MICRO
PUBLICPLACES

Situated Technologies Pamphlets 6:
MicroPublicPlaces
Hans Frei and Marc Böhlen

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THE ARCHITECTURAL LEAGUE OF NEW YORK
SITUATED TECHNOLOGIES PAMPHLETS 6

HANS FREI AND MARC BÖHLEN

ABOUT THE SERIES

The Situated Technologies Pamphlet Series extends a discourse initiated in the summer of 2006 by a three-month-long discussion on the Institute for Distributed Creativity (IDC) mailing list that culminated in the Architecture and Situated Technologies symposium at the Urban Center and Eyebeam in New York, co-produced by the Center for Virtual Architecture (CVA), the Architectural League of New York and the IDC. The series explores the implications of ubiquitous computing for architecture and urbanism: how our experience of space and the choices we make within it are affected by a range of mobile, pervasive, embedded, or otherwise "situated" technologies. Published three times a year over three years, the series is structured as a succession of nine "conversations" between researchers, writers, and other practitioners from architecture, art, philosophy of technology, comparative media studies, performance studies, and engineering.

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FROM THE EDITORS

In this volume of the Situated Technologies Pamphlets Series, Marc Böhlen and Hans Frei propose a unique confluence of public architecture and information systems that they term MicroPublicPlaces. Beginning with a critique of the current state of the public realm, they follow two trajectories: one through Hannah Arendt's *"vita activa"* and Bruno Latour's *"dingpolitiks"*, and another through the history of information and computation technologies. Through the former they establish an understanding of the "public" as a space of difference that is held in common, while through the latter they formulate an infrastructure that could support such a contestable space. This leads them argue for a new public realm built on specific architectural programs (water purification plants, zoos, kindergartens, repair shops, chapels) and adaptive learning environments that initiate collaborative relations between people and machines. Their goal is to foster a manifold public through the participatory structures of MicroPublicPlaces.

The idea of participatory design facilitated through communication and computing technologies is not new. Reyner Banham, Yona Friedman, Nicholas Negroponte and Herman Hertzberger have argued in various ways for democratizing the design process. Their arguments have hinged on the idea that the inhabitant is best positioned to decide the design of their respective lived spaces. Architectural expertise and vision can only get in the way of individual expression and freedom. Not surprisingly their critiques have been directed specifically at the design of domestic architecture. Böhlen and Frei take a refreshingly different approach. They address public architecture exclusively (city halls, zoos and schools) and exclude houses and housing entirely from their consideration. This allows them to take Latour's "parliament of things" at face value, allowing projective vision, iconography, expert knowledge, as well as collective participation to openly engage in a dialogue through architecture. MicroPublicPlaces propose an "expanded solution search space" rather than a single solution. They postulate a truly participatory architecture that doesn't fall prey to the "tyranny of choice."

Omar Khan, Trebor Scholz and Mark Shepard

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PREFACE

The text you are about to read is a travel journal, a description of a trip by two minds combined into a single story. One thread will lead you back to ancient Greece to revisit the original political meaning of the public realm. The other will move in the opposite direction and seek a new interpretation of information technologies as resource for a 21st century public realm.

Although we set off in opposite directions, we eventually landed in the same place where the public realm is organized along new principles —where information is understood as a resource and technology is a collaborative effort between people and machines. MicroPublicPlaces are a first, and admittedly incomplete, result we can offer.

Hans Frei, Zürich
Marc Böhlen, Toronto/Buffalo/Zürich
November 2009

In 1999 the artist Hans Haacke placed the inscription "DER BEVÖLKERUNG" (To the population) in the courtyard of the German Parliament in Berlin. It was a provocative contradiction to the old inscription "DEM DEUTSCHEN VOLK" (To the German people) still visible on the building's frontispiece.

What if Haacke had dedicated the building "To the public"? Who would it have addressed? Perhaps an anonymous mass that includes tourists (for whom, in fact, the spiral ramp inside the new, Norman Foster-designed cupola was built)? Or to the contrary, would "public," be considered a challenge to the ongoing privatization of the public realm?

Two meanings of the word "public" frame the dilemma we explore here. While we must accept the fact that the public realm has become increasingly phantom-like, we need that realm—particularly in a globalized world—as a contested space in which the differences between people are held together by that which is common to all. The dilemma cannot be solved by the continuous expansion of public institutions. Their size is in fact part of the problem rather than the solution. Instead, it is necessary to return to the origins of "public" as a site where differences are assembled.

1 Arendt's Polis

There are activities that belong to the private realm and others that belong to the public realm. In our daily lives we shuttle constantly between the two, and there are more or less fixed limits that separate and regulate movement between them. The introduction of private concerns into the public realm has long been a well-proven tactic for influencing political debate on power and emancipation. And, of course, as Luis Buñuel has shown us, *The Discreet Charm of the Bourgeoisie* actually depends on deliberately upsetting the distinction between private and public.

That distinction is the subject of Hannah Arendt's grand historical narrative, *The Human Condition* (1958). One can see it as a categorical reply to Martin Heidegger's epoch-making *Sein und Zeit* (1927), written when Arendt was his student and mistress. What thinking is to him, acting is to her. While being as such is of interest to him and "human being" therefore is subjected to the general conditions of being, Arendt understands "human being" as a being among humans, that is, as a being in public.

Arendt's point of departure is the ancient Greek city—the *polis*—in which citizens moved between two distinct orders of existence. There was the private household carved from the world, like a clearing in the woods, through hard work and the production of tools essential for survival. While all household clearings were seen as equal from the outside, their internal structures were organized in a strictly hierarchical manner. Only the master of the household—not women or slaves—was allowed to leave this realm of necessity and pursue, together with other citizens, the kind of political activity par excellence that Arendt calls "action." In contrast to private labor and work, action is the only activity "that goes on directly between men without the intermediary of things or matter" (7). Thus it was through action rather than through work or labor that the ancient Greek citizens expanded the scope of their polis. While the private realm was dedicated to guaranteeing the livelihood of each individual, the public realm was reserved for the creation of a world "that gathers men together and relates them to each other" (55). In the first case human beings were surrounded by the world, in the second the world was between them; or as Arendt writes, "To live together in the world means essentially that a world of things is between those who have it in common, as a table is located between those who sit around it; the world, like every in-between, relates and separates men at the same time" **(52)**.

The public realm of the Greek polis was bound neither to a specific place nor building. It could be anywhere within the polis, between private households and was characterized by antagonism rather than conformism. It was a "space of difference" **(Kristeva)** held together in the middle by that common to all; a field of competition where the "fiercely agonal spirit" **(Arendt, 41)** of each citizen was focused on the public good rather than private interests. Without the things in the middle, "worldlessness" **(52)** would spread between them, and the world would be reduced to a mere sea of senselessly moving matter. In that case it would be like two people sitting opposite each other, "no longer separated but also . . . entirely unrelated to each other by anything tangible" **(53)**.

For Arendt the tragedy of modern man, the "'withering away' of the whole public realm" **(60)**, was set in motion by what we call progress. For progress has proved unfortunate for human beings, if one understands being human as a being among humans. The more people conform

to the dynamic forces of progress, Arendt feared, the less they will be willing to tolerate people who behave differently (40). And that in turn will also make them less willing to act in concert. Instead the emancipation of the individual would be increasingly measured by economic growth and technical progress.

These days, private interests prevail over public concerns. The state is organized like a gigantic household in which the role of the public realm—as pointed out by Habermas —is limited to opposing authority. Accustomed to speaking of the public only in the plural, the public realm appears to us like the hustle and bustle of a carnival. Every difference, whether it be of a sub-personal or transnational dimension, has the right to a public hearing. That no one limits either access or mobility to others is the crucial prerequisite to such cultural relativism. As Søren Kierkegaard—whose writings Arendt knew "quite well"—wrote in the mid-nineteenth century, the public has become a "phantom," "a monstrous abstraction," "an all-embracing something which is nothing."

But the public realm described by Arendt is cut from a completely different cloth. It is the site of collective performance that brings together those who are different from one another precisely because they are different. Thus with the rise of particular and compliant publics the question of the public (in singular) must be replanted. What is common to all is of great importance to a multicultural society. The collective that acts in the public realm is not a uniform entity such as a class, a nation, or a mass. What brings people together here is exactly what separates them from each other; in other words, according to Arendt, the public realm is like parentheses that hold together the differences between people.

Arendt's theory is still relevant in the current debate on the public realm because she insists that it is of universal significance. While her model may be neither democratic nor politically correct (it would be unfair to judge historical facts using today's criteria), it is perfectly justifiable to elevate the historical conditions of a rather small elite to the category of universal relevance. If we take the declaration of human rights seriously, the Greek model is indeed compelling. Implementing these rights, however, would not signify erasing the differences between people, but rather constructing from them a collective that merits the title "public."

2 Latour's Thing

To restore to the public realm the status it once had according to Arendt, we have to go back, not in time to ancient Greece, but to reality, or as Bruno Latour puts it "back to things" (2005: 13). Compared to Arendt, Latour's approach is more pragmatic (Greek: *pragma*, the thing). While his thoughts on "the public" primarily address the problems of today's mass society and are strongly influenced by the American political philosophers Walter Lippmann and John Dewey, he ultimately defines the public realm "of things" as Arendt did, as a contested space ruled by antagonism rather than by conformism.

According to the Oxford Dictionary, the word "thing" originally meant an assembly or a court —the "Thingstätte" or the "Ting"—as well as a cause or a matter of concern brought before a court or discussed in an assembly. Only later did the word take on the current meaning of an ordinary material object.

A combination of these different meanings of "thing" gives us a signification diametrically opposed to that of the term "object." An object stands out because of the unshakeable obstinacy of its factuality. It is considered perfect in itself, self-contained, and independent of the bad or good intentions of anyone who makes use of it. The owner of the object is also the owner and master of its properties.

In contrast, a thing defies ownership. One can only take part in a thing, as for example one takes part in a court hearing or a soccer game. It is not possible to separate matters of fact—like the weight of a ball—from matters of concern—like the control of that ball. Things embody human matters of concern as well as physical matters of fact (2004: 231); they are the product of negotiations on their manufacture, use, and disposal.

It is the power of assembly that constitutes the quintessential quality of a thing, and precisely the quality Martin Heidegger found missing from technical objects. Emphasizing the specific quality of things, in his lecture on "Das Ding" ("The Thing"), Heidegger spoke for over an hour about an earthen water jug and how it is capable of "gathering together" earth and sky, divinities and mortals.

Following on this theme, Latour asks why one shouldn't transfer Heidegger's respect for things to technical objects (2004: 233). Even a simple

Coca-Cola can embodies more aspects of being than Heidegger's water jug—from the exploitation of natural resources, to energy consumption, marketing strategies, global retail networks, product placement, and the politics of recycling. It implicates everyone from the ordinary worker eating his lunch to the demigods of the Olympic Games.

One only has to take a closer look to realize that technical objects have always been things in the original sense of the word, merely concealing their complicated networks of relationships under smooth and perfect surfaces. Confronted with things like cars, nuclear reactors, baby milk, mobile phones, etc., we are forced to acknowledge "external" forces that exist within things. So Latour writes with good reason, "What the etymology of the word *thing* . . . had conserved for us mysteriously as a sort of fabulous and mythical past has now become, for all to see, our most ordinary present" **(2004: 236)**. Moreover, in a globalized world, things—including the accidents they cause and their potential misuse—connect us more than kinship, identity, or territory **(2005: 4)**. We have become cosmopolitans gathered together by things rather than by nationalities.

Therefore, a return to things does not require a revolution. The materials for the "building of public life" are already present **(2001: 232)**. But without a plan for how to organize them, they make no sense. Things lead nowhere if their inherent publicness is not made explicit. The new public realm needs a constitution so that all potential participants know how to present their concerns. And it needs a place—not necessarily a monumental structure—at which representatives can come together and act in concert.

The Greek model is no longer an option, because action cannot be left to small elites. Latour suggests instead what he calls "Dingpolitik" **(2005: 4)**, by which he means a Western-style democratic parliamentary system, but assembled around things. If things are assemblages, then they can be seen as the basis for assemblies of those who represent the relevant facts and concerns. *Making Things Public*—the title of an exhibition he organized with Peter Weibel in the ZKM in Karlsruhe—is for Latour making inherent diversity the subject of public mediation. What Arendt saw in the Greek polis, he sees in the "parliament of things": the birthplace of a public spirit understood as a search for what is common to us all **(2001: 289)**.

As with any parliament, the question of representation is crucial here in two respects. On the one hand the question is: who is represented, who is allowed to present his or her concerns? In regard to things it is not easy to find a satisfying solution, especially because it entails giving the power of representation not only to humans, but also to the nonhuman world. Fortunately, scientists have developed enough instruments to give speech to the speechless. In order to meet all demands, the composition of the "parliament of things" must be continuously called into question; old representatives must defend their claims, while the petitions of the new must be consistently taken into consideration. As Latour writes, "The point of reviving this old etymology is that we don't assemble because we agree, look alike, feel good, are socially compatible or wish to fuse together but because we are brought by divisive matters of concern into some neutral, isolated place in order to come to some sort of provisional makeshift (dis)agreement" **(2004: 13)**.

One should remember here that Arendt speaks in a very similar way of the table—that is the world of things—around which people gather. Gathering together differences is more important than forming a perfect unity.

The major hazard of modernism was—and still is—keeping the number of representatives small enough to reduce the degree of entanglement and arrive at conclusions efficiently. A recent example of such a perpetuation of the modernist attitude can be found in the essay "The Politics of the Envelope" by Alejandro Zaero-Polo. He mobilizes the usual aspects that make buildings systems more efficient, instead of making them self-reflexive by taking into account the building's impact on the local context.

The question of who represents the public realm is, on the other hand, a question of how the public realm should be represented. Just as the polis represented the ancient Greek concept of the public realm, Dingpolitik needs a localization that represents its particular version of the public, in order to speak, gather together differences, and act in concert. In this respect, Latour provides a great deal of practical examples of how artists, economists, natural scientists, and sociologists are accustomed to representing the results of their work.

Contemporary cities don't resemble the Greek polis. Rather, they are gigantic households in which private matters take on public relevance.

Under such circumstances it is hard to find a place to represent Greenland's glaciers or the migration flows from the South, or, for that matter, any form of the avant-garde. But we know for sure that the local problems can't be solved without taking into consideration global warming, global migration, and time battering the earth. How do we give them a voice?

One possibility for addressing this dilemma is to rethink the public realm. One can imagine it as something holding gigantic households together as cities and nations; no longer a specific place in-between as in the Greek polis, but rather connected through networks. Just imagine public institutions as Thingstätte and sites of direct democracy applied to our globalized world. From this networked condition would emerge new building types that facilitate new relationships among participants, alternative uses of technical media, new links between the local and the global, between human experience and machine knowledge, real and virtual resources, reality without speech and speech without reality. They are laboratories for experiments on the construction of public spirit rather than public department stores we know can be easily looted. In so doing we would attempt a redefinition of a school, a prison, a zoo, a hospital: places where public goods such as education, security, environment, health, etc. are produced by a manifold public (in the singular).

Of all the art-forms and technologies currently in circulation, architecture and information technology have something particular in common. Architecture is the most public of the arts and information technology is likely also the most public of technologies. But not all aspects of living are equally amenable to the dictates of technical logic. Giedion pointed this out in *Mechanization Takes Command,* suggesting that we "discriminate between the spheres that are fit for mechanization and those that are not".

The market economy has shaped our approach to perceived personal needs for technical novelty with great success. Computers, mobile phones and the networking technologies that make them work effectively, merge with ease into the demands of the everyday. It comes with no surprise that the *Century of the Self* **(Curtis)** preceded the *ME++* society **(Mitchell).** Unfortunately, ME++ leaves us unprepared for considering the possibility of a *WE++* future.

The following sections glean from the history of the information age what we need for the design of an alternative public. It formulates the technical requirements of an infrastructure upon which a network of things can be constructed. As a condensed tale of our digital era, it is told with twists and a new emphasis on the potential of change through adaptation and learning, love, longing, fear, health, education and death in the age of shared resources and endless learning systems.

1 Resources

If urban life still matters in the 21st century, then we must understand the boundary conditions that information technologies create for the design of cities. Infrastructure sets the stage for this not only in pipes, ducts, wires and antennas, but in opportunities to rearrange resources we all need. This discussion of physical infrastructures is not another celebration of the advantages of wired life but rather an attempt to find viable entry points from which to rearrange infrastructures for a new public beyond business opportunities. The issue of infrastructure far exceeds the cables, repeaters, gateways and routers, configured for neutrality or not, that constitute communication infrastructure **(Bar, Baer, Ghandeharizadeh, Oronez).**

Water, sewage, gas and electricity (WGE) constitute the infrastructural foundation of urban life in the 19th and 20th centuries. Today, sensors,

software and connectivity (SSC) build a new layer on top of and next to the WGE system. Dams are monumental while mobile phone towers blend in with other urban rooftop junk, making the new infrastructure far more invisible than its predecessor. Invisibility is in many ways paradigmatic of this second infrastructure. Contrary to the WGE infrastructure often housed in representational buildings, SSC is designed to exist in the background.

None of the new infrastructure renders the older obsolete. Not only does SSC need the water and electricity delivered by WGE, but it adds additional demands on it. Exploding numbers of power hungry gadgets consume more and more electricity, making the construction of even more power plants all but inevitable. The two systems, WGE and SSC, have become intertwined and mutually dependent. Hydroelectric power is piped via computer control to wherever it is needed. The electric grid, in turn, is becoming adaptive to varying energy needs. With the transportation and waste disposal infrastructure, they build the back bone of large scale postmodern hardware. Far from being restricted to compromising comfort, blackouts and water shortages show us just how fragile infrastructure-heavy civilization can be.

This infrastructure mix defines the matrix of possibilities from which the city of bits and atoms can constitute itself. The flows that emerge are only separable on paper; spaces of place and flow **(Castells)** mix to exciting cocktails that belie their simple ingredients. While noticeable even in one's own home, it becomes viscerally noticeable in international airports, the cathedrals of post modernity **(Stalder)**.

2 Data

Today, many people are more likely to check their gps-capable mobile phones than the stars in the sky for orientation. More than ever, we experience our world though sensor enabled gadgets. Sensors replace lost skills, introduce new one and always remind us of the other worlds we have no access to.

Our primitive senses no longer suffice for critical intellectual navigation in an age of synthetic design. Magnetic flux, infrared waves, ultrasonic sound are just a few of the worlds closed to our primitive sensory organs. Beyond expanding our own sensory perception ranges, sensors change our temporal orientations. They do not tire, do not blink and do not need rest. Combined with mesh-works they can span large distances to become all perceiving. A dumb weather buoy that blindly collects air temperature data at a fixed location can become, when linked with other buoys, an integral part of a storm tracking system dispersed across the oceans **(Kington and Selinger)**. Or the isolated video camera with a limited field of view can, when networked with others, become part of a phalanx of surveillance cameras able to track people as they walk through the city **(Chandra and Flynn)**.

In contrast to the relative ease with which software and hardware can scale is the difficulty of storing data. While short term storage has become un-problematic, long term storage defies solution. Even archival quality compact disks are expected to last less than 100 years (The Optical Storage Technology Association). The best alternatives, such as *Potshards* (Protection Over Time, Securely Harboring And Reliably Distributing Stuff) **(Storer et al.)** and Lorie's *UVC* (Universal Virtual Computer) require data to migrate from one system to another, relying not on the temporal stability of a material carrier such as granite, but on the persistence of data transmission protocols. Maintaining the longevity of digital data has become a Sisyphus task of continuous data rearrangement, moving bits from one soon obsolete system to the next, with no end in sight. Eternity has now become procedural.

But sensors, the data they generate and the way they are represented are meaningless without a way to access them. From the very start of the evolution of computing, the detailed rules that organize the flow of bits have defined what the accumulated data can and cannot represent. Indeed, the flow itself signifies, as bit position matters far more than bit value. The sequential notational markings themselves create in turn the basis for imagining, mathematically and philosophically, as Badiou shows in *Nombre et les nombres, the idea of Number,* and provide counter-intuitive materiality to the vaporous metaphor of the digital bit.

Flow and sequence are the default structure of data. But only structured data makes the flow accessible and hence searchable. Structures simple and complex are the first line of intervention into the flow of bits. They are the first alteration of the data's raw state. The *algorithm* is the processing equivalent of data structure, the first line of manipu-

lation of events and setting of commands. The term structure is not rich enough really to do justice to the significance of arranging data, making it available and giving it presence—*curating* data would be more appropriate.

With curated data the algorithm morphs, as Wirth noted, to the program, the most recognizable element of the computer. Programs specialized for finance, document processing, photo and video management constitute, in turn, the amorphous conglomerate software, now a medium in its own right. Software is disrupting in the sense that is serves one purpose and creates new ones in its (modified) use. Also, software construction can scale from small domains such as managing personal photos to large domains such as managing the flow of foods across the globe. And it scales across the user base, from solitary actors to coordinated actions of many individuals. As such, software is a means by which structures can be produced.

The malleability of software makes it brittle, but also other-worldly. Being one and another while able to emulate any version of itself made Turing call his concept computer a universal machine. While fundamentals are very out of vogue, as far as computing goes, quantum computing is universality par excellence. At least in theory, quantum computers would be able to simulate with arbitrary accuracy the behavior of arbitrary physical systems **(Deutsch, 2004)**. But how this might work in our world is still largely unknown **(Deutsch, 2002) (Flachbart and Weibel)**. There is no need to wait for quantum computing for urban informatics. The dualism (particle-wave, it-bit) at the heart of quantum physics is part and parcel of built systems. Despite the best efforts of architects, the inside is never really separated from its environs.

Ontological quantum extravagance aside, virtuality is integral to current computer technology. In engineering jargon, virtualization refers to the abstraction of computer hardware resources. Virtual memory allows uniform and contiguous addressing of physically separate and non-contiguous memory and disk areas. Storage virtualization completely abstracts the logical data storage from its physical storage. Likewise network virtualization creates an abstracted network addressing space across network subnets. This inherent capacity to be many things, to span time and space, allows software more than other forms of infrastructure to be commandeered for special purposes. And these special purposes are not always benevolent. Hindu extreme nationalism, for example, is strongest not amongst the poor, but amongst the professional classes, the software engineers, lawyers and scientists; the educated networked class with easy access to (manipulated) information **(Kaplan)**.

3 Networks

The isolated computer is one thing, but the networked computer is another. Indeed, as foreseen by John Gage **(Riske)**, the network has become the computer. As we expect water to flow from an open faucet and electricity to be available from every outlet, we now expect the ever-updated archives of the Internet to be available at every corner of the world. Provided we have access. And access requires not only servers, routers, opto-electric transmission and wireless hubs, but codes and passwords. New city walls have been erected around us.

Networked computers and the dynamics that emerge from them are in turn dependent on infrastructure. Computer protocols for the exchange of email and transfer of files have been optimized for efficient transport of data. At the same time, protocols constrain what can be shared amongst computers and the people who have come to rely on them. And reliability is the raison d'être of networks. Paul Baran's early vision of packet switched communication was born of the hope for survivability from nuclear attack. Baran understood that the most reliable network was the one that had no central control or administration, one that had many ways of routing messages through a network. Redundancy was the key to his vision of reliability, and Baran recognized the potential of digital technology to deliver this robustly and cheaper than competing technologies such as microwave. Redundancy also improves the ability to learn. Developmental psychologists have determined that *intersenory redundancy* **(Bahrick and Lickliter)**, the combination of information from two separate sensory modalities, facilitates infants' ability to direct attention to events convened through multiple sensing modalities, as in hearing a hammer hammer and watching a hammer in action at the same time.

The network of networks and infrastructure *pure,* as it were, is today what we call the *Internet*. If identity or territory defines what is shared by the people of a nation, then the all-encompassing technical matrix

of the Internet defines what is common to people online. And this generates its own form of public realm, albeit a strange one. Each computer terminal is now a public stage and a market place. Each node is cultivating its own little garden, marked on the map of the matrix in the same manner as the node of an international corporation. Just as in urban junkspaces **(Koolhaas)**, there are no contested spaces on *Facebook*, *Flickr* and *Twitter*. Nobody has an idea of what public means beyond the exhibition of personal desires and identities. As Kazys Varnelis writes at the end of Network Publics: "All the while, whether network culture plants the seeds of greater democratic participation and deliberation, or whether it will only be used to mobilize already like-minded individuals, remains an open question." Online, everything is public, everything can be seen (and known)—nothing but the technical matrix behind the Internet is shared by all.

Only in affluent parts of the world can one take infrastructure for granted. That holds for water and networks alike. Luckily, lack of one form of infrastructure can sometimes be compensated by excess in another. *HachCache,* a caching method developed by Pai and colleagues makes data access easier where network bandwidth is compromised. Not only does the system reduce bandwidth needed for frequently accessed data but it reduces the amount of electricity required to do so by diligently moving the web data directly onto a computer's hard disk in lieu of the more energy demanding random-access memory. The clever infrastructure swapping allows *HachCache* to work even with outdated computers. And in some parts of the world, such as the *Kokrobitey Institute* in Ghana and *Obafemi Awolowo University* in Nigeria where the system is being tested **(Talbot)**, old computers and shoddy connectivity is the state of the art. But shoddy network infrastructure has its price. Global Internet companies are losing revenue in Asia and Africa where people hungry for video stress the insufficient bandwidth available to them. *MySpace,* for example, is testing a stripped-down low bandwidth version of its services that is less expensive to display. It is called, euphemistically, *Profile Lite* **(Stone and Helft)**.

Finding ways of dealing with compromised (information) infrastructure is even becoming a prerequisite to doing useful work at all. The international nonprofit organization *InSTEDD* **(Kass-Hout and Tada)**, for example, helps communities in remote locations identify infectious diseases. InSTEDD makes use of adaptive mobile phone based information sharing and machine learning to recognize infectious disease patterns in the Mekong Delta where a patchwork of technologies, including ham radios and oral communication, augment spotty mobile phone coverage.

Sooner or later, connectivity will be common place and making sense of the masses of data will irrevocably move into the foreground. In that regard the future is here. Virtualization has made computing heavenly, cloudy, actually. And on-demand cloud computing simulates physical computers so well that one can run any kind of software in the clouds without noticing that the calculations themselves no longer take place on the desktop but in remote data centers. The once powerful personal computer has been demoted to a dummy terminal, and the music you download from the cloud onto the device formerly known as your personal computer, will never belong to you. While the accents of workers at telephone response centers still make the occasional customer call a trip to a different part of the world, cloud computed calculations go global unnoticed. Socially and computationally, economies of scale seem to benefit cloud computing for now. This software service model is big business, growing in leaps and bounds, and occasionally stumbling along. Many of the major players in cloud computing have experienced *snafus* of significant proportions **[1]**. Still, terabytes of data residing on thousands of servers are processed with data association models such as Google's *MapReduce* and *Hadoop* **(Dean and Ghemawat)** at global data collection companies all over the world. Your casual web surfing is being recorded with or without your consent. And the personal electronic bookshelf you might pride yourself with if you have a networked eBook redefines the idea of owning a book. Recently the maker of the *Kindle* "synchronized" a few problematic e-book entries **(Stone)** and made George Orwell's 1984 disappear from customers' eBooks into the very incineration chute aka "memory hole" described in Orwell's text. Just like that.

4 Intelligence

What kinds of thoughts occur in the machines that perform these elaborate operations? Is this intelligence? Despite claims by some computer scientists to the contrary, it remains difficult to assess what kind of thinking, if any, computers perform. Artificial is the most common term for this thinking, but alien might be more appropriate. Some see

the failure of artificial intelligence to deliver super human smartness as little more than a bad choice. Logic simply does not suffice for intelligence. None less than the grand master of mathematical logic recognized this problem from the beginning. Understanding that intelligence is unlikely to be created ex nihilio, Turing suggested the term *machine learning* **(Turing)** as a way to boot-strap the dull child machine towards the state of more enlightened machinic adulthood.

Computer scientists use the term "learning" in a very specific way. In less domain specific lingo one might simply call this "following rules" or "training". More generally, machine learning is understood as the discipline that develops the principles and procedures for making machines improve with experience **(Mitchell)**. Machine Learning grew out of the field of Artificial Intelligence, but is less concerned with symbolic logic and more interested in interaction with the 'real' world, where a fixed algorithm might not be available to solve a problem. Indeed, current computational solutions to many challenging problems such as speech recognition, synthetic speech generation and computer vision belong in this category.

Our interpretation of the significance of machine learning for the making of a new public differs from that emphasized by the computer science community, where the promise of even more efficient machines and yet higher levels of automated control are the focal points. For the design space we focus on, "learning" includes the acknowledgement of ignorance, the willingness to listen to others and the ability to learn from mistakes. Self-reflection and being linked to human judgment gives learning systems a unique scope. Understanding computation as a mediator and complementary participant with people is a powerful paradigm, one other areas of research seem also attracted to. Pentland and colleagues, for example, coined the term *social computation* to describe the field where behavior and habit analysis meet computational media. Indeed, querying the 'social' data generated by millions of people surfing the Internet is becoming a trans-disciplinary field in its own right. Other researchers are focusing on the potential of meta-level knowledge gleaned from large corpora of data. *Collective intelligence* **(Malone et al.)**, for example, suggests new ways of harnessing the aggregate knowledge from masses of individuals. Consensus, voting, averaging are acts performed on collected inputs. Depending on the particular application, these procedures actively aggregate and even robustly orchestrate knowledge snippets from individuals into something larger than the individual snippets themselves. But sometimes even this robustness is insufficient. Deliberation of social networking sites is often heralded as a democratic feature of the web. Contrary to intuition, deliberating groups do not do well at aggregating information objectively and fall prey to group think. Mixing people with information processes requires designers to seek new solutions for the obvious. Just as government comprises more than downloading application forms, public deliberation is more than just blogging. Interestingly, prediction methods, such as prediction markets with incentives, can achieve, at least according to Sunstein the kind of knowledge and deliberation results isolated minds cannot. But collective intelligence, for all its virtues, is too focused on a priori definitions of its search space, and too strongly convinced that the collective will always know better. For our interests, learning systems offer a more general framework, one that contains the potential of collective intelligences but expands it with system inherent adaptivity. The idea of combining the strengths of machinic procedure with human intuition and common sense is powerful because it has the potential to deliver ways of knowing neither of the two is capable of in isolation. Machine learning introduces to the machine world a sense of humility and suggests that machines are not all knowing, and that they can be designed to co-operate on our terms.

We cannot know what will be important tomorrow, hence the need to be able to operate in unknown territory. Cloud computing, stream processing and the *perpetual analytics* **(Pauw et al.)** it offers by continuously harvesting time ordered data from heterogeneous collections of sensors, was hardly known only a few years ago. Learning systems allow one to consider continuous flow, constant change and input from many different sources, humans, non-humans and synthetic systems alike. These features—and not the current spectacular success stories—make machine learning a prime candidate for a future framework of parliaments of things.

Have we not heard such stories of future wonders before? The trap of projecting qualitative change onto technology is an old story, and architecture has also been enticed by its lure. We are still waiting for the smart house to be smart by anyone's standards and the responsive environment to be more than a caricature of responsive. Cybernetics stumbled over its grand interpretations of early successes, over-interpreting the significance and scope of the simple feedback systems it so

desperately hoped were signs of a new age. Learning systems offer the opportunity to reconnect to this important legacy while acknowledging the new conditions on the ground today; it allows one to work towards reconnecting the social and the public with the technical in important new ways. And through these reconnections one rearranges the things that can emerge from them, because technical systems embody political and moral choices. And this rearrangement must now be understood as part of design practice, a logical extension of architectural practice that has always been 'comprehensive'. Just like the DJ and the programmer, who no longer create, but reorganize, as Bourriaud might put it.

Unfortunately, one cannot expect the current state of machine learning to be of much use to the arts and architecture. Systems built for optimizing search engines or robot trajectories are of no direct use. Indeed, new ones will be needed for intelligent urban design. And while these new configurations will be informed by those that proceeded them, their success and failure will be based on their ability to deliver both technical and social robustness. Confrontations will be unavoidable, but we have plenty of experience with that. Indeed, too numerous are the voices that accuse the new technical infrastructure of enslaving us in ever more elaborate forms. From critics of video surveillance **(Crang and Graham)** to RFID tracking **(Kuitenbrouwer)**, everyone seems to know just how dire the situation is. And the engineers who followed Weiser's well intended but disastrous suggestion of moving information infrastructure into the background—where no one knows what it is actually doing—are now hard at work attempting to prevent yet more public outcry by bringing it, selectively, back to the foreground. The design guidelines for privacy enforcement known as the *privacy razor* formulated by Lahlou and Jegou as part of the Disappearing Computer initiative, are one example of this belated clean up exercise. And even the most respected Human Computer Interaction designers who should bring some practical sense into the infrastructure mess only tell us what we already know, namely that information is a cultural good **(Dourish)**.

We do not have a concise theory of how to live with the powerful systems at our disposal, and this text will not change this. Instead of a solution we will offer, in the next section, an expanded solution search space with documents from imagined places, where information is understood as a public resource and learning systems act in concert with the people they are designed for.

MICRO PUBLICPLACES

1 A short list of MicroPublicPlaces

The documents we present begin with a short list of *MicroPublicPlaces*. These are mini institutions at the intersections of public interests. They rearrange resources of all kinds to generate new services outside of the private domain.

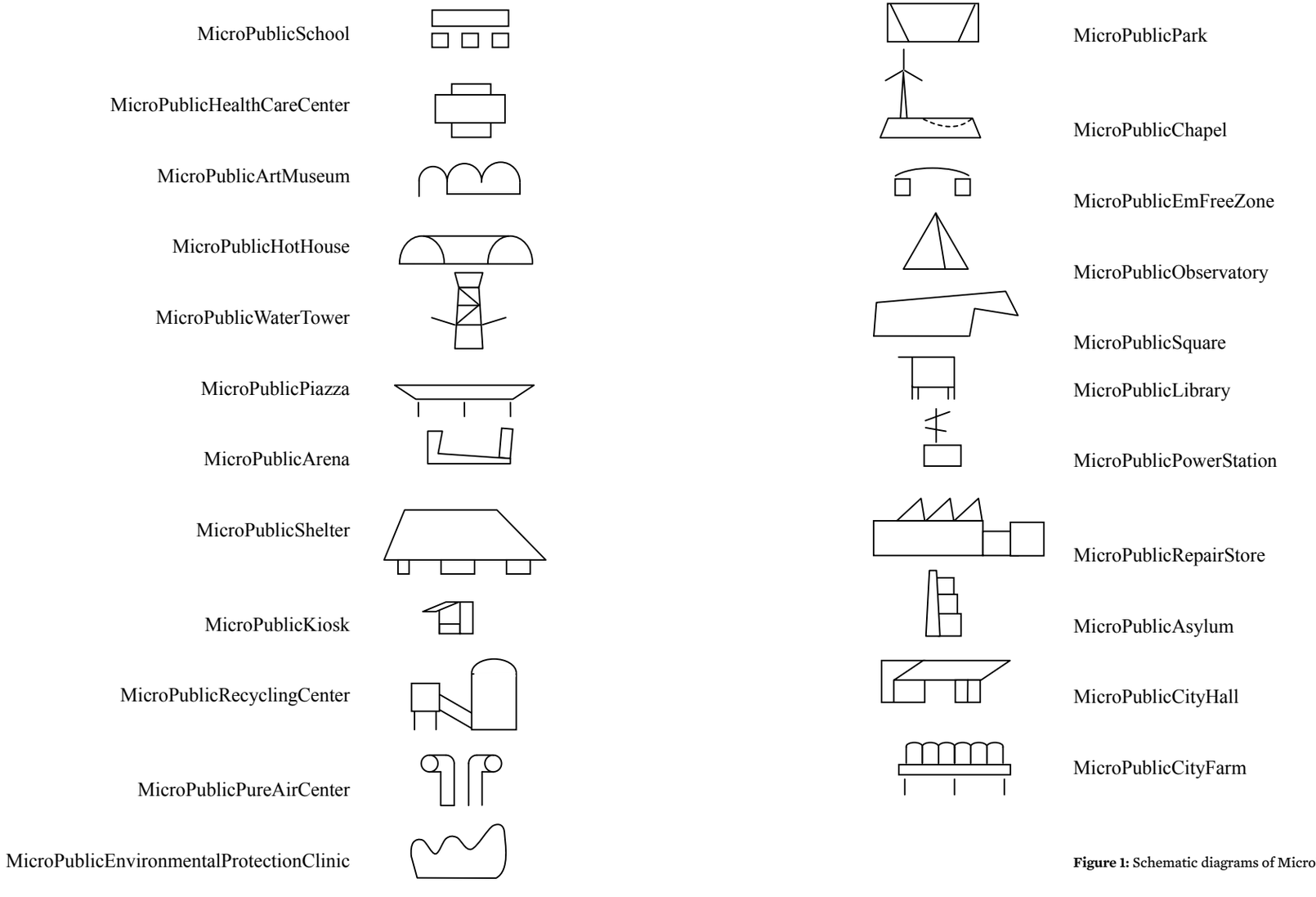

Figure 1: Schematic diagrams of MicroPublicPlaces

2 MicroPublicPlaces in the city

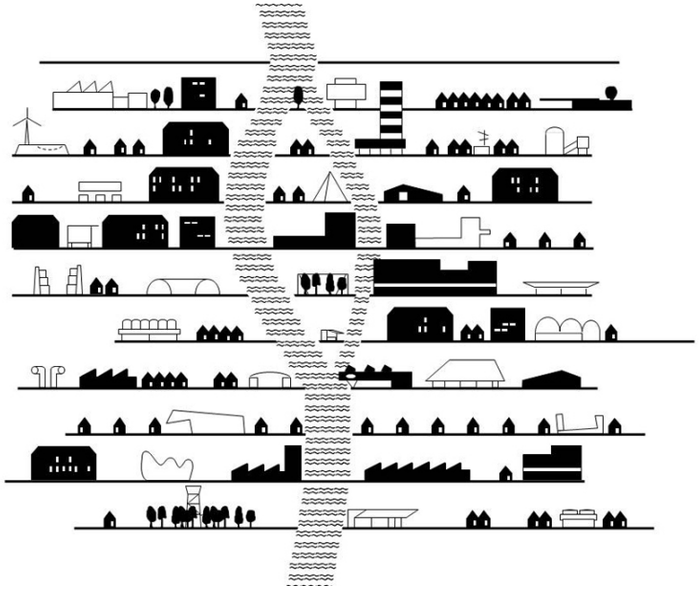

Figure 2: MicroPublicPlaces are small, many and distributed throughout the city

3 MicroPublicPlaces in action

3.1 The MicroPublicWaterPlant (MPW)

This MPW is situated in *Real de Catorce,* Mexico. Linked into the existing water treatment infrastructure of the town, it is a supplemental water enhancement system that improves the quality of drinking water and fortifies it with minerals. The inhabitants of Real de Catorce can make use of this water as long as supplies last. The right to do so is given to all who offer something in return. Peter Brabeck-Letmathe, a former CEO of Nestlé once said that water would continue to be wasted as long as it is free. Alternatively, it is also true that water, like other resources, is distributed unfairly once subjected to market forces. What is needed is a new currency for water, one in which water is paid for by work for water.

The system used here is based on the *slow sand filtration* approach, in use for hundreds of years **(Huisman and Wood)** in several different parts of the world. This gravity and time based method lets water seep through a sand and gravel bed of varied composition, and depending on the particulars of the filtration process, removes biological contaminants while adding minerals to the water. The contents of the filters are collected close to the MPW wherever possible. Local gravel and sand pits are good sources of material, and the old mining town of Real de Catorce has several of them. The two MPW filtration containers each have a diameter of 5 meters and a combined footprint of about 50m^2. Once the water has passed through the filtration system, it is stored in an underground cistern. Of course the system needs to be serviced periodically. The sand mix is replaced every three months and the old sand and gravel mix is used in the repair of sidewalks.

The MPW has a control room where the water filtration system is monitored and controlled. The water is continuously tested for composition and the results of the water tests are visible on a large electronic billboard on top of the MPW for maximum visibility.

A water bar is connected to the control room. The bar is a meeting place for information about both local and global water quality and supply issues. If water is a common good, then the public and not just private corporations need to monitor it. A program searches on-line news agencies, patent offices, chat rooms and social networking sites for pertinent information on any issues of significance related to water and water use. This generates an early warning system on economic activities that might compromise MPW's ability and right to generate good water. If the program finds, for example, that a company is attempting to buy the water rights to lands the MPW makes use of, a warning message is sent to all community members via text messaging.

A water sample dispenser lets visitors taste the water. Additionally, community members can also tell the MPW system how they like the water. The joint of all the votes, collected through networked mobile phones, is used as an aggregate input into the water taste design subsystem. The more votes the system receives, the better it learns to make a consensus estimate. Taste can be modified by adding calcium, or the pH can be increased or decreased by having the water seep through an additional layer of crushed sea shells. Some aspects of water are not perceivable by human sensory organs, such as the presence of bacteria. For that reason, some water issues are not subject to subjective prefer-

ences of taste and smell, but are regulated by best practices of water quality control expertise. Collective knowledge is not always superior to expert knowledge, and there is no substitute for common sense.

The MPW functions effectively because its members contribute to its design and upkeep. The motivational factor is strong as community members can see and taste the effect of their participation and efforts. Several companies have donated equipment and software to the MPW. Depending on skill and inclination, community members volunteer their knowledge and time. Students get university credit through internship programs in water quality management and social networking skills. Office workers can volunteer their spare time as system performance monitors while interfacing with the public as MPW tour guides. But altruism is not the only mechanism at work. Some of the hours put in at the MPW can be used as tax credits. The bulk of the work, however, falls on the MPW person, the *custodian*.

The custodian holds a new job that the MPP system and the logic of local activities coupled with networked systems requires. The custodian is a new kind of manager with a passion for serving his/her community, a penchant for organizational challenges and a desire to be reimbursed for it. For example, the custodian organizes a small and always changing collection of volunteers with specific skills around the MPW. The custodian helpers self-organize and keep a watchful eye on the workings

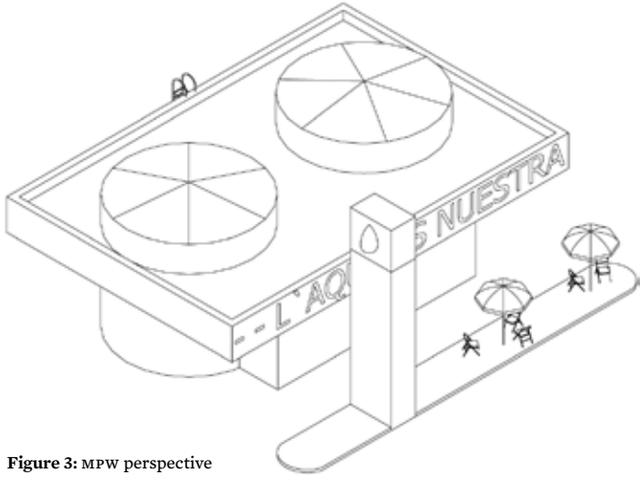

Figure 3: MPW perspective

of the MPW and serve as a first line technical consulting group. While the custodian helpers are local to each MPW, their knowledge and expertise travels to all networked MPPs to the benefit of all. As in the other MPPs, the MPW custodian receives a modest salary from the community, but is allowed to make use of the MPW infrastructure for personal monetary interests. One MPW custodian, for example, made ice cream using MPW's high quality water and sold the amazingly tasty products to MPW visitors at a premium, making a handsome sum in the process.

3.2 The MicroPublicZoo

The animals that live in the Berliner MPZ are reminiscent of a well known fable from a well know ancient Chinese encyclopedia. They can be grouped into three categories: 1) wild animals that are only present virtually, 2) animals that live in the MPZ and move around freely and 3) organisms that are too small to be perceived by the un-aided eye.

The MPZ is an extension of Berlin's *Mauerpark*. It is about 260m² and surrounded by a chain linked fence. The area is under continuous video surveillance. The MPZ contains three pavilions: The salon of the lions, the ant-sphere and the boudoir of microorganisms.

The salon of the lions resembles a semi-transparent greenhouse. Inside, there are three large screens that show live video feeds from cameras located in the Serengeti (about the same longitude as Berlin, hence in the same time zone). One camera takes close-up shots, another collects panoramic views while the third searches for animal activities. The control of the cameras is either automated operating locally, or remote, controlled by a team of animal observers in Kenya. The team of video operators in Kenya replaces the animal keepers that would otherwise be in Berlin. Looking at the displays, one sees the animals in their usual habitat and of course most of the time nothing at all happens. Hours of laziness pass by as the lions just lie around and sleep. Sometimes a tail moves. Sometimes the scene is completely empty. Many visitors leave then. Too bad. One must be patient. But then, all of a sudden, bam! Dozens of zebras run past the camera. Where are they headed—what happened?

For those too impatient to sit and watch the live feed there is a searchable video archive with tagged footage. This allows visitors to issue

simple queries such as “hunter”, “sex”, and “lion babies” to mine the rich video archive. Users can also re-tag the video sequences and assist the search algorithm in refining its results. The more people tag and re-tag the clips, the better the system can operate using the collective intelligence of the visitors. This aggregate information is then repurposed to inform the search activity of the camera responsible for close-ups to look for what most people want to see. Sometimes inappropriately labeled data confuses the system and the camera points to the sky, waiting for new commands. But the panorama camera does not respond to any such wishes. It maintains distance, pans to and fro while delivering an unemotional overview of the scene.

The ant sphere, the pavilion of the real, is the home of two species of ants, the red wood ant, *formica rafa,* and the black garden ant, *lasius niger* **(Seifert)**. The ant sphere is a response to the famous *bio-sphere II* that was destroyed by ants. This dome in Berlin does not have its own atmosphere, but it is a text-book colony with numerous entries and exits for ants and humans alike. Transparent tubes criss-cross the interior of the dome and connect the various ant biotopes with each other. Visitors can march about on their own, following the maze of tubes and watch the ants carry food, building materials and each other from one end of the dome to the other, fulfilling a plan only they seem to understand. Visitors to the MPZ are free to observe and record the ants’ activities. They are encouraged to upload their data to the MPZ database or watch other peoples’ video clips. Maybe one of the many visitors will see something the busy scientists have not noticed. The ant colonies are easy to manage; they take care of themselves. During the winter they disappear into the ground.

The boudoir of the micro-organisms is dedicated to those small creatures that live in our bodies, the *human microbiome.* There are several displays that show various members of the human flora and microbiota. Some are well-known such as *E-coli* while others have just been discovered. All of them, however, are our neighbors and closer to us than lovers and children. They share our bodies, our beds, our bathrooms and our buildings. Yet we don’t even know if all people share the same human microbiome **(The Human Microbiome Project)**. The pathway through the boudoir creates an opportunity to explore this strange world. Some exhibits show how bacteria replicate, others show DNA maps. There are time-lapse videos of bacteria and fungi that inhabit our mouths and our sexual organs. Even basic facts of some of the strange bacterial flora are more interesting than a science fiction movie. At the end of the boudoir there is a small section with lab equipment. Systems biology students from Berlin’s universities show curious visitors how to create and maintain harmless bacteria cultures and ensure that bacterial literacy becomes popular culture. The MPZ custodian has assembled a small crew of helpers and assistants to deal with the many aspects of the MPZ and its maintenance. As in the other MPPs, time and energy offered to the MPZ are reimbursed with a mix of direct remuneration, tax credits, and respect. The latter is especially important for the younger members of the custodian crew.

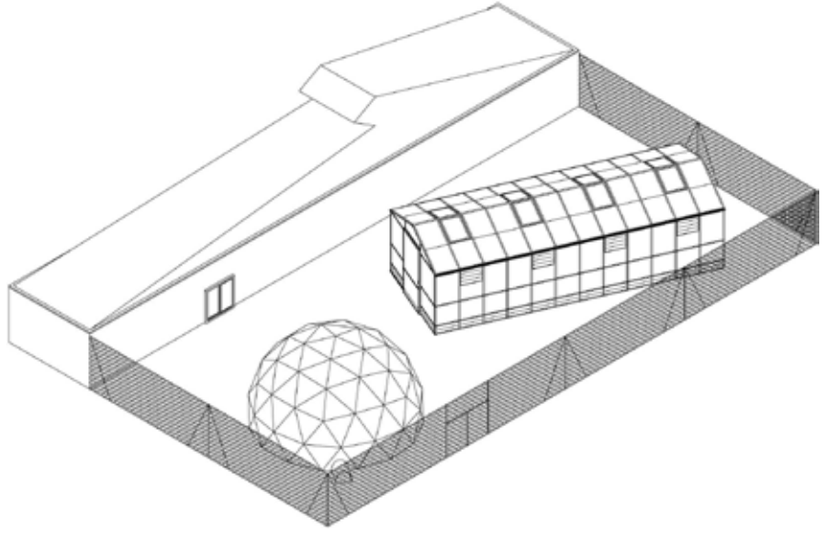

Figure 4: MPZ perspective

3.3 The MicroPublicKindergarten (MPK)

This MPK is not a traditional kindergarten. This MPK is a playground designed for play with a particular didactic approach. It is recombinant architecture, but not the kind William Mitchell had proposed. Instead of a plethora of electronic display gadgets you will find a recombinant learning environment. Here, children learn through simple word games and basic arithmetic while machines learn to mediate the materials in the most effective and enjoyable manner.

This MPK is set in Indonesia in the city of *Yogyakarta*. Indonesia encompasses a large range of cultures, languages and ethnicities. The MPK is designed to work alongside Indonesia's diverse educational infrastructure that has seen influence by European educational norms, Islam, and boarding schools such as the *pesantren*. Open from 7am to dusk, the MPK gives toddlers an opportunity to engage in play-based, self-paced, imitation-inspired learning while maintaining the strictness and formality common to schools in Indonesia **(Cummings and Christiano)**. The MPK is designed as a bridge and operates as a bridge. It connects two *campungs* on either side of the *Kali Code*. The bridge is a busy place. There are children everywhere, laughing and shouting as they run around the elaborate playground made of simple local materials. A canopy covers the play area with a welcome shade.

On the southern side three 25ft containers stand in a row. They contain the service rooms and the office of the bridge custodian. The custodian prevents aggressive children from bullying others and cares for minor cuts and bruises that inevitably accompany serious play. Stacked on top of the three lower level containers are four 25ft containers that have been combined into one large space of about 60m^2. This is where the structured but playful learning under machine supervision occurs. All the activities are based on imitation games, methods of learning and teaching that occur in all human societies, robot control **(Ratliff et al.)** and some animal societies **(Dautenhahn and Nehaniv)**. Imitation is an efficient teaching method that avoids lengthy trial and error processes. While the supervision required for imitation learning has traditionally been supplied by people, today some of this supervision and attention can be delivered by computer systems.

The MPK has two different kinds of learning areas, one dedicated to sounds and one to symbols (letters and numbers). The sounds area reproduces the sounds of birds children hear in the forests and markets. There is the sound of the *Yellow-crowned Bulbul,* the *Triton Cockatoo,* and *Javan barbet*. The system plays examples from the bird songs, and the children are invited to imitate the sounds. The system replays their attempts and then replays the original, allowing an intuitive comparative evaluation that invites further improvement. This continues until the difference between the original recording and a child's imitation is small. This allows children to practice their animal imitation skills, and some children become quite adept at it. Since the system has examples from birds in the wild, as well as birds in captivity, the children learn through the imitation game the audible differences between life in the forest and life in captivity. This changes the way they think about live animal markets, such as *Pramuka* **(Nash)**.

Alternatively the children choose a game based on letters. A program displays letters of the Bahasa Indonesia or English alphabet on a large low resolution screen.259. If the children shout out the letter correctly, a second one appears, then a third, until simple words are formed. This is a new interpretation of *ing ngarso sung tulodho* (in the front giving examples), as coined by one of Indonesia's educational reformers, *Ki Hajar Dewantara* **(Soefijanto)**.

Children can also play this game in groups. In some cases, they learn together better than alone. Sometimes they learn from each other more effectively than from the imitation system. All of these approaches are supported and encouraged. Students can sign in with a password to have their results recorded or play anonymously. Crafty children who progress quickly are challenged with ever longer words, while those

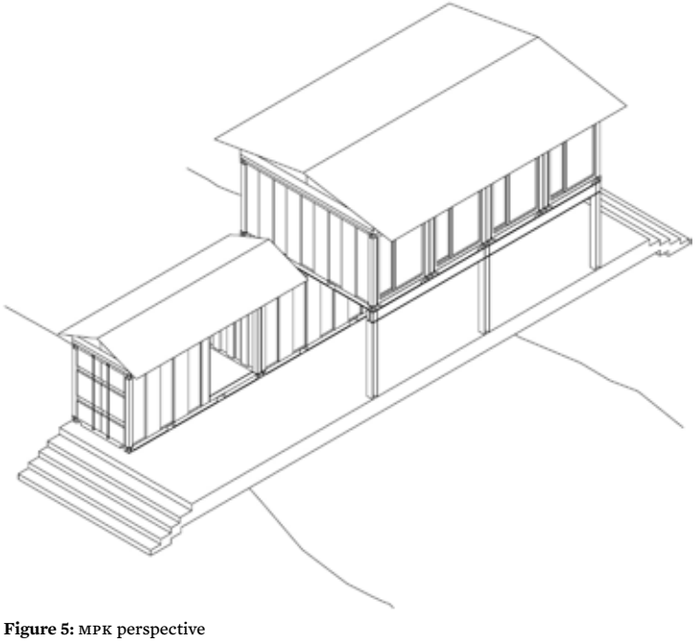

Figure 5: MPK perspective

who work slowly are given time to reconsider their answers. The system adapts to the facility with which the children respond. They can practice all day long if they want; the computer, as opposed to a human teacher, never gets impatient. Oh, but the children get impatient! And then they move on to the numbers area. This site lets them practice simple arithmetic. The system has an electronic billboard where, for example, two numbers are added and the result displayed. On a second line two numbers are added, but no result is displayed. The children take turns typing into a keypad their results. If correct, the system moves on to a next level. Sometimes the next level takes an unexpected turn. There is, for example, special emphasis on simple representations of nothing: the empty set, the number zero, silence. When playing in groups the system follows the lead of the average performance of the children. When played individually, the system adapts to the skill level of the single player, increasing the complexity by working with larger numbers and reducing the amount of time allocated for generating answers. Children doing well in the numbers area are allowed to play on their own in the playground on the bridge.

3.4 The MicroPublicRepairCenter (MPR)

While the previous MPPs have been modeled along institutions of long historical lineage such as the school, the chapel or the communal well, this MPP is built for a form of assembly that has little historic precedent. The MPR is a community center where people come to consider broken objects. They come for repairs, insights and discussions. It is set in *Bochum,* Germany, close to the site of the *OPEL* automobile factory, where highly skilled workers already have lost or are likely to lose their jobs **(Stumm)**.

At a corner of the factory complex there are two small buildings adjacent to each other, a bright yellow building, flooded with sunlight and an orange one behind it with almost no windows. Inside the yellow building, the MPR custodian and his crew are busy reviewing the latest schematics and diagrams of parts, circuits and gizmos delivered electronically from all over the planet. The MPR is a public library of things large and small that our domestic appliances, mobile phones, automobiles, computers and microwave ovens depend on. Diagrams, schematics, parts and materials lists of every possible model are stored here; a veritable knowledge base of what holds consumer products together. A large screen in the background displays a computer model of the newest database entry, slowly rotating around its center of gravity.

Repair—is not only about fixing things. What happens when the mobile phone, automobile and music player stop working? Staled automobiles, burnt-out microwave ovens and short-circuited electric toothbrushes may be non-operational in their original sense, but functional in a new sense, as Maturana describes in the *Tree of Knowledge*. The defective toaster is an open window onto what toasting is intended to be, might be imagined as and never can be. In the contemplation of the dysfunctional home appliance one has the opportunity to consider domestic life in ways the normal state of affairs does not offer.

People stop by the MPR with all kinds of requests. One elderly man's coffee grinder no longer grinds. Instead of discarding the object he has grown attached to, he brings it to the MPR. One of the custodian's crew recognizes the problem immediately. A specialty screw is missing. With years of experience working on automobiles, these workers are primed for deep understanding of all things practical. The MPR offers the unemployed workers an opportunity to share this knowledge for a modest sum and apply it to new and old venues of concern to their community. The coffee grinder's make and model are typed into the system and a complete parts list as well as the site of manufacturing appears on the large screen. Ah, so this one was assembled in former East Germany, interesting. The missing screw is identified and the specifications are sent to the back room fabrication lab where a recently decommissioned factory robot under the supervision of another worker crew creates a replica screw from the delivered data. That was easy! The digital fabrication lab can deal with everything from signs, circuits, and antennas to furniture and more **(Gershenfeld)**.

After having their urgent repair needs taken care of, people linger around the MPR and chat. A lounge under the sky roof invites for relaxation. Next to the lounge is a booth for the *small parts oral history project*. Just like the many oral history projects launched in recent years, this one attempts to capture undocumented experiences through interviews. Unlike other oral history projects, this one is centered on experiences we all share. Here the emphasis is on the experience of things going

wrong, something breaking unexpectedly. How annoying is that! Anyone who visits the MPR can have the story of their broken appliance recorded. The audio and video data are filtered and parsed by a classification system that tags the narratives so they become searchable. Frequencies of failure types and patterns of unanticipated events are tallied and compared with the technical materials from manufacturers, hobbyists and do-it-yourselfers. This in turn tunes the system's ability to actively learn, and to recognize new kinds of failure modalities and unexpected usage patterns. If for example a particular toy is repeatedly checked in at the MPR, a more complete background check on the item is performed and product recalls can be issued before serious incidents occur. Recently the system discovered a design flaw in a juice mixer that lead several people to believe their mixer was not operational when indeed they had inadvertently put it in hibernation mode. Sometimes collective ignorance beats collective intelligence at its own game.

The collected dataset is a rich window onto the shadow life of objects and the worlds that create them. Sociologists use the data to understand how people live with domestic appliances. Marketing professionals use it to understand purchase preferences. Linguists and philosophers use it to study the changing ways in which we describe, and understand, technical appliances. Engineers and interaction designers use it to improve their designs and imagine new ones. Parents use it to show their children what domestic life was like during their youth. The collected data also benefits the former auto plant as it hopes to learn, over time, how to improve its new generation of automobiles. In return, the MPR can remunerate the custodian, the crews and maintain access to the old factory buildings and decommissioned machinery.

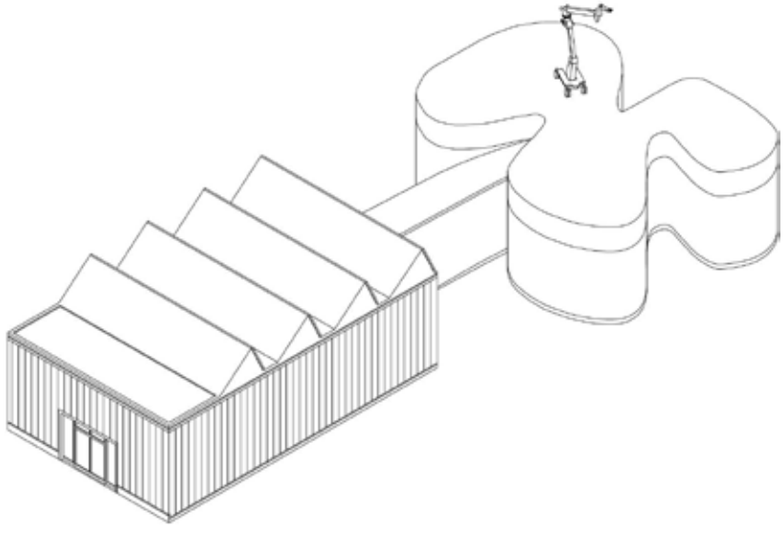

Figure 6: MPR perspective

3.5 MicroPublicChapel (MPC)

The MPC is a site of contemplation in the age after God. It invites its visitors to ponder first and last questions. How did the universe begin? Why are we here? Or to quote Brian Eno: "More and more I find I want to be living in a Big Here and a Long Now".

The Big Here.

This MPC is set in *Tirana,* Albania, close to the *Et'hem Bey Mosque*. It consists of an earthen ring wall into which a concrete dish of 10m diameter is cast. Adjacent to the wall are a control room with an observation post and a subterranean energy storage site. Energy required for the operation of the MPC is generated by a wind turbine and the heat accumulated through insolation of the concrete dish.

During the day one can watch the clouds move slowly across the large sky outlined by the edge of the earthen ring wall. Some people spend hours just looking up to the sky. In the control room one has access to all kinds of astronomical data collected from various sources such as high end observatories from across the planet, satellite hunters, meteorite searchers, as well as personal narratives from astronauts and alien abduction claims. Everyday more is known about the universe and yet everything remains a mystery. The observation post includes a robotic telescope that scans the sky for real-time local celestial events, including commercial and military satellite passings. You never know what is flying by. Any networked mobile phone can access all of this data.

At dusk the dish becomes an eye to the night sky as it blocks much of the urban light pollution. The spherical opening to the night sky is reminiscent of the view of a cockpit where the visitor is on the deck of space ship earth. The robotic telescope has limited resolution and can-

not see some of the more interesting objects in the sky. But it points in the right direction. Sometimes it points to the site of Gleise 581 in the constellation Libra. That includes one of Gleise's planets, Gleise 581d, the smallest exoplanet discovered to date that just might be habitable **(Bloh et al.)**. It is too far away and too faint to see, but we know it is there. Visitors desiring more information consult the custodian who fills in the missing details, and often spins a tale of his/her own making.

Hobby astronomers supply the system with their own observations. Lay people can use their mobile phones to report unidentified flying objects or other unusual night time activities. An algorithm trains itself to filter junk data from quality data, but sometimes it fails. On cloudy nights the MPC server donates its extra computing capacity to the *SETI@home* project **(Anderson et al.)**.

The subterranean cavern stores all the rechargeable electric battery cells the MPC depends on. It is cool in the summer, warm in the winter, and a nice place to be alone, particularly since it acts as a shield against electromagnetic waves and prevents mobile phone reception. The software that controls the charge system was originally composed by one of the custodians of an MPC in France. It is open source and has since been continuously updated and improved by the MPCcustodian community over the years. The base program is designed to adapt to local conditions, the storage capacity and charge rate of the batteries. If no power can be generated, as on windless cloudy days, and the energy storage has been depleted, the MPC goes into temporary hibernation and remains closed to the public, until it can recharge itself. And it always does.

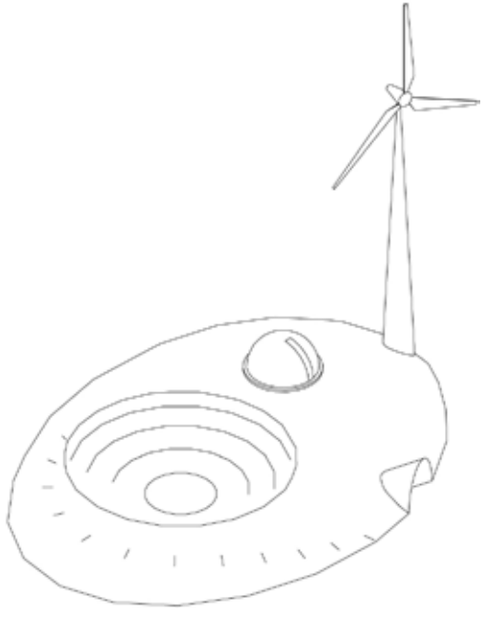

Figure 7: MPC perspective

To the Public

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[1] Maybe the largest cloud computing fiasco to date occurred on January 30th 2009 when the social book-marking service *Ma.gnolia.com* lost about half a terabyte of data, including backup files after a database became corrupted, forcing the service to shut down. [Naone2009]. Worse is yet to come, guaranteed.