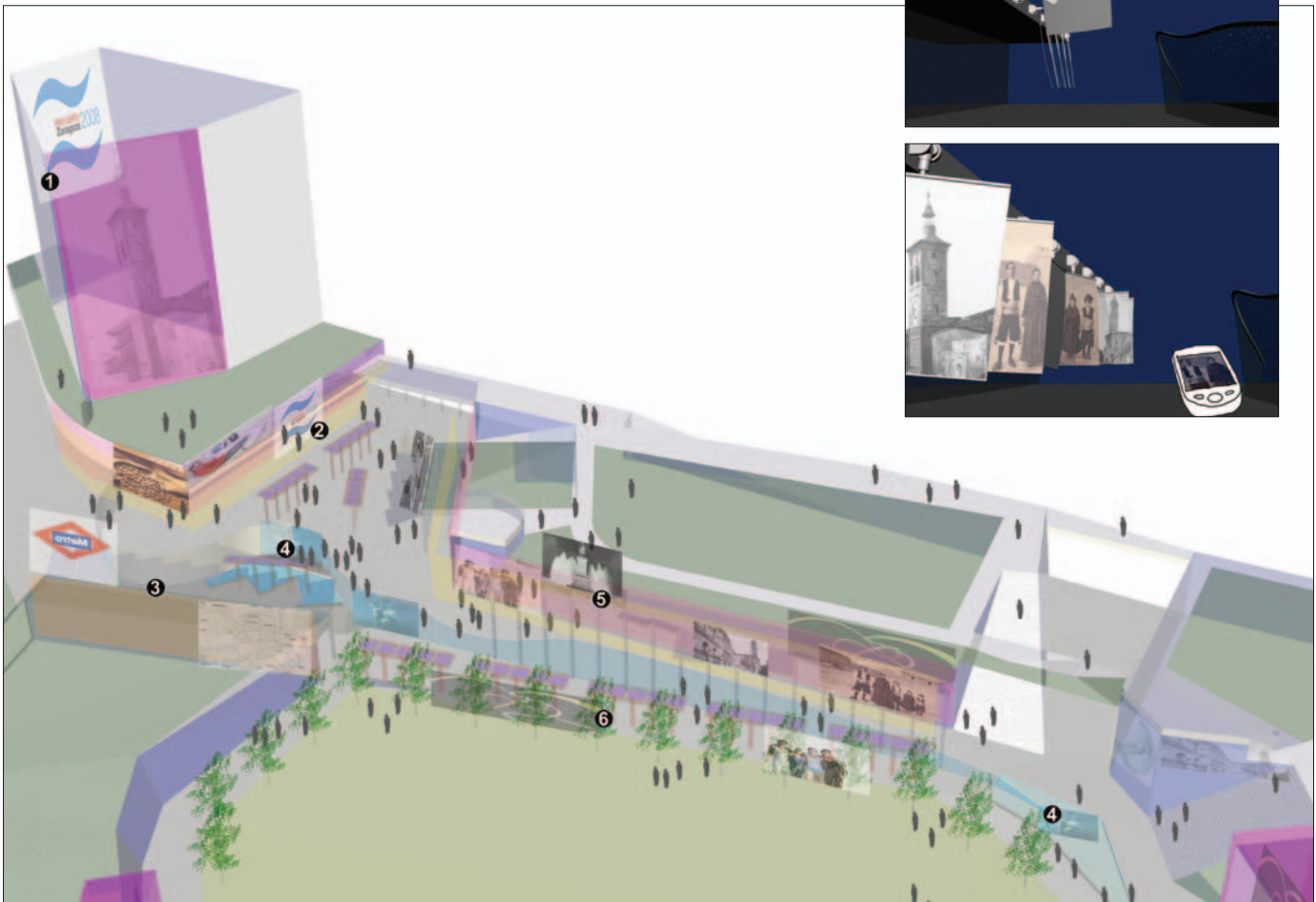
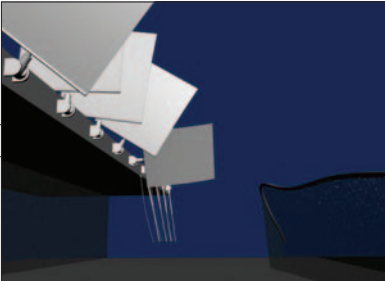
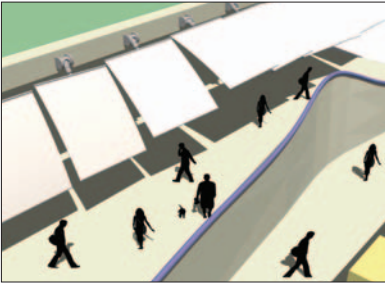
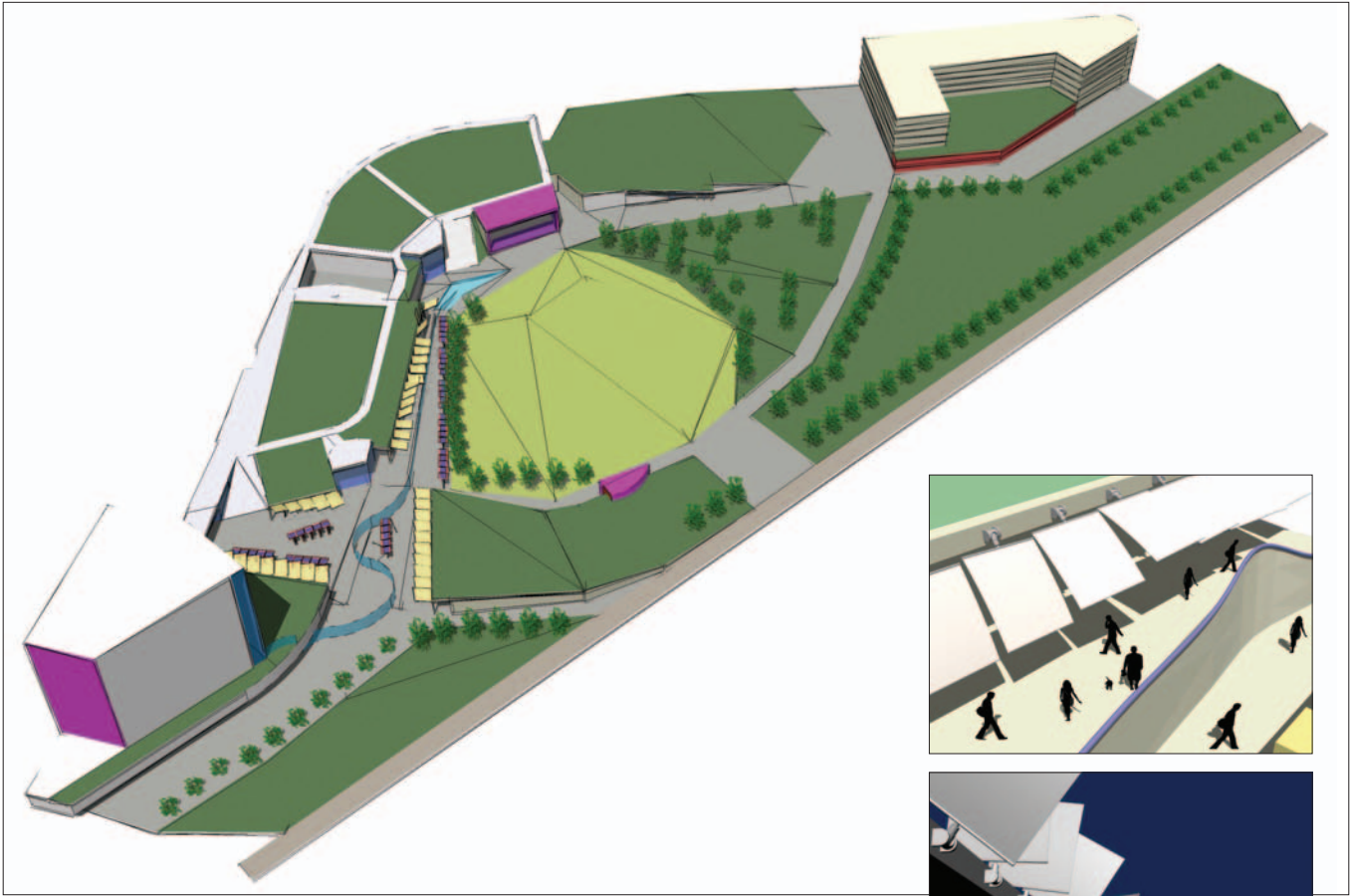
or modify spaces along the edges of buildings, paving that reflects patterns of use, a “waterwall” that responds to ambient conditions and human interaction, and urban light pixels that delineate the edges of space.

A Neighborhood Place

The proposed spaces at Portillo and Almozara illustrate how physical and digital elements can come together to make new kinds of urban places.

Portillo is one of the most historic and culturally significant locations in the city, at the eastern gate of Zaragoza, once protected by the Aljaferia. It is also the site of the former train station, surrounded by a dense fabric of historic apartment buildings, hotels, factories and offices. Political negotiations over its future were contentious, with many interests claiming that their needs should be met there. The challenge was to create truly useable spaces that could serve different constituencies—neighborhood residents, school children, Aljaferia tourists, working commuters, and other Zaragozans—at different times.

To satisfy this competing collection of needs, the design calls for Portillo to be primarily a neighborhood park, but to also include extensive public facilities, a private office



tower, and residential development. The project will accommodate passive recreation, organized sports, playgrounds, a community center, a citywide performance and meeting venue, and the Museum of the Mile, which will engage school children and their parents with digital culture. It will also be the location of a new subway and bus station.

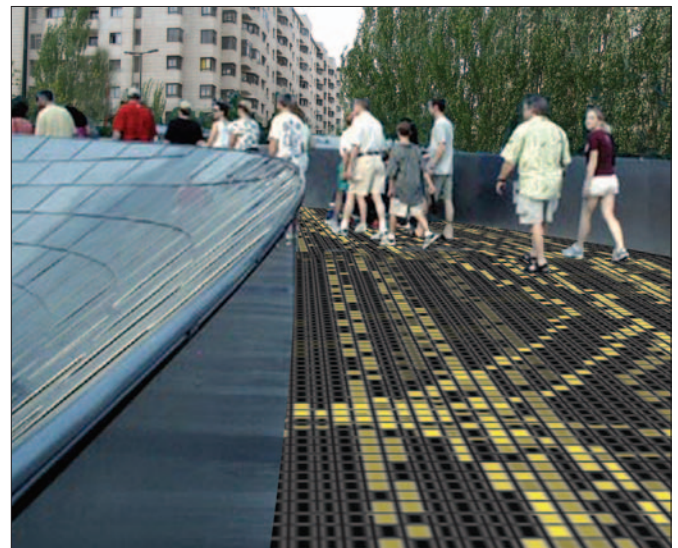
All these uses will be accommodated through an innovative design that layers activities vertically within a constructed landscape. Along the northern edge of the site, the museum, community center, and a multiuse pavilion will be situated partially underground so that functional green spaces can flow up and across their vegetated roofs, providing more park area. A lawn at the center of the park will slope gently downward toward the edge of these facilities, where a promenade will be created. This edge will be a place of transition where people can stroll, and where different uses can spill out of the buildings onto the sidewalk. Along the promenade, paths of movement intersect at a key place between the office tower, museum, and subway entrance. This space is linked to the Aljaferia and overlooked by the upper levels of the rooftop park, creating a prime location for social activities and media. We envision a humanly scaled digital place where people can move to and from the subway, sit at outdoor cafe tables, watch kids playing in a fountain, view shows about Zaragoza, monitor the functions of the city, and dance on Saturday evenings.

Different activities would be nurtured by a responsive setting that will include digital awnings that can move in various directions, providing shade, dividing spaces for outdoor activities, or becoming surfaces for projection; programmable waterwall fountains that can respond to the people around them; memory paving that can sense and illuminate paths of movement; and display surfaces incorporated into facades and furniture that can be accessed by users.

These features may come into play in different ways at different times to make a gentle but highly responsive space. It might, for example, change with the weather, time of day, or nature of users; or its content might be designed by artists or school children experimenting in the museum, or by guests from the Web, anywhere in the world.

A Regional Place

The complement to Portillo is Almozara, situated across from the high-speed rail station. Almozara will be one of the most prominent sites in Zaragoza, visible to incoming traffic from Madrid, train and bus patrons, and virtually every visitor to the Expo 2008 site. The opportunity exists to create a powerful gateway to Zaragoza at this location, providing a new image for city.



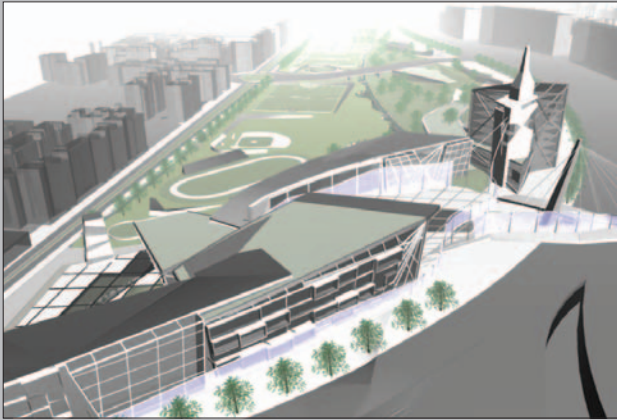
Above: Portillo: Memory paving uses digitally responsive ground surfacing to record footfalls of pedestrians, displaying how pathways are reinforced by multiple trips. Luminescence accretes into lines and spaces: one passage would be invisible; multiple passages would be rewarded, encouraging pedestrians to examine pathways and try new ones. Images by Rajesh Kottamasu.

Opposite Above: Portillo: The site, top, features a sequence of open spaces surrounded by digitally mediated facades. Images by Michal Stangel.

Opposite Below: Digital space, bottom, incorporates media into pavement, wall surfaces, building edges and street furniture to create a layered, responsive environment. Images by Michal Stangel.

Opposite Inset: "Digital awnings," right, moveable screens that accommodate different images, uses, and audiences. Images by Michal Stangel.

Research into Digital Places



The use of digital media to enhance public space has been an expanding research agenda of MIT's City Design and Development (CDD) group in the Department of Urban Studies and Planning, in collaboration with the Media Lab's Smart Cities group, the Center for Real Estate, and the Department of Architecture. Such collaborations are essential, since the topic of digital space is inherently interdisciplinary.

Research on the Digital Mile has drawn on earlier work at MIT, including: *Urban Narratives*, a study of how digital media can help in "making the city speak"; design of the Seoul Digital Media City and Street, in Korea, featuring intelligent building facades, signage, and pedestrian spaces (<http://dmc.seoul.go.kr/english/index.jsp>); *Event Places*, which studied programmable spaces across the U.S. and Europe (*Places*, Vol. 16, No. 3, Fall 2004); and *New Century Cities*, an international symposium on digital place-making and development. (<http://mit.edu/cre/research/ncc/symposium.html>).

The Digital Mile project was led at MIT by co-principal investigators Dennis Frenchman and William J. Mitchell. Faculty included Michael Joroff and Carlo Ratti. Research Assistants were Daniel Berry, Rajesh Kottamasu, Francisca Rojas, Susanne Seitinger, Andres Sevtsuk, Pryanka Shah, Michal Stangel, Matt Trimble, Jacob Wegmann, and Albert Wei. The research was funded by the City of Zaragoza under direction of Jose Carlos Arnal, Assistant to the Mayor, and Ricardo Caveró, City Councilman and Director of Technology.

The Advisory Committee for the project includes William J. Mitchell (Chair), François Bar, Manuel Castells, Dennis Frenchman, Peter Hall, Pekka Himanen, Michael Joroff, Veronique Kleck, Guido Martinotti, and

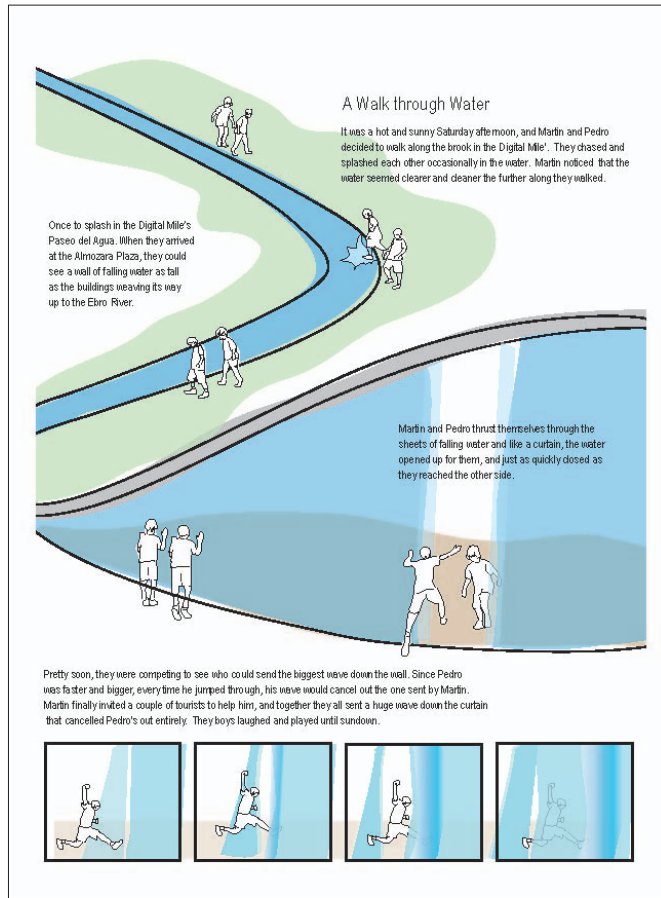
In this context, the design imagines physical and digital elements that combine to play a more assertive role, defining an image for Zaragoza within its traditional vocabulary of form. Most dramatically, a system of waterwalls will extend for a thousand feet in front of buildings and across the pedestrian bridge, its scale making it visible to speeding cars on the highway. The system will be fed from a landmark water tower, which will collect and cleanse storm runoff from the roof of the rail station and from nearby highways—utilizing a wasted resource that now flows untreated into the Ebro. Originating from the tower, the waterwalls twist and dive, capable of displaying patterns or images and defining three-dimensional space, and providing an urban design element like the great fountains of Rome or a Christo installation.

Regional development at Almozara will include a business center, high-tech offices, research facilities, and the Aragon School of Media Arts and Sciences. This new institution will provide instructional space for students and living/laboratory space for professional artists. The school is envisioned as the centerpiece of the Digital Mile, bringing the city's long tradition in the visual arts and higher learning together with digital technology and culture. Students and faculty there will also play an important curatorial role by helping program the open-source media along the Mile. The building itself is one of these elements: its studios will face the train station and oncoming traffic, providing artists an opportunity to orchestrate digital displays.

These facilities will define a unique event place at Almozara—at the crossroads of commuters flowing to the station, visitors moving to the river along the Paseo del Agua, and residents making use of parks and recreation facilities. The physical place will be surrounded by galleries, meeting and exhibition spaces, and waterwalls on three sides, allowing it to change form and texture. As such, it is envisioned as a digital showcase, an extension of the School of Media Arts and Sciences, and a venue for experimental installations of environmental art.

Above: Almozara: Proposed gateway to Zaragoza, showing bridge, tower and plaza. Waterwall moves through and defines space: passing by School of Media Arts and Sciences, lower left; visible from highway, lower right. Image by Albert Wei.

Opposite: Scenarios such as these helped to visualize the potentials of digital space: water and graffiti walls. Images by Rajesh Kottamasu.



Thoughts about Urban Design

The framework for the Digital Mile proposed in the research has now been adopted by the City of Zaragoza, and the first digital space will be constructed at Rivergate, the main entrance plaza of Expo 2008 along the Ebro River. Further development of the Digital Mile will follow.

Several observations can be made about the project as an effort to combine physical and digital place-making. First, the exercise drew upon many individual experiments being made by other designers of architecture, landscape and the city, including efforts to create narrative spaces, green roofs, and digital displays of one kind or another. These elements fit together with surprising ease in the Digital Mile plan, leading us to believe that they represent different aspects of an emerging paradigm for urban public space. In this paradigm, buildings, landscape and media lose their traditional boundaries and meld into a layered cityscape of fine-grained places, visual images, and multiple shifting activities.

In some cases, like Almozara and Portillo, the develop-

ment may be quite dense; but it is still layered, serving multiple groups with changeable places that are both urban and “natural” at the same time. This fabric is inherently more sustainable than traditional development, with less runoff and more efficient use of land and energy. And it is potentially more livable, allowing opportunities for recreation, learning, living and working to exist in close proximity.

Finally, we discovered there were opportunities for great beauty in the system. The simple devices proposed for the Mile, when taken together and animated through “open-source” software, offer an extraordinary organic quality, responding to light, people and events with subtlety and imagination. They provide the basis for a new kind of public realm.